

## EASY SELECTION

### Selection of Extreme Duty Setscrew Ball Bearings

DODGE Extreme Duty mounted ball bearings are primarily designed for radial loading. However, they have the capacity to carry thrust loads and combined radial/thrust loads. The maximum recommended load which can be applied is limited by various components in the system, such as bearing, housing, shaft attachments, speed and life requirements as listed in this catalog and the instruction manual that accompanies each bearing. DODGE Extreme Duty ball bearings have been applied successfully when these limits have been exceeded under controlled operating conditions. Contact DODGE Engineering for applications which exceed these recommendations.

Select a bearing from the Selection Table that has a radial load rating at the operating speed equal to or greater than the calculated Equivalent Radial Load for a desired L<sub>10</sub> life. This simple method is all that is required for the majority of general applications and provides for occasional average shock loads.

**L<sub>10</sub> Hours Life**-the life which may be expected for at least 90% of a given group of bearings operating under identical conditions.

**Heavy Service**-For heavy shock loads, frequent shock loads or severe vibrations, add up to 50% (according to severity of conditions) to the Equivalent Radial Load to obtain a Modified Equivalent Radial Load. Consult Application Engineering for additional selection assistance.

A maximum thrust load value of C/10 is recommended as a guide for general applications and will give adequate L<sub>10</sub> life. If the thrust load exceeds this limit, it is advisable to use auxiliary thrust carrying devices, such as a shaft shoulder, snap ring, or a thrust collar. Where substantial radial load pulls the housing away from the mounting base, both the hold-down bolts and housing must be of adequate strength. Auxiliary load carrying devices, such as shear bars, are advisable for side or end-loading of pillow blocks and radial loads for flange units.

To determine the L<sub>10</sub> hours life for loads and RPMs not listed use the following equation:

$$L_{10} = \left(\frac{C}{P}\right)^3 \times \left(\frac{16,667}{n}\right)$$

Where:

L<sub>10</sub>= Life, hours

C = Dynamic Capacity, lbs. or N

P = Equivalent Radial Load, lbs. or N

n = Revolutions per minute

When the load on a ball bearing is solely a radial load with no thrust (axial) load, the Equivalent Radial Load (P) is equal to the actual radial load. However, when a thrust (axial) load is applied, the radial and thrust loads applied must be converted into an Equivalent Radial Load. Use X (radial factor) and Y (thrust factor) from Table 1 to convert the actual applied thrust and radial loads to an Equivalent Radial Load which has the same effect on the life of a bearing as a radial load of this magnitude.

$$P = XF_R + YF_A$$

Where:

P = Equivalent Radial Load, lbs.

F<sub>R</sub>= Radial load, lbs.

F<sub>A</sub>= Thrust load, lbs.

e = Thrust load to radial load factor (Table 1)

X = Radial load factor (Table 1)

Y = Thrust Factor (Table 1)

C<sub>0</sub>= Basic static capacity (Selection Table)

To find X and Y, first calculate F<sub>A</sub>/C<sub>0</sub> to determine e.

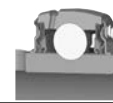
Calculate F<sub>A</sub>/F<sub>R</sub> and compare to e to determine the X and Y factors to use from Table 1.

#### Shaft Tolerances

Normal Shaft Size	Commercial Shaft Tolerance	Recommended Shaft Tolerances
	(Inches)	Setscrew Ball Bearing (Inches)
Up to 1-1/2"	+0.000 -0.002	+0.0000 -0.0005
Over 1-1/2" to 2-1/2"	+0.000 -0.003	+0.0000 -0.0010
Over 2-1/2" to 4"	+0.000 -0.004	+0.0000 -0.0010

**NOTE:** Bearing analysis program "BEST" is available on [www.ptwizard.com](http://www.ptwizard.com)

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Table 1

$F_A/C_0$	$e$	Radial/Thrust Factors			
		If $F_A/F_R$ is equal to or less than $e$		If $F_A/F_R$ is greater than $e$	
		$F_A/F_R \leq e$		$F_A/F_R > e$	
		X	Y	X	Y
0.014	0.19	1	0	0.56	2.30
0.021	0.21	1	0	0.56	2.15
0.028	0.22	1	0	0.56	1.99
0.042	0.24	1	0	0.56	1.85
0.056	0.26	1	0	0.56	1.71
0.070	0.27	1	0	0.56	1.63
0.084	0.28	1	0	0.56	1.55
0.110	0.30	1	0	0.56	1.45
0.170	0.34	1	0	0.56	1.31
0.280	0.38	1	0	0.56	1.15
0.420	0.42	1	0	0.56	1.04
0.560	0.44	1	0	0.56	1.00

**Lubrication-** DODGE Ball Bearings are lubricated at the factory and are ready to run. The bearings are initially lubricated with a lithium complex grease and should be relubricated with the same or some equivalent. For high speeds, high loads, extreme temperatures and other abnormal operating conditions, special greases may be required. Contact DODGE Application Engineering for recommendations on these types of applications.

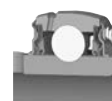
**Misalignment -** DODGE Ball Bearings are designed to allow a maximum of  $\pm 2^\circ$  static misalignment. These bearings are not suitable for dynamic misalignment. To ensure good alignment, mounting surfaces must be checked for flatness and must lie in the same plane. When tightening base bolts, each bolt should be alternately tightening in incremental torque values until full torque is achieved to prevent the angular shifting of the pillow block that occurs when one bolt is tightened to its full torque. Shimming may be required to minimize misalignment.

Substitute all known values into the Equivalent Radial Load equation. The Equivalent Radial Load (P) thus determined can be used in the  $L_{10}$  life formula or compared to the allowable Equivalent Radial Load rating desired in the expanded rating chart to select a bearing (Selection Table).

If calculated value of P is less than  $F_R$ , use  $P=F_R$ .

**NOTE:** Bearing analysis program "BEST" is available on [www.ptwizard.com](http://www.ptwizard.com)

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# SELECTION

## Setscrew Ball Bearings

Recommended Torque													
Setscrews					D-LOK			Mounting Bolts					
Setscrew Size	Key Hex Across Flats	◆ Recommended Torque			Cap Screw Size	Recom. Torque	EZ-KLEEN Recom. Torque	Metal Housings		EZ-KLEEN Housed Bearings			
		Standard Ball Bearing Insert		Corrosion Resistant Stainless Steel				Bolt Size	Recom. Dry Torque (Grade 2)	2-Bolt PB, 2 & 4 Bolt Fig. and Fig. Brackets		Tapped Base PB	
		Min	Max							Bolt Size	Torque ①	Bolt Size	Torque ②
(in.)	(in.)	(in.-lbs.)	(in.-lbs.)	(in.-lbs.)	(in.)	(in.-lbs.)	(in.-lbs.)	(in.)	(in.-lbs.)	(in.)	(in.-lbs.)	(in.)	(in.-lbs.)
#10	3/32	28	33	25	#8-32	58	46	3/8-16	240	3/8-16	225	3/8-16	175
1/4	1/8	66	80	60	#10-32	90	72	7/16-14	384	7/16-14	350	7/16-14	350
5/16	5/32	126	156	117	1/4-28	180	144	1/2-13	600	1/2-13	500	1/2-13	400
3/8	3/16	228	275	206	5/16-24	400	320	5/8-11	1200	9/16-12	650		
7/16	7/32	342	428	321	3/8-24	750	600	3/4-10	1950	5/8-11	1000		
								7/8-9	2890				
(mm)	(mm)	(N-m)	(N-m)	(N-m)	(mm)	(N-m)	(N-m)	(mm)	(N-m)	(mm)	(N-m)	(mm)	(N-m)
M5	2.5	3.2	3.7	2.8	M4	585	4.68	M10	29	M8	15		
M6	3	6.2	7.7	5.8	M5	10.75	8.6	M12	50	M10	25		
M8	4	14.2	17.8	13.4	M6	20.5	16.4	M16	124	M12	50		
M10	5	26	31	23	M8	45	36	M20	238	M14	75		
M12	6	46	57	43				M22	322	M18	125		

① Torque for Austenitic (18-8) Stainless  
② Max. torque values published. Do not exceed

### Lubrication

High Speed Operation - In the higher speed ranges, too much grease will cause over-heating. The amount of grease that the bearing will take for a particular high speed application can only be determined by experience. If excess grease in the bearing causes overheating, it will be necessary to remove grease fitting to permit excess grease to escape. The bearing has been greased at the factory and is ready to run. When establishing a relubrication schedule, note that a small amount of grease at frequent intervals is preferable to a large amount at infrequent intervals.

◆ **NOTE:** Dodge does not recommend the use of oils or locking agents on setscrew threads. However, if utilized, the minimum installation torque values should be followed.

### Lubrication Guide

Use a No. 2 Lithium complex base grease or equivalent\*

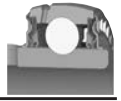
Hours Run per Day	Suggested Lubrication Period in Weeks							
	1 to 250 RPM	251 to 500 RPM	501 to 750 RPM	751 to 1000 RPM	1001 to 1500 RPM	1501 to 2000 RPM	2001 to 2500 RPM	2501 to 3000 RPM
8	12	12	10	7	5	4	3	2
16	12	7	5	4	2	2	1	1
24	10	5	3	2	1	1	1	1

\* For EZ-KLEEN series bearings, use an aluminum complex base grease.

Lubrication recommendations are intended for standard products applied in general operating conditions. For modified products, high temperature applications, and other anomalous applications contact product engineering at 864-284-5700.

**NOTE:** Bearing analysis program "BEST" is available on [www.ptwizard.com](http://www.ptwizard.com)

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**SELECTION**

**Extreme Duty SCED/SCMED**

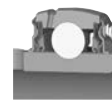
Ring Size	Shaft Size		Dynamic Capacity C, lbs.	Static Capacity Co, lbs.	L <sub>10</sub> Life - Hours	Allowable Equivalent Radial Load Rating (lbs.) at Various RPM*											
	SCED	SCMED				50	150	250	500	750	1000	1250	1500	1600	1750	2000	2250
204	1/2 5/8 3/4 13/16 20mm		2899	1482	2000	741	513	433	344	300	273	253	238	233	226	217	208
					3000	647	449	378	300	262	238	221	208	204	198	189	182
					4000	588	408	344	273	238	217	201	189	185	180	172	165
					6000	513	356	300	238	208	189	176	165	162	157	150	144
					10000	433	300	253	201	176	160	148	139	136	132	127	122
205	7/8 15/16 1 25mm		3146	1769	2000	804	557	470	373	326	296	275	259	253	246	235	226
					3000	702	487	411	326	285	259	240	226	221	215	205	17
					4000	638	442	373	296	259	235	218	205	201	195	187	179
					6000	557	386	326	259	226	205	191	179	176	170	163	157
					10000	470	326	275	218	191	173	161	151	148	144	137	132
206	1-1/16 1-1/8 1-3/16 1-1/4 30mm	1 25mm	4368	2538	2000	1116	774	652	518	452	411	382	359	351	341	326	314
					3000	975	676	570	452	395	359	333	314	307	298	285	274
					4000	886	614	518	411	359	326	303	285	279	271	259	249
					6000	774	536	452	359	314	285	265	249	244	237	226	217
					10000	652	452	382	303	265	240	223	210	206	199	191	183
207	1-1/4 1-5/16 1-3/8 1-7/16 35mm	1-3/16 1-1/4 30mm	5759	3461	2000	1471	1020	860	683	596	542	503	473	463	450	430	414
					3000	1285	891	752	596	521	473	439	414	405	393	376	361
					4000	1168	810	683	542	473	430	399	376	368	357	341	328
					6000	1020	707	596	473	414	376	349	328	321	312	298	287
					10000	860	596	503	399	349	317	294	277	271	263	252	242
208	1-1/2 1-5/8 40mm	1-7/16 1-1/2+ 35mm	7332	4475	2000	1873	1299	1095	869	759	690	641	603	590	573	548	527
					3000	1636	1134	957	759	663	603	560	527	515	500	478	460
					4000	1487	1031	869	690	603	548	508	478	468	454	435	418
					6000	1299	900	759	603	527	478	444	418	409	397	380	365
					10000	1095	759	641	508	444	403	375	352	345	335	320	308
209	1-5/8 1-11/16 1-3/4 45mm	1-1/2 40mm	7891	4906	2000	2016	1398	1179	936	817	743	689	649	635	616	589	567
					3000	1761	1221	1030	817	714	649	602	567	555	538	515	495
					4000	1600	1109	936	743	649	589	547	515	504	489	468	450
					6000	1398	969	817	649	567	515	478	450	440	427	409	393
					10000	1179	817	689	547	478	434	403	379	371	360	345	331
210	1-15/16 2 50mm	1-11/16 1-3/4 45mm	7891	5213	2000	2016	1398	1179	936	817	743	689	649	635	616	589	567
					3000	1761	1221	1030	817	714	649	602	567	555	538	515	495
					4000	1600	1109	936	743	649	589	547	515	504	489	468	450
					6000	1398	969	817	649	567	515	478	450	440	427	409	393
					10000	1179	817	689	547	478	434	403	379	371	360	345	331
211	2 2-3/16 2-1/4 55mm	1-15/16 2 50mm	9755	6588	2000	2492	1728	1457	1157	1010	918	852	802	785	762	729	701
					3000	2177	1509	1273	1010	883	802	744	701	686	665	636	612
					4000	1978	1371	1157	918	802	729	676	636	623	605	578	556
					6000	1728	1198	1010	802	701	636	591	556	544	528	505	486
					10000	1457	1010	852	676	591	537	498	469	459	445	426	410
212	2-1/4 2-7/16 60mm	2-3/16 2-1/4 55mm	11791	8100	2000	3012	2088	1761	1398	1221	1110	1030	969	949	921	881	847
					3000	2631	1824	1539	1221	1067	969	900	847	829	804	769	740
					4000	2391	1657	1398	1110	969	881	818	769	753	731	699	672
					6000	2088	1448	1221	969	847	769	714	672	658	638	611	587
					10000	1761	1221	1030	818	714	649	602	567	555	538	515	495
214	2-11/16 70mm	2-7/16 2-1/2 65mm	13995	9838	2000	3575	2479	2091	1659	1450	1317	1223	1150	1126	1093	1045	1005
					3000	3123	2165	1826	1450	1266	1150	1068	1005	984	955	913	878
					4000	2837	1967	1659	1317	1150	1045	970	913	894	867	830	798
					6000	2479	1719	1450	1150	1005	913	848	798	781	758	725	697
					10000	2091	1450	1223	970	848	770	715	673	658	639	611	588
215	2-15/16 75mm	2-11/16 70mm	14872	11108	2000	3799	2634	2222	1763	1540	1400	1299	1223	1197	1161	1111	1068
					3000	3319	2301	1941	1540	1346	1223	1135	1068	1045	1015	970	933
					4000	3015	2091	1763	1400	1223	1111	1031	970	950	922	882	848
					6000	2634	1826	1540	1223	1068	970	901	848	830	805	770	741
					10000	2222	1540	1299	1031	901	818	760	715	700	679	650	625
216	2-15/16 3 75mm		17407	13102	2000	4446	3083	2600	2064	1803	1638	1521	1431	1401	1359	1300	
					3000	3884	2693	2272	1803	1575	1431	1328	1250	1223	1187	1136	
					4000	3529	2447	2064	1638	1431	1300	1207	1136	1112	1079	1032	
					6000	3083	2138	1803	1431	1250	1136	1054	992	971	942	901	
					10000	2600	1803	1521	1207	1054	958	889	837	819	795	760	
218	3-7/16 3-1/2 85mm		21451	16641	2000	5479	3799	3204	2543	2222	2019	1874	1763	1726			
					3000	4787	3319	2799	2222	1941	1763	1637	1541	1508			
					4000	4349	3015	2543	2019	1763	1602	1487	1400	1370			
					6000	3799	2634	2222	1763	1541	1400	1299	1223	1197			
					10000	3204	2222	1874	1487	1299	1181	1096	1031	1009			

\* Slight interference fit required when operating on the right of the heavy line or in the shaded area.

+ Piloted flange only

**NOTE:** Bearing analysis program "BEST" is available on [www.ptwizard.com](http://www.ptwizard.com)

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# SELECTION

## Extreme Duty SCED/SCMED

Ring Size	Shaft Size		Dynamic Capacity C, lbs.	Static Capacity C <sub>0</sub> , lbs.	L <sub>10</sub> Life - Hours	Allowable Equivalent Radial Load Rating (lbs.) at Various RPM*											
	SCED	SCMED				2500	2750	3000	3250	3500	3600	4000	4500	5000	5250	5500	6000
204	1/2 5/8 3/4 13/16 20mm		2899	1482	20000	201	195	189	184	180	178	172	165	160	157	155	150
					30000	176	170	165	161	157	155	150	144	139	137	135	131
					40000	160	155	150	146	143	141	136	131	127	125	123	119
					60000	139	135	131	128	125	123	119	115	111	109	107	104
					100000	118	114	111	108	105	104	101	97	93	92	90	88
205	7/8 15/16 1 25mm		3146	1769	20000	218	211	205	200	195	193	187	179	173	170	168	163
					30000	191	185	179	175	170	169	163	157	151	149	147	142
					40000	173	168	163	159	155	153	148	142	137	135	133	129
					60000	151	147	142	139	135	134	129	124	120	118	116	113
					100000	128	124	120	117	114	113	109	105	101	100	98	95
206	1-1/16 1-1/8 1-3/16 1-1/4 30mm	1 25mm	4368	2538	20000	303	293	285	278	271	268	259	249	240	237		
					30000	265	256	249	242	237	234	226	217	210	207		
					40000	240	233	226	220	215	213	206	198	191	188		
					60000	210	203	198	192	188	186	180	173	167	164		
					100000	177	172	167	162	158	157	151	146	141	138		
207	1-1/4 1-5/16 1-3/8 1-7/16 35mm	1-3/16 1-1/4 30mm	5759	3461	20000	399	387	376	366	357	354	341	328				
					30000	349	338	328	320	312	309	298	287				
					40000	317	307	298	290	283	281	271	261				
					60000	277	268	261	254	247	245	237	228				
					100000	234	226	220	214	209	207	200	192				
208	1-1/2 1-5/8 40mm	1-7/16 1-1/2♣ 35mm	7332	4475	20000	508	492	478	466	454	450	435					
					30000	444	430	418	407	397	393	380					
					40000	403	391	380	370	361	357	345					
					60000	352	341	332	323	315	312	301					
					100000	297	288	280	272	266	263	254					
209	1-5/8 1-11/16 1-3/4 45mm	1-1/2 40mm	7891	4906	20000	547	530	515	501	489	485						
					30000	478	463	450	438	427	423						
					40000	434	421	409	398	388	385						
					60000	379	367	357	348	339	336						
					100000	320	310	301	293	286	283						
210	1-15/16 2 50mm	1-11/16 1-3/4 45mm	7891	5213	20000	547	530	515	501	489	485						
					30000	478	463	450	438	427	423						
					40000	434	421	409	398	388	385						
					60000	379	367	357	348	339	336						
					100000	320	310	301	293	286	283						
211	2 2-3/16 2-1/4 55mm	1-15/16 2 50mm	9755	6588	20000	676	655	636	620								
					30000	591	572	556	541								
					40000	537	520	505	492								
					60000	469	454	441	430								
					100000	396	383	372	362								
212	2-1/4 2-7/16 60mm	2-3/16 2-1/4 55mm	11791	8100	20000	818	792										
					30000	714	692										
					40000	649	629										
					60000	567	549										
					100000	478	463										
214	2-11/16 70mm	2-7/16 2-1/2 65mm	13995	9838	20000	970											
					30000	848											
					40000	770											
					60000	673											
					100000	567											
215	2-15/16 75mm	2-11/16 70mm	14872	11108	20000	1031											
					30000	901											
					40000	818											
					60000	715											
					100000	603											
216	2-15/16 3 75mm		17407	13102	20000												
					30000												
					40000												
					60000												
					100000												
218	3-7/16 3-1/2 85mm		21451	16641	20000												
					30000												
					40000												
					60000												
					100000												

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