Service Factor and L10 Bearing Life for TA Family, MangaGear XTR and Maxum XTR Gearboxes

Most customers who use gearboxes are concerned about service factor. Service factor is the ratio of gearbox HP rating at a certain rpm divided by the HP of the motor driving the gearbox.

Service factor = Gearbox HP rating / Motor HP

Obviously, the service factor needs to be at least 1.0 (Class 1) to have a gearbox that is appropriately sized for certain applications. This Class 1 selection is fine if the reducer is used a couple of hours a day in a uniformly loaded application. However, most people use a service factor that is at least 1.4 (Class 2) for additional usage and gearbox life. When the application becomes heavily loaded, needs to run 24-7, or is susceptible to shock loading, a 2.0 service factor or higher (Class 3) is probably needed. Typically, as you move up to each service factor class, the gearbox size goes up one case size.

Some customers require a certain number of L10 hours for the gearbox bearings. Dodge sees many specification sheets that call out L10 hours, sometimes up to 100,000 hours. TA Family, MagnaGear XTR, and Maxum XTR gearboxes all are designed to have at least 5,000 hours of L10 bearing life at a 1.0 service factor. As you increase service factor, the L10 bearing life grows exponentially.

This whitepaper has done on the calculations between service factor and L10 bearing life in Dodge's heavy-duty gearboxes and put them in graphic and tabular form. Table 1 gives you the service factor required for a certain number of L10 bearing hours. Table 2 gives you the L10 hours for certain service factors and Figure 1 shows the same information a graphic form.

There are a couple of columns in the tables depending on the gearboxes used:

Gearbox Style 1: All TXT/SCXT sizes except TXT1-2/SCXT1-2. All TA II, MTA II, MagnaGear XTR, and Maxum XTR sizes

Gearbox Style 2: TXT1-2 and SCXT1-2

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L10 Hours Required	Gearbox Style 1 (Service Factor Required)	Gearbox Style 2 (Service Factor Required)
5,000	1	1
10,000	1.23	1.26
15,000	1.39	1.44
20,000	1.52	1.59
25,000	1.62	1.71
30,000	1.71	1.82
35,000	1.79	1.91
40,000	1.87	2
45,000	1.93	2.08
50,000	2	2.15
55,000	2.05	2.22
60,000	2.11	2.29
65,000	2.16	2.35
70,000	2.21	2.41
75,000	2.25	2.47
80,000	2.3	2.52
85,000	2.34	2.57
90,000	2.38	2.62
95,000	2.42	2.67
100,000	2.46	2.71

Table 1 - Service Factor required for known L10 Bearing Hours

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Service Factor	Gearbox Style 1 (L10 hours)	Gearbox Style 2 (L10 hours)
1	5,000	5,000
1.02	5,341	5,306
1.04	5,698	5,624
1.06	6,072	5,955
1.08	6,462	6,299
1.1	6,870	6,655
1.12	7,295	7,025
1.14	7,738	7,408
1.16	8,200	7,804
1.18	8,681	8,215
1.2	9,181	8,640
1.22	9,701	9,079
1.24	10,242	9,533
1.26	10,803	10,002
1.28	11,385	10,486
1.3	11,989	10,985
1.32	12,615	11,500
1.34	13,263	12,031
1.36	13,935	12,577
1.38	14,630	13,140
1.4	15,348	13,720
1.42	16,092	14,316
1.44	16,860	14,930
1.46	17,653	15,561
1.48	18,472	16,209
1.5	19,317	16,875
1.52	20,189	17,559
1.54	21,088	18,261
1.56	22,015	18,982
1.58	22,970	19,722
1.6	23,954	20,480
1.62	24,966	21,258
1.64	26,009	22,055
1.66	27,081	22,871
1.68	28,184	23,708
1.7	29,318	24,565
1.72	30,483	25,442

Service Factor	Gearbox Style 1 (L10 hours)	Gearbox Style 2 (L10 hours)
1.74	31,681	26,340
1.76	32,911	27,259
1.78	34,175	28,199
1.8	35,471	29,160
1.82	36,802	30,143
1.84	38,168	31,148
1.86	39,568	32,174
1.88	41,004	33,223
1.9	42,476	34,295
1.92	43,985	35,389
1.94	45,531	36,507
1.96	47,115	37,648
1.98	48,736	38,812
2	50,397	40,000
2.02	52,096	41,212
2.04	53,836	42,448
2.06	55,615	43,709
2.08	57,436	44,995
2.1	59,297	46,305
2.12	61,201	47,641
2.14	63,146	49,002
2.16	65,135	50,388
2.18	67,167	51,801
2.2	69,243	53,240
2.22	71,364	54,705
2.24	73,530	56,197
2.26	75,741	57,716
2.28	77,998	59,262
2.3	80,303	60,835
2.32	82,654	62,436
2.34	85,053	64,065
2.36	87,500	65,721
2.38	89,997	67,406
2.4	92,542	69,120
2.42	95,138	70,862
2.44	97,784	72,634
2.46	100,482	74,435
2.48	103,231	76,265

Service Factor	Gearbox Style 1 (L10 hours)	Gearbox Style 2 (L10 hours)
2.5	106,032	78,125
2.52	108,886	80,015
2.54	111,793	81,935
2.56	114,755	83,886
2.58	117,770	85,868
2.6	120,841	87,880
2.62	123,967	89,924
2.64	127,150	91,999
2.66	130,389	94,105
2.68	133,686	96,244
2.7	137,041	98,415
2.72	140,454	100,618
2.74	143,926	102,854
2.76	147,458	105,123
2.78	151,050	107,425
2.8	154,702	109,760
2.82	158,416	112,129
2.84	162,193	114,532
2.86	166,031	116,968
2.88	169,933	119,439
2.9	173,899	121,945
2.92	177,929	124,485
2.94	182,024	127,061
2.96	186,184	129,672
2.98	190,410	132,318
3	194,704	135,000
3.02	199,064	137,718
3.04	203,493	140,472
3.06	207,990	143,263
3.08	212,556	146,091
3.1	217,191	148,955
3.12	221,897	151,857
3.14	226,674	154,796
3.16	231,523	157,772
3.18	236,443	160,787
3.2	241,437	163,840
3.22	246,503	166,931
3.24	251,644	170,061

Service Factor	Gearbox Style 1 (L10 hours)	Gearbox Style 2 (L10 hours)
3.26	256,859	173,230
3.28	262,150	176,438
3.3	267,516	179,685
3.32	272,959	182,972
3.34	278,478	186,299
3.36	284,076	189,665
3.38	289,751	193,072
3.4	295,506	196,520
3.42	301,340	200,008
3.44	307,254	203,538
3.46	313,249	207,109
3.48	319,326	210,721
3.5	325,484	214,375
3.52	331,726	218,071
3.54	338,050	221,809
3.56	344,458	225,590
3.58	350,951	229,414
3.6	357,529	233,280
3.62	364,193	237,190
3.64	370,944	241,143
3.66	377,781	245,139
3.68	384,706	249,180
3.7	391,720	253,265
3.72	398,823	257,394
3.74	406,015	261,568
3.76	413,298	265,787
3.78	420,671	270,051
3.8	428,136	274,360
3.82	435,694	278,715
3.84	443,344	283,116
3.86	451,088	287,562
3.88	458,926	292,055
3.9	466,859	296,595
3.92	474,887	301,181
3.94	483,011	305,815
3.96	491,233	310,496
3.98	499,551	315,224
4	507,968	320,000

Table 2 - L10 Bearing Hours for known Service Factor

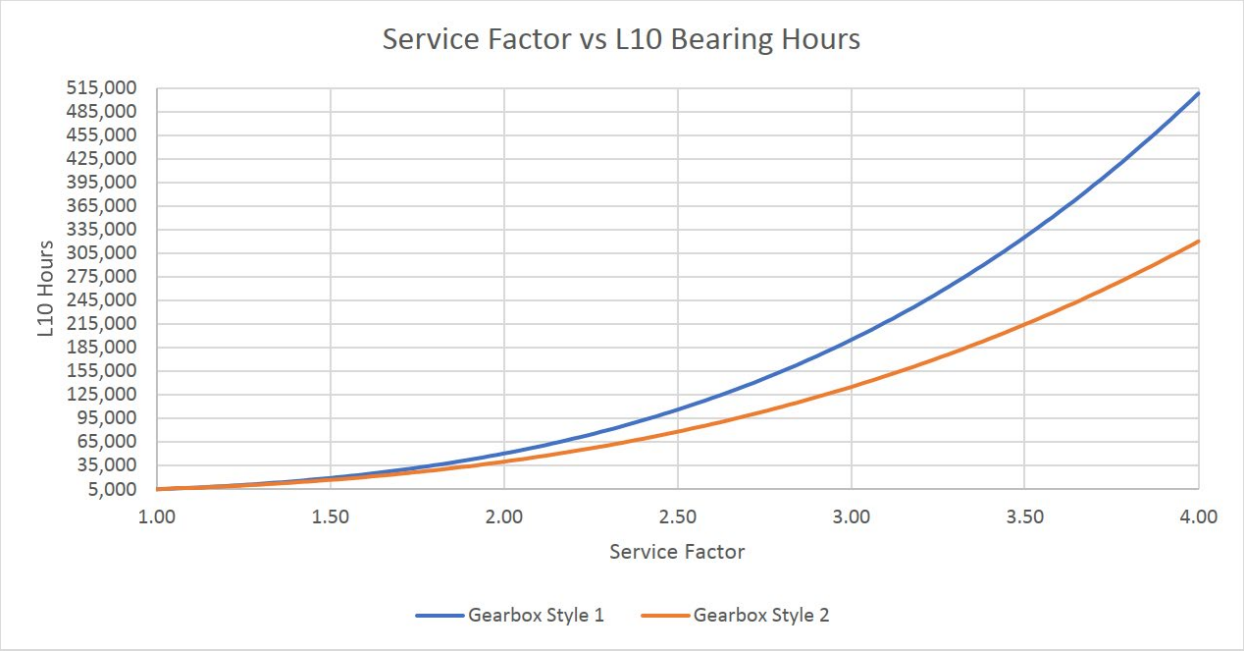

Figure 1 - Service Factor vs L10 Bearing Hours