



90 Bissel Street

Joliet, IL 60432

phone 800.876.7216

fax 815.723.9207

SERRATED SHAFT ENDS – SAE J500

Straight Sided Serrations

Report of Parts and Fitting Division approved 1922 and last revised by Parts and Fittings Committee June 1955

Formulas

This Recommended Practice is intended for service only. Use SAE Standard, Involute Splines, Serrations, and Inspection-SAE J498 for new applications.

Straight Shafts

N = Number of serrations
 B = Included angle of the space in the hole, and the tooth on the shaft.

The pitch diameter (PD) and the hole are basic.

The pitch line is midway between the inner and outer sharp points.

The minimum hole with maximum shaft as measured across wires in Table1, produce basic (no clearance) fit.

The wire diameter in Table 1 is the diameter that will bear on the pitch line.

Tolerance for diameter across wires= .001 on tooth thickness of hole and shaft sizes from 1/3 to 1 3/4 in., and -.0015 on sizes from 2 to 3 in., inclusive.

Tooth thickness on the shaft may be varied from the tolerance given, to secure desired fit.

We= Constant to be added to measurement across wires for shaft, subtracted for hole, for each .001-in. increase in wire diameter used over wire size in Table1.

When serrations are hobbled, the sides of teeth are involute. This departure from flat sides is slight and is ignored.

1. Diameter over sharp points
 (OD) = 1.0476479 PD for 36 serrations.
 = 1.0349592 PD for 48 serrations.
2. Diameter under sharp points
 (RD) = .9523521 PD for 36 serrations.
 = .9650408 PD for 48 serrations.
3. Diameter of wire that will bear on pitch line of hole
 (Wh) = .05309792 PD for 36 serrations
 = .04133332 PD for 48 serrations
 Diameter of wire that will bear on pitch line of shaft
 (Ws) = .06565005 PD for 36 serrations
 = .0485955 PD for 48 serrations
4. Measurement across wires for hole
 = .9119441 PD for 36 serrations
 = .9309375 PD for 48 serrations
 Measurement across wires for shaft
 = 1.1113285 PD for 36 serrations
 = 1.0823601 PD for 48 serrations
5. Tolerance constant for measurement across wires per .0001-in. tooth thickness for hole = $.001 \frac{\sin 45}{\sin (45-180/N)}$
 for shaft = $.001 \frac{\sin (45-180N)}{\sin 45}$
6. Wire diameter constant for use of other diameter wire than that which bears on pitch line. (We)
 thickness for hole = $.001 + \frac{.001}{\sin (45-180/N)}$ for hole
 for shaft = $.001 + \frac{.001}{\cos 45}$ for shaft



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Hole of Shaft						Hole							Shaft						
Nominal Dia.	Pitch Dia.	N	b, Deg	Theoretical Dia. Of Points		Large Dia. Min.	Small Dia. Max.	Dia. Across Wires Min.	Dia. Across Wires Max.	Wire Size, Wh	Wc	Root Dia., Max.	Outside Dia.		Dia. Across Wires		Wire Size We		
				OD	RD								Max.	Min.	Max.	Min.	We	We	
1/8	0.122	36	80	0.1278	0.1162	0.1250	0.1180	0.1170	0.1113	0.1124	0.0065	0.0026	0.1160	0.1240	0.1230	0.1356	0.1347	0.0080	0.0024
3/16	0.182	36	80	0.1907	0.1733	0.1870	0.1760	0.1750	0.1660	0.1671	0.0097	0.0026	0.1740	0.1860	0.1850	0.2023	0.2014	0.0120	0.0024
1/4	0.243	36	80	0.2546	0.2314	0.2500	0.2350	0.2340	0.2216	0.2227	0.0129	0.0026	0.2330	0.2490	0.2480	0.2701	0.2692	0.0160	0.0024
3/16	0.303	36	80	0.3174	0.2886	0.3120	0.2930	0.2920	0.2763	0.2774	0.0161	0.0026	0.2910	0.3110	0.3100	0.3367	0.3358	0.0200	0.0024
3/8	0.363	36	80	0.3603	0.3457	0.3750	0.3520	0.3510	0.3310	0.3321	0.0193	0.0026	0.3500	0.3740	0.3730	0.4034	0.4025	0.0239	0.0024
1/2	0.485	36	80	0.3081	0.4619	0.5000	0.4690	0.4680	0.4423	0.4434	0.0258	0.0026	0.4670	0.4990	0.4980	0.5390	0.5381	0.0319	0.0024
5/8	0.605	36	80	0.6338	0.5462	0.6250	0.5840	0.5830	0.5517	0.5528	0.0321	0.0026	0.5820	0.6240	0.6230	0.6724	0.6715	0.0398	0.0024
3/4	0.733	48	82-1/2	0.7586	0.7074	0.7500	0.7160	0.7140	0.6824	0.6835	0.0303	0.0025	0.7130	0.7490	0.7470	0.7934	0.7925	0.0356	0.0024
7/8	0.855	48	82-1/2	0.8849	0.8251	0.8750	0.8350	0.8330	0.7960	0.7971	0.0353	0.0025	0.8320	0.8740	0.8720	0.9254	0.9245	0.0415	0.0024
1	0.977	48	82-1/2	1.0112	0.9428	1.0000	0.9540	0.9520	0.9095	0.9106	0.0404	0.0025	0.9510	0.9990	0.9970	1.0575	1.0565	0.0475	0.0024
1-1/8	1.098	48	82-1/2	1.1364	1.0596	1.1250	1.0710	1.0690	1.0222	1.0233	0.0454	0.0025	1.0680	1.1240	1.1220	1.1884	1.1875	0.0534	0.0024
1-1/4	1.220	48	82-1/2	1.2626	1.1773	1.2500	1.1900	1.1880	1.1357	1.1368	0.0504	0.0025	1.1870	1.2490	1.2470	1.3205	1.3196	0.0593	0.0024
1-3/8	1.342	48	82-1/2	1.3889	1.2951	1.3750	1.3090	1.3070	1.2493	1.2504	0.0555	0.0025	1.3060	1.3740	1.3720	1.4525	1.4516	0.0652	0.0024
1-1/2	1.464	48	82-1/2	1.5152	1.4128	1.5000	1.4280	1.4260	1.3829	1.3640	0.0605	0.0025	1.4250	1.4990	1.4970	1.5846	1.5837	0.0711	0.0024
1-3/4	1.708	48	82-1/2	1.7677	1.6483	1.7500	1.6660	1.6640	1.5900	1.5911	0.0706	0.0025	1.6630	1.7490	1.7470	1.8487	1.8478	0.0830	0.0024
2	1.952	48	82-1/2	2.0202	1.8839	2.0000	1.9040	1.9020	1.8172	1.8188	0.0807	0.0025	1.9010	1.9990	1.9970	2.1128	2.1114	0.0949	0.0024
2-1/4	2.196	48	82-1/2	2.2728	2.1192	2.2500	2.1420	2.1400	2.0443	2.0459	0.0908	0.0025	2.1390	2.2490	2.2470	2.3769	2.3755	0.1067	0.0024
2-1/2	2.440	48	82-1/2	2.5252	2.3547	2.5000	2.3800	2.3780	2.2715	2.2731	0.1009	0.0025	2.3770	2.4990	2.4970	2.6410	2.6396	0.1180	0.0024
2-3/4	2.684	48	82-1/2	2.7778	2.5902	2.7500	2.6180	2.6160	2.6986	2.5002	0.1109	0.0025	2.6150	2.7490	2.7470	2.9051	2.9037	0.1304	0.0024
3	2.928	48	82-1/2	3.0304	2.8256	3.0000	2.8560	2.8540	2.7258	2.7274	0.1210	0.0025	2.8530	2.9990	2.9970	3.1692	3.1678	0.1423	0.0024