Straight-Sided Serrations Chart
Serrated Shaft Ends - SAE J500

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

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 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 Table 1, 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 = 0.001 on tooth thickness of hole and shaft sizes from 1/3 to 1-3/4 in., and - 0.0015 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 0.001-in. increase in wire diameter used over wire size in Table 1.

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

Formulas

1. Diameter over sharp points
(OD) = 1.0476479 PD for 36 serrations.
= 1.0349592 PD for 48 serrations.

2. Diameter under sharp points
(RD) = 0.9523521 PD for 36 serrations.
= 0.9650408 PD for 48 serrations.

3. Diameter of wire that will bear on pitch line of hole
(Wh) = 0.05309792 PD for 36 serrations.
= 0.04133332 PD for 48 serrations.
Diameter of wire that will bear on pitch line of shaft
(Ws) = 0.06565005 PD for 36 serrations.
= 0.0485955 PD for 48 serrations.

4. Measurement across wires for hole
= 0.9119441 PD for 36 serrations.
= 0.9309375 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 0.0001-in.tooth

$$\text{thickness for hole} = 0.001 \frac{\sin 45}{\sin (45 - 180/N)}$$

$$\text{for shaft} = 0.001 \frac{\sin(45-180/N)}{\sin 45}$$

6. Wire diameter constant for use of other diameter wire than that which bears on pitch line. (We)

$$\text{thickness for hole} = \frac{0.001 + 0.001}{\sin (45 - 180/N)}$$

$$\text{for shaft} = \frac{0.001 + 0.001}{\cos 45}$$

Hole of Shaft						Hole							Shaft						
Nominal Pitch	Pitch Dia.	N	b, Deg	OD	RD	Large Dia. Min	Small Dia. Max	Small Dia. Min	Dia. Across Wires Max	Dia. Across Wires Min	Wire Size, Wh	Wc	Root Dia. Max	Outside Dia. Max	Outside Dia. Min	Dia. Across Wires Max	Dia. Across Wires Min	Wire Size, We	We
1/8	0.122	36	80	0.1278	0.1162	0.125	0.118	0.117	0.1124	0.1113	0.0065	0.0026	0.116	0.124	0.123	0.1356	0.1347	0.0080	0.0024
3/16	0.182	36	80	0.1907	0.1733	0.187	0.176	0.175	0.1671	0.1660	0.0097	0.0026	0.174	0.186	0.185	0.2023	0.2014	0.0120	0.0024
1/4	0.243	36	80	0.2546	0.2314	0.250	0.235	0.234	0.2227	0.2216	0.0129	0.0026	0.233	0.249	0.248	0.2701	0.2692	0.0160	0.0024
5/16	0.303	36	80	0.3174	0.2886	0.312	0.293	0.292	0.2774	0.2763	0.0161	0.0026	0.291	0.311	0.310	0.3367	0.3358	0.0200	0.0024
3/8	0.363	36	80	0.3603	0.3457	0.375	0.352	0.351	0.3321	0.3310	0.0193	0.0026	0.350	0.374	0.373	0.4034	0.4025	0.0239	0.0024
1/2	0.485	36	80	0.3081	0.4619	0.500	0.469	0.468	0.4434	0.4423	0.0258	0.0026	0.467	0.499	0.498	0.5390	0.5381	0.0319	0.0024
5/8	0.605	36	80	0.6338	0.5762	0.625	0.584	0.583	0.5528	0.5517	0.0321	0.0026	0.582	0.624	0.623	0.6724	0.6715	0.0398	0.0024
3/4	0.733	48	82.5	0.7586	0.7074	0.750	0.716	0.714	0.6835	0.6824	0.0303	0.0025	0.713	0.749	0.747	0.7934	0.7925	0.0356	0.0024
7/8	0.855	48	82.5	0.8849	0.8251	0.875	0.835	0.833	0.7971	0.7960	0.0353	0.0025	0.832	0.874	0.872	0.9254	0.9248	0.0415	0.0024
1	0.977	48	82.5	1.0112	0.9428	1.000	0.954	0.952	0.9106	0.9095	0.0404	0.0025	0.951	0.999	0.997	1.0575	1.0565	0.0475	0.0024
1-1/8	1.098	48	82.5	1.1364	1.0596	1.125	1.071	1.069	1.0233	1.222	0.0454	0.0025	1.068	1.124	1.122	1.1884	1.1875	0.0534	0.0024
1-1/4	1.220	48	82.5	1.2626	1.1773	1.250	1.190	1.188	1.1368	1.1357	0.0504	0.0025	1.187	1.249	1.247	1.3205	1.3196	0.0593	0.0024
1-3/8	1.342	48	82.5	1.3889	1.2951	1.375	1.309	1.307	1.2504	1.2493	0.0555	0.0025	1.306	1.374	1.372	1.4525	1.4516	0.0652	0.0024
1-1/2	1.464	48	82.5	1.5152	1.4128	1.500	1.428	1.426	1.3640	1.3829	0.0605	0.0025	1.425	1.499	1.497	1.5846	1.5837	0.0711	0.0024
1-3/4	1.708	48	82.5	1.7677	1.6483	1.750	1.666	1.664	1.5911	1.5900	0.0706	0.0025	1.663	1.749	1.747	1.8487	1.8478	0.0830	0.0024
2	1.952	48	82.5	2.0202	1.8839	2.00	1.904	1.902	1.8188	1.8172	0.0807	0.0025	1.901	1.999	1.997	2.1128	2.1114	0.0949	0.0024
2-1/4	2.196	48	82.5	2.2728	2.1192	2.250	2.142	2.140	2.0459	2.0443	0.908	0.0025	2.139	2.249	2.247	2.3769	2.3755	0.1067	0.0024
2-1/2	2.440	48	82.5	2.5252	2.3547	2.500	2.380	2.378	2.2731	2.2715	0.1009	0.0025	2.377	2.499	2.497	2.6410	2.6396	0.1180	0.0024
2-3/4	2.684	48	82.5	2.7778	2.5902	2.750	2.618	2.616	2.5002	2.6986	0.1109	0.0025	2.615	2.749	2.747	2.9051	2.9037	0.1304	0.0024
3	2.928	48	82.5	3.0304	2.8256	3.000	2.856	2.854	2.7274	2.7258	0.1210	0.0025	2.853	2.999	2.997	3.1692	3.1678	0.1423	0.0024

Straight-Sided Serrations Chart

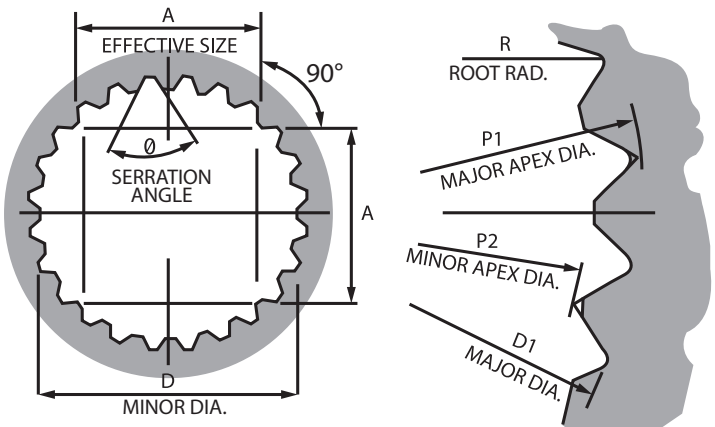
British Straight Sided Serration Standard

# of Serr. S	Nominal Size	0	P1	P2	C	C-S	R	Hole D1	Hole D	Hole A	Shaft D2	Shaft D3
12	1/4	60	0.2780	01966	0.0172	0.2064	0.009	0.268	0.2114	0.1390	0.248	0.199
12	1/4	60	0.2780	0.1966	0.0172	0.2064	0.006	0.268	0.2126	0.1399	0.247	0.199
12	5/16	60	0.3476	0.2458	0.0214	0.2568	0.012	0.335	0.2649	0.1738	0.310	0.249
12	5/16	60	0.3476	0.2458	0.0214	0.2568	0.007	0.335	0.2661	0.1747	0.309	0.249
16	3/8	67.5	0.3974	0.3123	0.0216	0.3456	0.009	0.389	0.3271	0.2208	0.373	0.314
16	3/8	67.5	0.3974	0.3123	0.0216	0.3456	0.006	0.389	0.3287	0.2217	0.372	0.314
16	7/16	67.5	0.4637	0.3643	0.0252	0.4032	0.011	0.456	0.3820	0.2576	0.435	0.366
16	7/16	67.5	0.4637	0.3643	0.0252	0.4032	0.006	0.456	0.3836	0.2585	0.434	0.366
16	1/2	67.5	0.5299	0.4163	0.0300	0.4800	0.012	0.520	0.4354	0.2944	0.498	0.419
16	1/2	67.5	0.5299	0.4163	0.0300	0.4800	0.007	0.520	0.4370	0.2953	0.497	0.419
20	5/8	72	0.6489	0.5394	0.0313	0.6260	0.011	0.643	0.5578	0.3814	0.540	0.523
20	5/8	72	0.6489	0.5394	0.0313	0.6260	0.006	0.643	0.5594	0.3826	0.540	0.522
20	3/4	72	0.7787	0.6473	0.0378	0.7560	0.013	0.769	0.6685	0.4577	0.748	0.650
20	3/4	72	0.7787	0.6473	0.0378	0.7560	0.008	0.769	0.6705	0.4589	0.746	0.650
20	7/8	72	0.9085	0.7552	0.0449	0.8980	0.015	0.896	0.7792	0.5340	0.873	0.760
20	7/8	72	0.9085	0.7552	0.0449	0.8980	0.010	0.896	0.7812	0.5352	0.871	0.760
24	1	75	1.0277	0.8847	0.0437	1.0488	0.013	1.020	0.9066	0.6256	0.998	0.886
24	1	75	1.0277	0.8847	0.0437	1.0488	0.008	1.020	0.9086	0.6271	0.996	0.896
24	1-1/8	75	1.1561	0.9953	0.0492	1.1808	0.015	1.146	1.0201	0.7038	1.123	0.999
24	1-1/8	75	1.1561	0.9953	0.0492	1.1808	0.010	1.146	1.0225	0.7053	1.121	0.999
24	1-1/4	75	1.2846	1.1059	0.0550	1.3200	0.017	1.272	1.1335	0.7820	1.248	1.111
24	1-1/4	75	1.2846	1.1059	0.0550	1.3200	0.012	1.272	1.1359	0.7835	1.246	1.111
24	1-3/8	75	1.4130	1.2165	0.0616	1.4784	0.018	1.399	1.2455	0.8602	1.373	1.222
24	1-3/8	75	1.4130	1.2165	0.0616	1.4784	0.018	1.399	1.2479	0.8617	1.371	1.222
24	1-1/2	75	1.5415	1.3271	0.0674	1.6176	0.020	1.525	1.3589	0.9384	1.498	1.335
24	1-1/2	75	1.5415	1.3271	0.0674	1.6176	0.015	1.525	1.3613	0.9399	1.496	1.335
36	1-5/8	80	1.6503	1.5002	0.0470	1.6920	0.014	1.643	1.52442	1.0608	1.523	1.502
36	1-5/8	80	1.6503	1.5002	0.0470	1.6920	0.009	1.643	1.5270	1.0626	1.521	1.502
36	1-3/4	80	1.7773	1.6156	0.0511	1.8396	0.015	1.769	1.6410	1.1424	1.748	1.618
36	1-3/4	80	1.7773	1.6156	0.0511	1.8396	0.010	1.769	1.6438	1.1442	1.746	1.618
36	1-7/8	80	1.9044	1.7311	0.0551	1.9836	0.016	1.895	1.7580	1.2241	1.873	1.743
36	1-7/8	80	1.9044	1.7311	0.0551	1.9836	0.011	1.895	1.7608	1.2259	1.871	1.743
36	2	80	2.0313	1.8465	0.0592	2.1312	0.017	2.021	1.8748	1.3057	1.998	1.851
36	2	80	2.0313	1.8465	0.0592	2.1213	0.012	2.021	1.8776	1.075	1.996	1.851
36	2	80	2.2852	2.0773	0.0672	2.4192	0.019	2.272	2.1084	1.4689	2.248	2.083
36	2	80	2.2852	2.0773	0.0672	2.4192	0.014	2.272	2.1116	1.4707	2.246	2.083
36	2-1/4	80	2.2852	2.3081	0.0750	2.7000	0.021	2.525	2.3428	1.6321	2.498	2.314
36	2-1/4	80	2.2852	2.3081	0.0750	2.7000	0.016	2.525	2.3460	1.6342	4.496	2.314
40	2-3/4	81	2.7885	2.5611	0.0735	2.9400	0.022	2.773	2.5972	1.8110	2.748	2.568
40	2-3/4	81	2.7885	2.5611	0.0735	2.9400	0.017	2.773	2.6004	1.8131	2.746	2.568
40	3	81	3.0420	2.7939	0.0798	3.1920	0.024	3.025	2.8328	1.9756	2.998	2.803
40	3	81	3.0420	2.7939	0.0798	3.1920	0.019	3.025	2.8364	1.9777	2.996	2.803
48	3-1/4	82.5	3.2893	3.0671	0.0686	3.2928	0.023	3.274	3.1053	2.1688	3.248	3.074
48	3-1/4	82.5	3.2893	3.0671	0.0686	3.2928	0.018	3.274	3.1089	2.1712	3.246	3.074
48	3-1/2	82.5	3.5424	3.3032	0.0741	3.5568	0.025	3.525	3.3442	2.3357	3.498	3.312
48	3-1/2	82.5	3.5424	3.3032	0.0741	3.5568	0.020	3.525	3.3478	2.3381	3.496	3.312
48	3-3/4	82.5	3.7954	3.6391	0.0804	3.8592	0.02	3.777	3.5815	2.5025	3.748	3.548
48	3-3/4	82.5	3.7954	3.6391	0.0804	3.8592	0.021	3.777	3.5851	5.5049	3.746	3.348
48	4	82.5	4.0484	3.7750	0.0859	4.1232	0.028	4.025	3.8202	2.6693	3.998	3.786
48	4	82.5	4.0484	3.7750	0.0859	4.1232	0.023	4.028	3.8242	2.6717	3.996	3.786
48	4-1/4	82.5	4.3015	4.0110	0.0911	4.3728	0.030	4.280	4.0598	2.8362	4.248	4.023
48	4-1/4	82.5	4.3015	4.0110	0.0911	4.3728	0.025	4.280	4.0638	2.8389	4.246	4.023

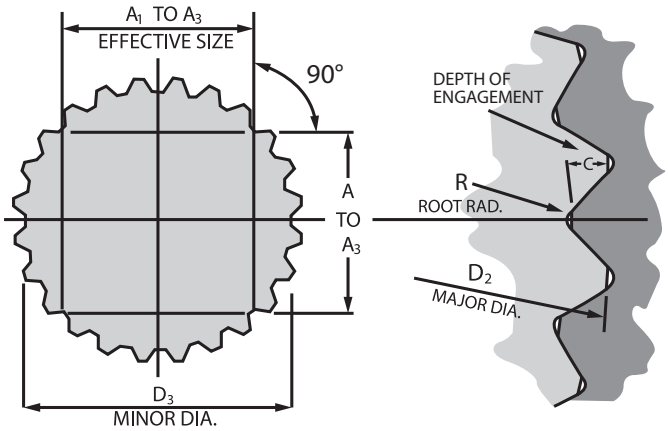
Straight-Sided Serrations Chart

British Straight Sided Serration Standard

Shaft			Resultants Fits		
A1	A2	A3	Fit 1 Inter - clearance A-A1	Fit 2 Transition A-A2	Fit 3 Clearance A-A3
0.1405	0.1393	0.1381	-1.5	-0.3	+ 0.9
0.1399	0.1384	0.1384	0	+ 1.5	+ 3.0
0.1753	0.1741	0.1741	-1.5	-0.3	+ 0.9
0.1747	0.1732	0.1732	0	+ 1.5	+ 3.0
0.2223	0.2211	0.2199	-1.5	-0.3	+ 0.9
0.2217	0.2202	0.2187	0	+ 1.5	+ 3.0
0.2591	0.2579	0.2567	-1.5	-0.3	+ 0.9
0.2585	0.2570	0.2555	0	+ 1.5	+ 3.0
0.2959	0.2947	0.2935	-1.5	-0.4	+ 1.2
0.2953	0.2938	0.2923	0	+ 2.0	+ 4.0
0.3834	0.3818	0.3802	-2.0	-0.4	+ 1.2
0.3826	0.3806	0.3786	0	+ 2.0	+ 4.0
0.4597	0.4581	0.4665	-2.0	-0.4	+ 1.2
0.4589	0.4569	0.4649	0	+ 2.0	+ 4.0
0.5360	0.5344	0.5328	-2.0	-0.4	+ 1.2
0.5332	0.5332	0.5312	0	+ 2.0	+ 4.0
0.6281	0.6261	0.6241	-2.5	-0.5	+ 1.5
0.6271	0.6246	0.6221	0	+ 2.5	+ 5.0
0.7063	0.7043	0.7023	-2.5	-0.5	+ 1.5
0.7053	0.7028	0.7003	0	+ 2.5	+ 5.0
0.7845	0.7825	0.7805	-2.5	-0.5	+ 1.5
0.7835	0.7810	0.7785	0	+ 2.5	+ 5.0
0.8627	0.8607	0.8587	-2.5	-0.5	+ 1.5
0.8617	0.8592	0.8567	0	+ 2.5	+ 5.0
0.9409	0.9389	0.9369	-2.5	-.05	+ 1.5
0.9399	0.9374	0.9349	0	+ 2.5	+ 5.0
1.0638	1.0614	1.0590	-3.0	-0.6	+ 1.8
1.0626	1.0596	1.0566	0	+ 3.0	+ 6.0
1.1454	1.1430	1.1406	-3.0	-0.6	+ 1.8
1.1442	1.1412	1.1382	0	+ 3.0	+ 6.0
1.2271	1.2247	1.2223	-3.0	-0.6	+ 1.8
1.2259	1.2229	1.2199	0	+ 3.0	+ 6.0
1.3087	1.3063	1.3039	-3.0	-0.6	+ 1.8
1.3075	1.3045	1.3015	0	+ 3.0	+ 6.0
1.4719	1.4695	1.4671	-3.0	-0.6	+ 1.8
1.4707	1.4677	1.4647	0	+ 3.0	+ 6.0
1.6356	1.6328	1.6300	-3.5	-0.7	+ 2.1
1.6342	1.6307	1.6272	0	+ 3.5	+ 7.0
1.8145	1.8117	1.8089	-3.5	-0.7	+ 2.1
1.8131	1.8096	1.8061	0	+ 3.5	+ 7.0
1.9791	1.9763	1.9735	-3.5	-0.7	+ 2.1
1.9777	1.9742	1.9707	0	+ 3.5	+ 7.0
2.1728	2.1696	2.1664	-4.0	-0.8	+ 2.4
2.1712	2.1672	2.1632	0	+ 4.0	+ 8.0
2.3397	2.3365	2.3333	-4.0	-0.8	+ 2.4
2.3381	2.3341	2.3301	0	+ 4.0	+ 8.0
2.5065	2.5033	2.5001	-4.0	-0.8	+ 2.4
2.5049	2.5009	2.4969	0	+ 4.0	+ 8.0
2.6733	2.6701	2.6669	-4.0	-.08	+ 2.4
2.6717	2.6677	2.6637	0	+ 4.0	+ 8.0
2.8407	2.8371	2.8371	-4.5	-.09	+ 2.7
2.8389	2.8344	2.8344	0	+ 4.5	+ 9.0



Internal Serrations



External Serrations

ASH GEAR AND SUPPLY
WORLD'S LARGEST GEAR TOOL INVENTORY

42650 Nine Mile Rd. • Novi, MI 48375 USA • 248-374-6155 • www.ashgear.com