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SAE J500 AUG89

Serrated Shaft Ends

SAE Recommended Practice
Revised August 1989

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SERRATED SHAFT ENDS

1. SCOPE:

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This SAE Recommended Practice is intended for service only. Use ANSI B 92.1 and 1a, Involute Splines and Inspection Standard.

2. STRAIGHT SHAFTS:

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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, for hole and shaft sizes from 1/8 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.

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

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3. FORMULAS:

3.1 Diameter over sharp points:

$$\begin{aligned} (OD) &= 1.0476479 \text{ PD for 36 serrations.} \\ &= 1.0349592 \text{ PD for 48 serrations.} \end{aligned}$$

3.2 Diameter under sharp points:

$$\begin{aligned} (RD) &= 0.9523521 \text{ PD for 36 serrations.} \\ &= 0.9650408 \text{ PD for 48 serrations.} \end{aligned}$$

3.3 Diameter of wire that will bear on pitch line of hole:

$$\begin{aligned} (Wh) &= 0.05309792 \text{ PD for 36 serrations.} \\ &= 0.04133332 \text{ PD for 48 serrations.} \end{aligned}$$

Diameter of wire that will bear on pitch line of shaft:

$$\begin{aligned} (Ws) &= 0.06585005 \text{ PD for 36 serrations.} \\ &= 0.0485955 \text{ PD for 48 serrations.} \end{aligned}$$

3.4 Measurement across wires:

$$\begin{aligned} \text{for hole} &= 0.9119441 \text{ PD for 36 serrations.} \\ &= 0.9309375 \text{ PD for 48 serrations.} \end{aligned}$$

Measurement across wires:

$$\begin{aligned} \text{for shaft} &= 1.1113285 \text{ PD for 36 serrations.} \\ &= 1.0823601 \text{ PD for 48 serrations.} \end{aligned}$$

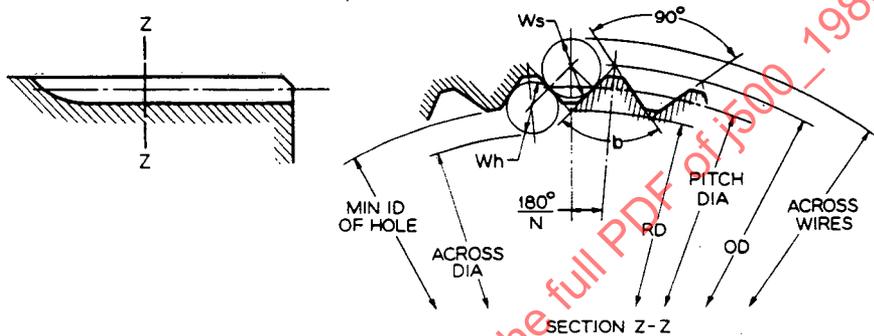
3.5 Tolerance constant for measurement across wires per 0.001-in tooth

$$\begin{aligned} \text{thickness for hole} &= 0.001 \frac{\sin 45}{\sin \left(45 - \frac{180}{N} \right)} \\ \text{for shaft} &= 0.001 \frac{\sin \left(45 - \frac{180}{N} \right)}{\sin 45} \end{aligned}$$

3.6 Wire diameter constant for use of other diameter wire than that which bears on pitch line, (Wc)

$$= 0.001 + \frac{0.001}{\sin \left(45 - \frac{180}{N} \right)} \text{ for hole.}$$

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



The phi (ϕ) symbol is for the convenience of the user in locating areas where technical revisions have been made to the previous issue of the report. If the symbol is next to the report title, it indicates a complete revision of the report.

TABLE 1 - Dimensions of Holes and Shafts, in

Nom- inal Dia	Hole and Shaft				Hole				Shaft				Wc					
	Pitch Dia	N	b, Deg	Theoretical Dia of Points OD	Large Dia, min	Small Dia		Dia Across Wires		Wire Size, Wh	Wc	Root Dia, max		Outside Dia		Dia Across Wires		Wire Size, Ws
						Max	Min	Min	Max					Max	Min	Max	Min	
1/8	0.122	36	80	0.1278	0.125	0.118	0.117	0.1113	0.1124	0.0065	0.0026	0.116	0.124	0.123	0.1356	0.1347	0.0080	
3/16	0.182	36	80	0.1907	0.187	0.176	0.175	0.1660	0.1671	0.0097	0.0026	0.174	0.186	0.185	0.2023	0.2014	0.0120	
1/4	0.243	36	80	0.2546	0.250	0.235	0.234	0.2216	0.2227	0.0129	0.0026	0.233	0.249	0.248	0.2701	0.2692	0.0160	
5/16	0.303	36	80	0.3174	0.2886	0.293	0.292	0.2763	0.2774	0.0161	0.0026	0.291	0.311	0.310	0.3367	0.3358	0.0200	
3/8	0.363	36	80	0.3803	0.3457	0.352	0.351	0.3310	0.3321	0.0193	0.0026	0.350	0.374	0.373	0.4034	0.4025	0.0239	
1/2	0.485	36	80	0.5081	0.4619	0.469	0.468	0.4423	0.4434	0.0258	0.0026	0.467	0.499	0.498	0.5390	0.5381	0.0319	
5/8	0.605	36	80	0.6338	0.5762	0.584	0.583	0.5517	0.5528	0.0321	0.0026	0.582	0.624	0.623	0.6724	0.6715	0.0398	
3/4	0.733	48	82-1/2	0.7586	0.7074	0.716	0.714	0.6824	0.6835	0.0303	0.0025	0.713	0.749	0.747	0.7934	0.7925	0.0356	
7/8	0.855	48	82-1/2	0.8849	0.8251	0.835	0.833	0.7960	0.7971	0.0353	0.0025	0.832	0.874	0.872	0.9254	0.9245	0.0415	
1	0.977	48	82-1/2	1.0112	0.9428	0.954	0.952	0.9095	0.9106	0.0404	0.0025	0.951	0.999	0.997	1.0575	1.0566	0.0475	
1-1/8	1.098	48	82-1/2	1.1364	1.0596	1.071	1.069	1.0222	1.0233	0.0454	0.0025	1.068	1.124	1.122	1.1884	1.1875	0.0534	
1-1/4	1.220	48	82-1/2	1.2626	1.1773	1.190	1.188	1.1357	1.1368	0.0504	0.0025	1.187	1.249	1.247	1.3205	1.3196	0.0593	
1-3/8	1.342	48	82-1/2	1.3889	1.2951	1.309	1.307	1.2493	1.2504	0.0555	0.0025	1.306	1.374	1.372	1.4525	1.4516	0.0652	
1-1/2	1.464	48	82-1/2	1.5152	1.4128	1.428	1.426	1.3629	1.3640	0.0605	0.0025	1.425	1.499	1.497	1.5846	1.5837	0.0711	
1-3/4	1.708	48	82-1/2	1.7677	1.6483	1.666	1.664	1.5900	1.5911	0.0706	0.0025	1.663	1.749	1.747	1.8487	1.8478	0.0830	
2	1.952	48	82-1/2	2.0202	1.8838	1.904	1.902	1.8172	1.8188	0.0807	0.0025	1.901	1.999	1.997	2.1128	2.1114	0.0949	
2-1/4	2.196	48	82-1/2	2.2728	2.1192	2.142	2.140	2.0443	2.0459	0.0908	0.0025	2.139	2.249	2.247	2.3769	2.3755	0.1067	
2-1/2	2.440	48	82-1/2	2.5253	2.3547	2.380	2.378	2.2715	2.2731	0.1009	0.0025	2.377	2.499	2.497	2.6410	2.6396	0.1180	
2-3/4	2.684	48	82-1/2	2.7778	2.5902	2.618	2.616	2.4986	2.5002	0.1109	0.0025	2.615	2.749	2.747	2.9051	2.9037	0.1304	
3	2.928	48	82-1/2	3.0304	2.8256	2.856	2.854	2.7258	2.7274	0.1210	0.0025	2.853	2.999	2.997	3.1692	3.1678	0.1423	

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