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INTERNATIONAL
400 Commonwealth Drive, Warrendale, PA 15096-0001

SURFACE VEHICLE STANDARD

SAE J532

Issued 1918-02
Editorial Change 1981-01

Adopted by the Department of Defense
Submitted for recognition as an American National Standard

AUTOMOTIVE STRAIGHT THREAD FILLER AND DRAIN PLUGS

GENERAL SPECIFICATIONS

1. SCOPE:

This standard includes complete general and dimensional specifications for those types of filler and drain plugs (shown in Figures 1-7 and Tables 1, 3, and 4) having straight threads which are commonly used with gaskets or seals in automotive and related industrial applications.

2. DIMENSIONS AND TOLERANCES:

Except for nominal sizes and thread specifications, dimensions and tolerances are given in both U.S. customary and SI units as designated. Tabulated dimensions shall apply to the finished plugs, plated, hardened, or otherwise processed, as specified by the purchaser. The minimum across corner dimensions of external hexagons shall be 1.092 times the nominal width across flats, but shall not result in a side flat width less than 0.43 times the nominal width across flats. The minimum across corner dimensions of external squares shall be 1.25 times the nominal width across flats, but shall not result in a side flat width less than 0.75 times the nominal width across flats. The diameter of the washer face on hexagon outside head plugs shall be equal to 95% of the maximum width across flats within a tolerance of ±5%. At maximum material condition, the radii at corners of hexagon and square sockets in broached or upset plugs shall not exceed 0.005 in (0.13 mm).

Tolerance on dimensions not otherwise limited shall be ±0.010 in (0.25 mm).

3. STRAIGHT THREADS:

Unified standard Class 2A external and Class 2B internal threads shall apply to inch sizes of plain finish (unplated) plugs and holes into which they assemble. For externally threaded parts with additive finish, the maximum diameters of Class 2A may be exceeded by the amount of the allowance, that is, the basic diameters (Class 2A maximum diameter plus the allowance) shall apply after plating. The pitch diameter tolerance for special diameter-pitch combinations shall be based on diameter, pitch, and a length of engagement of 9 times the pitch. See SAE J475.

For metric sizes of plugs and mating holes, threads shall conform with SAE J548.

For convenient reference, the data generally required to specify threads is given in Table 1 for both the plugs and mating holes. (Inasmuch as threads are normally produced and gaged with equipment made to the respective measurement system, conversion of size designations and dimensions to other measurement systems is considered unnecessary.)

External threads shall be chamfered or rounded from the diameters tabulated in Table 2 to produce a length of chamfered or partial thread as specified.

4. MATERIAL AND MANUFACTURE:

Plugs may be made from low carbon steel, cast iron, malleable iron, brass, bronze, or aluminum alloy as specified by purchaser, by casting, milling from the bar, or upsetting from a grade of material free of defects which will affect their serviceability.

5. FINISH:

Unless otherwise specified by the purchaser, steel plugs shall be furnished ed. cadmium or zinc plated to a thickness of 0.0002 in (0.005 mm) minimum. These parts must meet the requirements of a 32 h salt spray test in accordance with ASTM B 117. At manufacturer's option, plated plugs may be given a subsequent chromate treatment.

6. WORKMANSHIP:

Workmanship shall conform to the best commercial practice to produce high quality parts. Plugs shall be free from all hanging burrs, loose scale, and slivers which might become dislodged in usage and all other defects which might affect their serviceability.

7. NOTES:

This document has been adopted by the Department of Defense. Any revisions must be coordinated with the Military preparing/coordinating activity. The responsible Military Agency is Military Coordinating Activity: Army - AT.

SQUARE AND HEXAGON HEAD

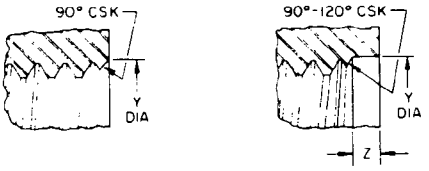
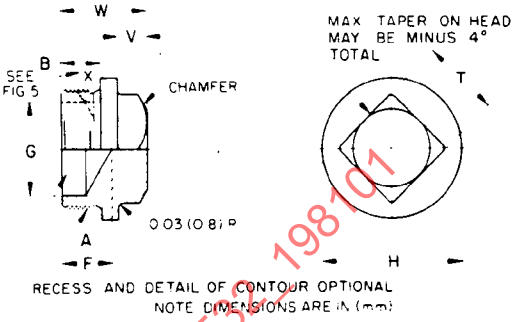


FIGURE 1 – Recommended Hole Data



ed. FIGURE 3 – Square Head Plug (420109B)

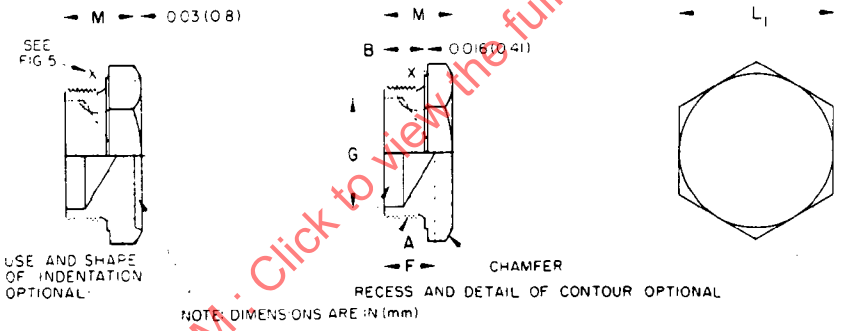


FIGURE 2 – Hexagon Outside Head Plug (420109A)

CODES SHOWN IN BRACKETS ADJACENT TO FIGURE NUMBERS REPRESENT RESPECTIVE FITTING IDENTIFICATION IN ACCORDANCE WITH SAE J846.

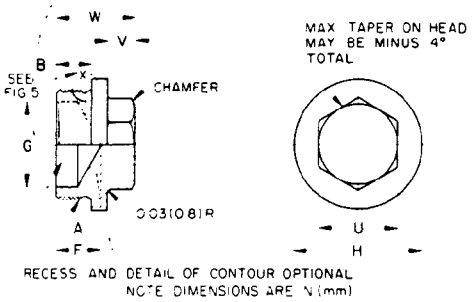


FIGURE 4 – Hexagon Inside Head Plug (420109C)

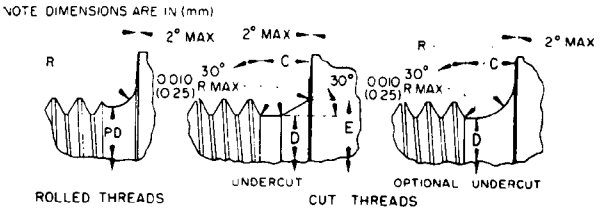


FIGURE 5 – Detail X Enlarged

TABLE 1 – Straight Thread Sizes (External and Internal) (Figures 1–7)

Nom Size, in	Series Designation	External Thread				Internal Thread							
		Pitch Diameter				Pitch Diameter				Minor Diameter			
		Max		Min		Max		Min		Max		Min	
		in	mm	in	mm	in	mm	in	mm	in	mm	in	mm
5/16–24	UNF	0.2843		0.2806		0.2902		0.2854		0.277		0.267	
3/8–24	UNF	0.3468		0.3430		0.3528		0.3479		0.340		0.330	
1/2–20	UNF	0.4662		0.4619		0.4731		0.4675		0.457		0.446	
5/8–18	UNF	0.5875		0.5828		0.5949		0.5889		0.578		0.565	
3/4–16	UNF	0.7079		0.7029		0.7159		0.7094		0.696		0.682	
7/8–18	UNS	0.8375		0.8329		0.8449		0.8389		0.828		0.815	
1–18	UNS	0.9625		0.9578		0.9701		0.9639		0.953		0.940	
1-1/4–18	UNEF	1.2124		1.2075		1.2202		1.2139		1.203		1.190	
1-1/2–18	UNEF	1.4624		1.4574		1.4704		1.4639		1.452		1.440	
1-3/4–16	UN	1.7078		1.7025		1.7163		1.7094		1.696		1.682	
2–16	UN	1.9578		1.9524		1.9664		1.9594		1.946		1.932	
Metric Thread Sizes													
10 x 1	—		9.335		9.238		9.446		9.350		8.954		8.844
14 x 1.25	—		13.155		13.048		13.297		13.188		12.962		12.499
18 x 1.5	—		16.980		16.853		17.153		17.026		16.426		16.266

SQUARE AND HEXAGON SOCKET HEAD

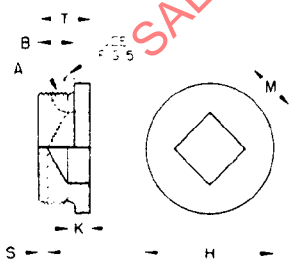


FIGURE 6A – Upset (420109D)

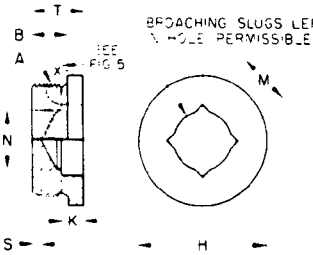


FIGURE 6B – Broached (420109E)

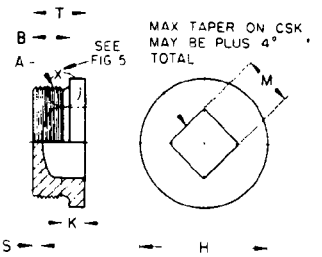


FIGURE 6C – Cast (420109F)

FIGURE 6 – Square Socket Head Plugs

CODES SHOWN IN BRACKETS ADJACENT TO FIGURE NUMBERS REPRESENT RESPECTIVE FITTING IDENTIFICATION IN ACCORDANCE WITH SAE J846.

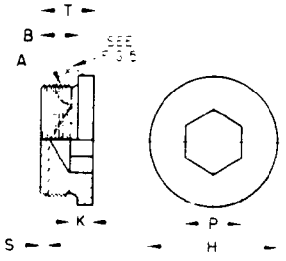


FIGURE 7A – Upset
(420109G)

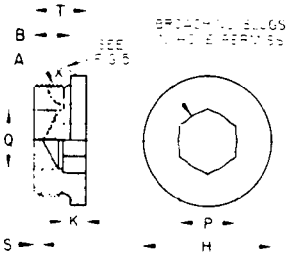


FIGURE 7B – Broached
(420109H)

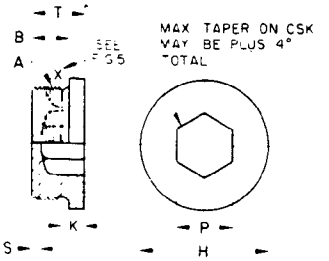


FIGURE 7C – Cast
(420109J)

FIGURE 7 – Hexagon Socket Head Plugs

ed. TABLE 2 (Figure 1)

Nom Size, in	Series Designation	External Thread								Internal Thread			
		Chamfer Dia				Length of Chamfer or Partial Thread				Y CSK or C'Bore Dia		Z C'Bore Depth	
		Max		Min		Max		Min		Basic		Basic	
		in	mm	in	mm	in	mm	in	mm	in	mm	in	mm
5/16-24	UNF	0.25	6.4	0.24	6.1	0.052	1.32	0.031	0.79	0.34	8.6	0.042	1.07
3/8-24	UNF	0.31	7.9	0.30	7.6	0.052	1.32	0.031	0.79	0.40	10.2	0.042	1.07
1/2-20	UNF	0.43	10.9	0.42	10.7	0.062	1.57	0.038	0.97	0.53	13.5	0.050	1.27
5/8-18	UNF	0.54	13.7	0.52	13.2	0.069	1.75	0.042	1.07	0.66	16.8	0.056	1.42
3/4-16	UNF	0.66	16.8	0.64	16.3	0.078	1.98	0.047	1.19	0.78	19.8	0.062	1.57
7/8-18	UNS	0.79	20.1	0.77	19.6	0.069	1.75	0.042	1.07	0.91	23.1	0.056	1.42
1-18	UNS	0.92	23.4	0.90	22.9	0.069	1.75	0.042	1.07	1.03	26.2	0.056	1.42
1-1/4-18	UNEF	1.17	29.7	1.15	29.2	0.069	1.75	0.042	1.07	1.28	32.5	0.056	1.42
1-1/2-18	UNEF	1.42	36.1	1.40	35.6	0.069	1.75	0.042	1.07	1.53	38.9	0.056	1.42
1-3/4-16	UN	1.66	42.2	1.64	41.7	0.078	1.98	0.047	1.19	1.78	45.2	0.062	1.57
2-16	UN	1.91	48.5	1.89	48.0	0.078	1.98	0.047	1.19	2.03	51.6	0.062	1.57
Metric Thread Sizes													
10 x 1	—	0.33	8.4	0.32	8.1	0.049	1.25	0.030	0.75	0.42	10.8	0.039	1.00
14 x 1.25	—	0.48	12.2	0.47	11.9	0.061	1.56	0.037	0.94	0.58	14.8	0.049	1.25
18 x 1.5	—	0.62	15.7	0.60	15.2	0.074	1.88	0.044	1.12	0.74	18.8	0.059	1.50

TABLE 3 – Dimensions of Hexagon Outside Head and Square, and Hexagon Inside Head Filler and Drain Plugs (Figures 2-5)

Nom Size, in	B Shoulder Length		C Relief Width		D Relief Dia		E Pilot Dia		F Recess Depth		G Recess Dia, Max		H Flange Dia		R Fillet Radius[a] Approx	
	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm
5/16	0.31	7.9	0.09	2.3	0.252 0.245	6.40 6.22	0.328 0.321	8.33 8.15	-	-	-	-	0.56	14.2	0.042	1.07
3/8	0.31	7.9	0.09	2.3	0.314 0.307	7.98 7.80	0.391 0.384	9.93 9.75	—	—	—	—	0.62	15.7	0.042	1.07
1/2	0.34	8.6	0.09	2.3	0.428 0.421	10.87 10.69	0.516 0.509	13.11 12.93	0.41	10.4	0.25	6.4	0.75	19.0	0.050	1.27
5/8	0.38	9.7	0.12	3.0	0.545 0.537	13.84 13.64	0.641 0.633	16.28 16.08	0.47	11.9	0.38	9.7	0.88	22.4	0.056	1.42
3/4	0.38	9.7	0.12	3.0	0.660 0.651	16.76 16.54	0.766 0.757	19.46 19.23	0.47	11.9	0.50	12.7	1.00	25.4	0.062	1.57
7/8	0.41	10.4	0.12	3.0	0.793 0.785	20.14 19.94	0.891 0.883	22.63 22.43	0.50	12.7	0.56	14.2	1.12	28.4	0.056	1.42
1	0.44	11.2	0.12	3.0	0.918 0.910	23.32 23.11	0.016 1.008	25.81 25.60	0.56	14.2	0.69	17.5	1.25	31.8	0.056	1.42
1-1/4	0.47	11.9	0.12	3.0	1.167 1.159	29.64 29.44	1.266 1.258	32.16 31.95	0.59	15.0	0.94	23.9	1.50	38.1	0.056	1.42

(Table continued on next page)

TABLE 3 – Dimensions of Hexagon Outside Head and Square, and Hexagon Inside Head Filler and Drain Plugs (Figures 2-5)

Nom Size, in	B Shoulder Length		C Relief Width		D Relief Dia		E Pilot Dia		F Recess Depth		G Recess Dia, Max		H Flange Dia		R Fillet Radius[a] Approx	
	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm
1-1/2	0.50	12.7	0.12	3.0	1.417 1.409	35.99 35.79	1.516 1.508	38.51 38.30	0.69	17.5	1.12	28.4	1.75	44.4	0.056	1.42
1-3/4	0.56	14.2	0.12	3.0	1.657 1.648	42.09 41.86	1.766 1.757	44.86 44.63	0.75	19.0	1.38	35.1	2.00	50.8	0.062	1.57
2	0.56	14.2	0.12	3.0	1.907 1.898	48.44 48.21	2.016 2.007	51.21 50.98	0.75	19.0	1.62	41.1	2.25	57.2	0.062	1.57
Metric Thread Sizes																
10	0.31	7.9	0.09	2.3	0.336 0.329	8.53 8.36	0.410 0.403	10.41 10.24	—	—	—	—	0.62	15.7	0.039	1.00
14	0.34	8.6	0.09	2.3	0.480 0.473	12.19 12.01	0.567 0.560	14.40 14.22	0.41	10.4	0.31	7.9	0.81	20.6	0.049	1.25
18	0.38	9.7	0.12	3.0	0.623 0.614	15.82 15.60	0.724 0.715	18.39 18.16	0.47	11.9	0.44	11.2	0.94	23.9	0.059	1.50

Nom Size, in	R1 Fillet Radius[a] Approx		Hex Outside Head L Hex Width		Hex Outside Head M Overall Length		Square and Hexagon Inside Head T Square Size		Square and Hexagon Inside Head U Hex Size		Square and Hexagon Inside Head V Square and Hex Height		Square and Hexagon Inside Head W Overall Length	
	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm
5/16	0.062	1.57	0.565 0.551	14.35 14.00	0.50	12.7	0.221 0.214	5.61 5.44	0.283 0.276	7.19 7.01	0.22	5.6	0.66	16.8
3/8	0.062	1.57	0.627 0.612	15.93 15.54	0.50	12.7	0.283 0.276	7.19 7.01	0.315 0.304	8.00 7.72	0.25	6.4	0.69	17.5
1/2	0.075	1.90	0.752 0.737	19.10 18.72	0.53	13.5	0.377 0.370	9.58 9.40	0.440 0.428	11.18 10.87	0.25	6.4	0.72	18.3
5/8	0.083	2.11	0.877 0.860	22.28 21.84	0.62	15.7	0.440 0.428	11.18 10.87	0.502 0.489	12.75 12.42	0.28	7.1	0.78	19.8
3/4	0.094	2.39	1.002 0.983	25.45 24.97	0.62	15.7	0.502 0.490	12.75 12.45	0.565 0.551	14.35 14.00	0.28	7.1	0.81	20.6
7/8	0.083	2.11	1.127 1.106	28.63 28.09	0.66	16.8	0.565 0.553	14.35 14.05	0.627 0.612	15.93 15.54	0.31	7.9	0.88	22.4
1	0.083	2.11	1.252 1.230	31.80 31.24	0.75	19.0	0.627 0.615	15.93 15.62	0.815 0.798	20.70 20.27	0.31	7.9	0.91	23.1
1-1/4	0.083	2.11	1.502 1.477	38.15 37.52	0.78	19.8	0.815 0.803	20.70 20.40	1.002 0.983	25.45 24.97	0.34	8.6	1.00	25.4
1-1/2	0.083	2.11	1.752 1.725	44.50 43.82	0.88	22.4	0.940 0.928	23.88 23.57	1.127 1.106	28.63 28.09	0.38	9.7	1.12	28.4
1-3/4	0.094	2.39	2.002 1.974	50.85 50.14	0.94	23.9	1.127 1.115	28.63 28.32	1.252 1.230	31.80 31.24	0.44	11.2	1.25	31.8
2	0.094	2.39	2.252 2.232	57.20 56.69	0.94	23.9	1.315 1.302	33.40 33.07	1.502 1.477	38.15 37.52	0.44	11.2	1.31	33.3
Metric Thread Sizes														
10	0.059	1.50	0.627 0.612	15.93 15.54	0.50	12.7	0.283 0.276	7.19 7.01	0.315 0.304	8.00 7.72	0.25	6.4	0.69	17.5
14	0.074	1.88	0.814 0.799	20.68 20.29	0.53	13.5	0.377 0.370	9.58 9.40	0.440 0.428	11.18 10.87	0.25	6.4	0.72	18.3
18	0.089	2.25	0.940 0.921	23.88 23.39	0.62	15.7	0.502 0.490	12.75 12.45	0.565 0.551	14.35 14.00	0.28	7.1	0.81	20.6

[a]See detail X in Fig. 5.

TABLE 4 – Dimensions of Square and Hexagon Socket Head Filler and Drain Plugs (Figures 5-7)

Nom Size, in	B Shoulder Length		C Relief Width		D Relief Dia		E Pilot Dia		H Flange Dia		K Socket Depth, Min		S Wall Thickness, Min		T Overall Length	
	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm
5/16	0.31	7.9	0.09	2.3	0.252 0.245	6.40 6.22	0.328 0.321	8.33 8.15	0.56	14.2	0.12	3.0	0.12	3.0	0.44	11.2
3/8	0.31	7.9	0.09	2.3	0.314 0.307	7.98 7.80	0.391 0.384	9.93 9.75	0.62	15.7	0.12	3.0	0.12	3.0	0.44	11.2
1/2	0.34	8.6	0.09	2.3	0.428 0.421	10.87 10.69	0.516 0.509	13.11 12.93	0.75	19.0	0.19	4.8	0.12	3.0	0.47	11.9
5/8	0.38	9.7	0.12	3.0	0.545 0.537	13.84 13.64	0.641 0.633	16.28 16.08	0.88	22.4	0.19	4.8	0.12	3.0	0.50	12.7
3/4	0.38	9.7	0.12	3.0	0.660 0.651	16.76 16.54	0.766 0.757	19.46 19.23	1.00	25.4	0.25	6.4	0.12	3.0	0.52	13.2

(Table continued on next page)