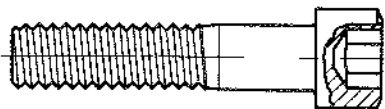


SOCKET HEAD CAP SCREWS													ASME B18.3-2003	
Basic Screw Diam.	D		A		H		C	J	F		T	G	K	
	Body Diameter		Head Diameter		Head Height		Top Chamfer or Radius	Hex Socket Size	Fillet Junction Diameter at Bearing Surface		Key Engagement	Wall Thickness	Bottom Chamfer or Radius	
	Max	Min	Max	Min	Max	Min	Max	Nom	Max	Min	Min	Min	Max	
0	0.0600	0.0568	0.096	0.091	0.060	0.057	0.004	0.050	0.074	0.062	0.025	0.020	0.007	
1	0.0730	0.0695	0.118	0.112	0.073	0.070	0.005	1/16	0.087	0.075	0.031	0.025	0.007	
2	0.0860	0.0822	0.140	0.134	0.086	0.083	0.008	5/64	0.102	0.090	0.038	0.029	0.007	
3	0.0990	0.0949	0.161	0.154	0.099	0.095	0.008	5/64	0.115	0.102	0.044	0.034	0.007	
4	0.1120	0.1075	0.183	0.176	0.112	0.108	0.009	3/32	0.130	0.117	0.051	0.038	0.008	
5	0.1250	0.1202	0.205	0.198	0.125	0.121	0.012	3/32	0.145	0.132	0.057	0.043	0.008	
6	0.1380	0.1329	0.226	0.218	0.138	0.134	0.013	7/64	0.158	0.144	0.064	0.047	0.008	
8	0.1640	0.1585	0.270	0.262	0.164	0.159	0.014	9/64	0.188	0.172	0.077	0.056	0.008	
10	0.1900	0.1840	0.312	0.303	0.190	0.185	0.018	5/32	0.218	0.202	0.090	0.065	0.008	
1/4	0.2500	0.2435	0.375	0.365	0.250	0.244	0.025	3/16	0.278	0.261	0.120	0.095	0.010	
5/16	0.3125	0.3053	0.469	0.457	0.312	0.306	0.033	1/4	0.347	0.329	0.151	0.119	0.010	
3/8	0.3750	0.3678	0.562	0.550	0.375	0.368	0.040	5/16	0.415	0.397	0.182	0.143	0.010	
7/16	0.4375	0.4294	0.656	0.642	0.438	0.430	0.047	3/8	0.484	0.465	0.213	0.166	0.015	
1/2	0.5000	0.4919	0.750	0.735	0.500	0.492	0.055	3/8	0.552	0.531	0.245	0.190	0.015	
5/8	0.6250	0.6163	0.938	0.921	0.625	0.616	0.070	1/2	0.689	0.664	0.307	0.238	0.015	
3/4	0.7500	0.7406	1.125	1.107	0.750	0.740	0.085	5/8	0.828	0.800	0.370	0.285	0.015	
7/8	0.8750	0.8647	1.312	1.293	0.875	0.864	0.100	3/4	0.963	0.932	0.432	0.333	0.020	
1	1.0000	0.9886	1.500	1.479	1.000	0.988	0.114	3/4	1.100	1.068	0.495	0.380	0.020	
1 1/4	1.2500	1.2336	1.875	1.852	1.250	1.236	0.144	7/8	1.370	1.333	0.620	0.475	0.020	
1 1/2	1.5000	1.4818	2.250	2.224	1.500	1.485	0.176	1	1.640	1.601	0.745	0.570	0.020	
Tolerance on Length	Nominal Screw Size		Nominal Screw Length											
			Up to 1 in., Incl.	Over 1 in. to 2-1/2 in., Incl.	Over 2-1/2 to 6 in., Incl.	Over 6 in.								
	0 thru 3/8, Incl.		-0.03	-0.04	-0.06	-0.12								
	7/16 thru 3/4, Incl.		-0.03	-0.06	-0.08	-0.12								
7/8 thru 1-1/2, Incl.		-0.05	-0.10	-0.14	-0.20									

<b>Description</b>	An externally threaded fastener with unified threads, a cylindrical head with a flat chamfered top surface, knurled cylindrical sides and hexagonal recess, made from alloy steel.
<b>Applications/Advantages</b>	Ideal for precision assembly work with close tolerances and applications needing a well-tooled appearance. Supplies greater tensile strength than equivalent sizes of Grade-5 or Grade-8 hex head cap screws while requiring less surface area or counterbore since the fastener is internally wrenched.
<b>Material</b>	Cap screws shall be made from an alloy steel which conforms to the following chemical composition requirements (per product analysis)-- Carbon: 0.31% minimum; Phosphorus: 0.040% maximum; Sulfur: 0.045% maximum. Also, one or more of the following elements shall be present in sufficient quantity to meet the strength requirements listed below: chromium, nickel, molybdenum or vanadium.
<b>Heat Treatment</b>	Cap screws shall be heat treated by oil quenching from above the transformation temperature and then tempered at a temperature not lower than 650°F.
<b>Hardness</b>	0 through 1/2" diameters: Rockwell C39 minimum; 5/8" diameter & larger: Rockwell C37 minimum
<i>Cap screws of a length 3D or greater, where D equals the nominal diameter of the screw, are subject to tensile strength, yield strength, elongation and reduction of area testing.</i>	
<b>Tensile Strength</b>	0 through 1/2" diameters: 180,000 psi; minimum; 5/8" diameter & larger: 170,000 psi; minimum
<b>Yield Strength</b>	0 through 1/2" diameters: 162,000 psi; minimum; 5/8" diameter & larger: 153,000 psi; minimum
<b>Elongation</b>	10% minimum (applies to machined specimens of length at least 4D where D equals the nominal diameter of the screw)
<b>Reduction of Area</b>	33% minimum (applies to machined specimens)
<b>Plating</b>	See Appendix-A for information on the plating of alloy steel socket cap screws.

Nominal Size	Tensile Strength (lbs., min.)		Yield Strength (lbs., min.)		Single Shear Strength (lbs., min.)		Tightening Torque (in.-lbs.)	
	UNRC	UNRF	UNRC	UNRF	UNRF	UNRC	UNRC	UNRF
0	-	320	-	290	305	-	-	2.6
1	475	500	425	450	450	450	4.5	4.8
2	665	710	600	635	625	625	7.5	8.0
3	875	940	790	845	830	830	11.0	12.0
4	1,090	1,190	975	1,070	1,060	1,060	16.0	18.0
5	1,430	1,490	1,290	1,345	1,325	1,325	24.0	24.0
6	1,640	1,825	1,470	1,645	1,615	1,615	30.0	34.0
8	2,520	2,650	2,270	2,385	2,280	2,280	55.0	58.0
10	3,150	3,600	2,835	3,240	3,060	3,060	79.0	90.0
1/4	5,725	6,550	5,150	5,900	5,295	5,295	200.0	230.0
5/16	9,430	10,440	8,490	9,395	8,285	8,285	415.0	460.0
3/8	13,950	15,805	12,555	14,225	11,910	11,910	740.0	845.0
7/16	19,135	21,365	17,220	19,230	16,200	16,200	1,190.0	1,305.0
1/2	25,540	28,780	22,990	25,905	21,175	21,175	1,800.0	2,065.0
5/8	38,400	43,500	34,550	39,150	31,300	31,300	3,400.0	3,800.0
3/4	56,750	63,400	51,100	57,050	45,050	45,050	6,000.0	6,750.0
7/8	78,500	88,500	70,700	77,850	61,350	61,350	8,250.0	9,200.0
1	103,000	112,700	92,700	101,450	80,100	80,100	12,500.0	13,000.0
1 1/4	164,700	182,400	146,250	164,150	125,100	125,100	25,000.0	27,750.0
1 1/2	238,800	268,800	215,950	241,900	180,200	180,200	43,500.0	49,000.0

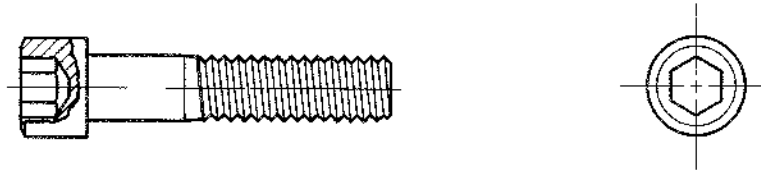
MECHANICAL PROPERTIES OF ALLOY STEEL SOCKET CAP SCREWS



Alloy Steel

Socket Cap Screws

Sockets



MECHANICAL PROPERTIES OF <i>STAINLESS STEEL</i> SOCKET CAP SCREWS							Blue Devil®
Nominal Size	Tensile Strength (lbs., min.)		Yield Strength (lbs., min.)		Body Section	Tightening Torque (In.-Lbs.)	
	UNRC	UNRF	UNRC	UNRF	Single Shear Strength (lbs., min.)	UNRC	UNRF
0	-	145	-	72	130	-	1.4
1	-	220	-	111	190	-	2.3
2	295	-	185	-	260	3.8	-
4	480	-	240	-	350	6.0	-
6	725	-	363	-	375	15.0	-
8	1,120	-	560	-	670	28.0	-
10	1,400	1,600	701	800	950	40.0	46.0
1/4	2,550	2,910	1,273	1,455	2,200	95.0	109.0
5/16	4,200	4,645	2,100	2,320	3,450	170.0	188.0
3/8	6,100	7,025	3,100	3,510	4,970	301.0	341.0
1/2	11,350	-	5,675	-	8,840	750.0	-

<b>Description</b>	An externally threaded fastener with unified threads, a cylindrical head with a flat chamfered top surface, knurled cylindrical sides and hexagonal recess. It is made from austenitic <b>stainless steel</b> .
<b>Applications/Advantages</b>	Although <b>stainless</b> socket cap screws have significantly less tensile and yield strength than alloy sockets, they have superior resistance to corrosion. They retain their mechanical and performance capabilities at higher than ambient temperatures.
<b>Material</b>	Cap screws shall be made from one of the following <b>stainless</b> alloys: 302, 303, 304, 305, 384, XM1 or XM7.
<b>Heat Treatment</b>	The austenitic alloys develop their strength through work hardening during the fastener manufacturing process, as seen from the hardness properties below. The only heat treatment normally available on austenitic <b>stainless</b> alloys is annealing, which is done at approximately 1900°F to a dead soft condition and is not normally thermally reversible.
<b>Hardness</b>	Rockwell B80 minimum
<i>Cap screws of a length 3D or greater, where D equals the nominal diameter of the screw, are subject to tensile strength, yield strength, elongation and reduction of area testing.</i>	
<b>Tensile Strength</b>	80,000 psi. minimum
<b>Yield Strength</b>	30,000 psi. minimum
<b>Elongation</b>	10% minimum (applies to machined specimens of length at least 4D where D equals the nominal diameter of the screw)
<b>Reduction of Area</b>	30% minimum (applies to machined specimens)

**ASME B18.3-2003 BODY AND GRIP LENGTHS OF SOCKET HEAD CAP SCREWS**

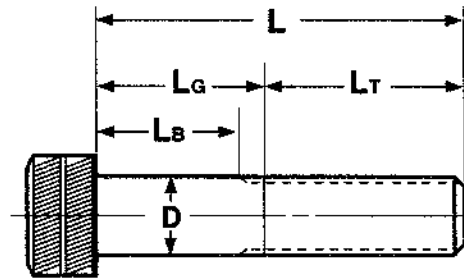
Nom. Size D	0	1	2	3	4	5	6	8	10	Basic Thread Length L <sub>t</sub>		Nominal Length L	
										Lg	Lb	Lg	Lb
1.00	0.50	0.44	0.25	0.17	0.25	0.15	0.25	0.12	0.50	0.44	0.25	0.17	
1.25	0.75	0.69	0.62	0.55	0.62	0.54	0.62	0.52	0.75	0.69	0.62	0.55	0.38
1.50	0.88	0.80	0.88	0.79	0.88	0.77	0.75	0.62	0.50	0.34	0.38	0.22	0.38
1.75	1.12	1.04	1.12	1.02	1.12	1.02	0.75	0.62	1.00	0.84	0.88	0.72	0.88
2.00	1.38	1.27	1.38	1.27	1.25	1.12	1.25	1.12	1.00	0.84	0.88	0.72	0.88
2.25	1.62	1.54	1.62	1.54	1.25	1.12	1.50	1.34	1.38	1.22	1.38	1.17	1.38
2.50	1.88	1.79	1.88	1.79	1.75	1.62	1.50	1.34	1.38	1.22	1.38	1.17	1.38
2.75	2.14	2.05	2.14	2.05	2.00	1.84	2.00	1.84	1.88	1.72	1.88	1.67	1.88
3.00	2.40	2.31	2.40	2.31	2.25	2.00	2.25	2.00	2.00	1.72	1.88	1.67	2.00
3.50	2.66	2.57	2.66	2.57	2.50	2.25	2.50	2.25	2.38	2.17	2.38	2.17	2.38

Nom. Size D	1/4	5/16	3/8	7/16	1/2	5/8	3/4	7/8	1	Basic Thread Length L <sub>t</sub>		Nominal Length L	
										Lg	Lb	Lg	Lb
1.50	0.50	0.25								0.50	0.25		
1.75	0.50	0.25	0.62	0.35	0.50	0.19				0.62	0.35	0.50	0.19
2.00	1.00	0.75	0.62	0.35	1.00	0.75				1.00	0.75	0.62	0.35
2.25	1.00	0.75	0.62	0.35	1.00	0.75				1.00	0.75	0.62	0.35
2.50	1.50	1.25	1.12	0.85	1.00	0.69	1.12	0.85	1.00	0.69	1.12	0.85	1.00
2.75	1.50	1.25	1.12	0.85	1.00	0.69	1.12	0.85	1.00	0.69	1.12	0.85	1.00
3.00	2.00	1.75	1.62	1.35	1.50	1.19	1.62	1.27	1.50	1.19	1.62	1.27	1.50
3.25	2.00	1.75	1.62	1.35	1.50	1.19	1.62	1.27	1.50	1.19	1.62	1.27	1.50
3.50	2.50	2.25	2.12	1.85	2.00	1.69	2.12	1.77	1.50	1.12	1.50	1.04	1.00
4.00	3.00	2.75	2.62	2.35	2.50	2.19	2.62	2.27	2.25	1.86	2.25	1.80	2.00
4.50	3.50	3.25	3.12	2.85	3.00	2.69	3.12	2.77	3.00	2.62	3.00	2.54	3.00
5.00	4.00	3.75	3.62	3.35	3.50	3.19	3.62	3.27	3.00	2.62	3.00	2.54	3.00
5.50	4.00	3.85	4.12	3.85	4.00	3.69	4.12	3.77	3.75	3.36	3.75	3.30	3.00
6.00	4.62	4.35	4.50	4.19	4.62	4.27	4.50	4.12	3.75	3.30	4.00	3.50	3.00
6.50	5.00	4.69	5.12	4.77	4.50	4.12	4.50	4.04	4.00	3.50	4.00	3.44	4.00
7.00	5.50	5.19	5.62	5.27	5.25	4.86	5.25	4.80	5.00	4.50	4.00	3.44	4.00
8.00	6.00	6.27	6.62	6.27	6.00	5.62	6.00	5.54	6.00	5.50	5.00	4.44	5.00
9.00	7.00	7.27	7.62	7.27	7.00	6.62	7.00	6.30	7.00	6.50	6.00	5.44	6.00
10.00	8.00	8.27	8.62	8.27	8.00	7.62	8.00	7.30	8.00	7.50	7.00	6.44	7.00
11.00	9.00	9.27	9.62	9.27	9.00	8.62	9.00	8.30	9.00	8.50	8.00	7.44	8.00
12.00	10.00	10.27	10.62	10.27	10.00	9.62	10.00	9.30	10.00	9.50	9.00	8.44	9.00

# Sockets

## Socket Cap Screws

### Length Specifications



**Notes Regarding the Thread Length of Socket Head Cap Screws**

- The basic thread lengths ( $L_T$ ) listed directly below the nominal sizes in the table on the previous page represents the nominal length up to which all screws of that diameter shall be fully threaded.
- To determine the threaded portion of the screws with a nominal length greater than  $L_T$ , subtract the minimum design grip length ( $L_G$ ) from the nominal length ( $L$ ).
- For screws over 1 in. in diameter and of nominal lengths longer than  $L_T$ , the maximum grip gaging length ( $L_G$ ) and the minimum body length ( $L_B$ ) of the screws shall be determined as follows:

$$L_G = L - L_T$$

$$L_B = L - L_{TT}$$

- Where:  $L$  = Nominal length
- $L_T$  = Minimum thread length tabulated below
- $L_{TT}$  = Maximum total thread length tabulated below

Nominal Size	Min Thread Length ( $L_T$ )	Max Total Thread Length ( $L_{TT}$ )
1-1/4	3.12	5.09
1-1/2	3.75	6.08

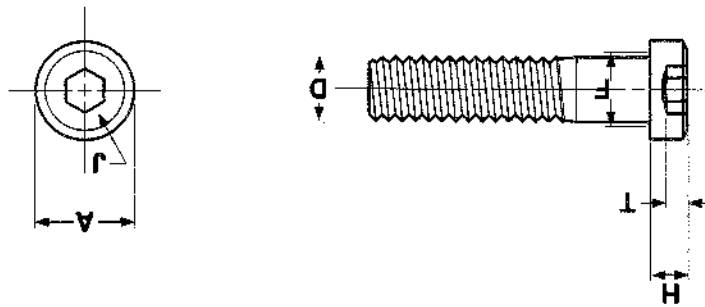
<b>Description</b>	Similar to a standard alloy socket cap screw except the head height is 50% of the standard's and the socket size is smaller. The low-head style is supplied only in plain steel.
<b>Applications/Advantages</b>	Used in applications where the limited clearance would not accommodate the head height of a standard socket cap screw. Also used in counterbored holes of material too thin for a regular socket cap screw. However, because of their design, they cannot withstand the same preloads as a standard socket head.
<b>Material</b>	Cap screws shall be made from an alloy steel which conforms to the following chemical composition requirements (per product analysis): -- Carbon: 0.31% minimum; Phosphorus: 0.040% maximum; Sulfur: 0.045% maximum. Also, one or more of the following elements shall be present in sufficient quantity to meet the performance requirements listed below: chromium, nickel, molybdenum or vanadium.
<b>Heat Treatment</b>	Cap screws shall be heat treated by oil quenching from above the transformation temperature and then tempered at a temperature not lower than 650°F.
<b>Hardness</b>	Rockwell C38 minimum
<b>Tensile Strength</b>	170,000 psi, minimum
<b>Yield Strength</b>	150,000 psi, minimum
<b>Elongation</b>	10% minimum (applies to machined specimens of length at least 4D where D equals the nominal diameter of the screw)
<b>Reduction of Area</b>	33% minimum (applies to machined specimens)

Nominal Size	Basic Screw Diameter		Body Diameter		Head Diameter		Head Height		Hex Socket Size	Min Engagement	Tensile Strength Pounds Min.	Tightening Torque Inch Pounds
	Max	Min	Max	Min	Max	Min	Max	Min				
1/2	0.5000	0.5000	0.4919	0.4919	0.750	0.743	0.254	0.244	.250	.151	23,400	615.0
3/8	0.3750	0.3750	0.3678	0.3678	0.562	0.556	0.192	0.182	.188	.115	12,800	273.0
5/16	0.3125	0.3125	0.3053	0.3053	0.437	0.431	0.158	0.152	.156	.110	8,650	156.0
1/4	0.2500	0.2500	0.2435	0.2435	0.375	0.369	0.127	0.121	.125	.094	5,250	77.9
10	0.1900	0.1900	0.1840	0.1840	0.312	0.307	0.098	0.092	.094	.072	2,890	33.5
8	0.1640	0.1640	0.1585	0.1585	0.270	0.265	0.085	0.079	.078	.060	2,310	19.4

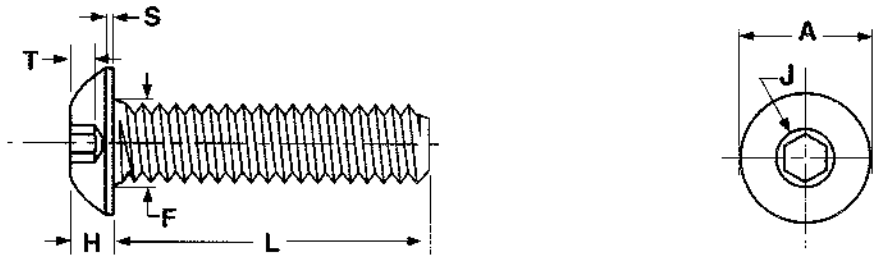
Nominal Screw Length				Tolerance on Length	
Nominal Screw Length		Tolerance on Length		Tolerance on Length	
Up to 1 in., incl.		0 thru 3/8		1/2	
Over 1 in. to 2-1/2 in., incl.					
				-0.03	
				-0.04	
				-0.06	

ASME B18.3 2003 Blue Devil  
**LOW HEAD SOCKET CAP SCREWS - ALLOY STEEL**



**Sockets**  
**Low Head Cap Screws**  
**Alloy Steel**

# Button Head Socket Cap Screws



SOCKET BUTTON HEAD CAP SCREWS - ALLOY STEEL												ASME B18.3-2003, Blue Devil		
Nominal Size	A		H		S	J	T	F		L	Tensile Test Load	Single Shear Strength of Body	Seating Torques in./lbs.	
	Head Diameter	Head Height	Head Side Height	Hex Socket Size	Key Engagement	Fillet Transition Diameter	Max Standard Length	Lb.	Lbs., Min.	Coarse Thread			Fine Thread	
	Max	Min	Max	Min	Ref	Nom	Min	Max	Min	Nom				
4	0.213	0.201	0.059	0.051	0.015	1/16	0.035	0.132	0.122	0.50	840	950	7.0	8.
6	0.262	0.250	0.073	0.063	0.015	5/64	0.044	0.158	0.148	0.63	1,260	1,400	13.	15.
8	0.312	0.298	0.087	0.077	0.015	3/32	0.052	0.194	0.184	0.75	1,940	2,000	25.	26.
10	0.361	0.347	0.101	0.091	0.020	1/8	0.070	0.220	0.210	1.00	2,440	2,700	45.	48.
1/4	0.437	0.419	0.132	0.122	0.031	5/32	0.087	0.290	0.280	1.00	4,430	4,700	95.	110.
5/16	0.547	0.527	0.166	0.152	0.031	3/16	0.105	0.353	0.343	1.00	7,300	7,300	190.	210.
3/8	0.656	0.636	0.199	0.185	0.031	7/32	0.122	0.415	0.405	1.25	10,800	10,600	300.	300.
1/2	0.875	0.851	0.265	0.245	0.046	5/16	0.175	0.560	0.540	2.00	19,800	18,800	900.	960.
5/8	1.000	0.970	0.331	0.311	0.062	3/8	0.210	0.685	0.665	2.00	31,500	29,400	1,700.	1,900.

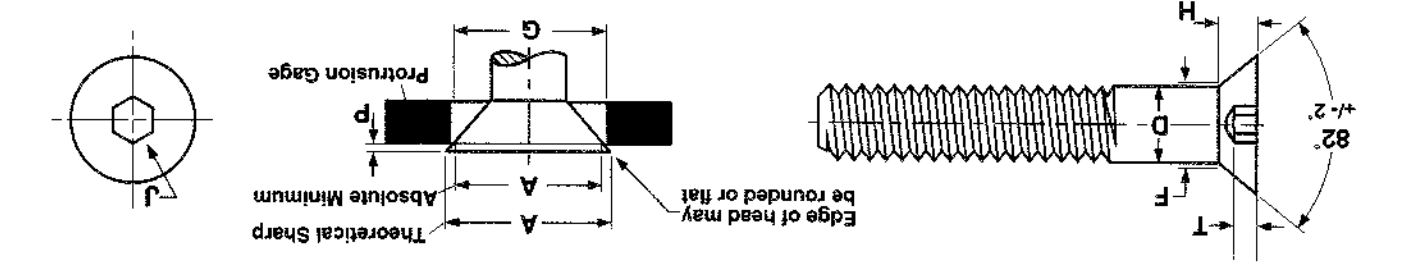
Tolerance on Length	Nominal Screw Size	Nominal Screw Length	
		Up to 1 in., Inclusive	Over 1 in. to 2-1/2 in., Inclusive
	0 thru 3/8, Inclusive		-0.03
1/2 and 5/8, Inclusive		-0.03	-0.06

<b>Description</b>	Has a similar thread design as a socket cap screw. The dome-shaped head is wider and has a lower profile than a socket cap screw.
<b>Applications/ Advantages</b>	Used when a wider bearing surface or a smoother, more finished appearance is desired. Button head cap screws do not afford the strength of socket head cap screws and are designed for light fastening applications. They are not recommended for critical, high-strength applications.
<b>Material</b>	Screws shall be made from an alloy steel which conforms to the following chemical composition requirements (per product analysis) - Carbon: 0.28 to 0.50%; Phosphorus: 0.045% maximum; Sulfur: 0.035% maximum. Also, one or more of the following elements shall be present in sufficient quantity to meet the performance requirements listed below: chromium, nickel, molybdenum or vanadium.
<b>Heat Treatment</b>	Screws shall be heat treated by oil quenching from above the transformation temperature and then tempered at a temperature not lower than 650°F.
<b>Hardness</b>	Rockwell C38 - 44
<b>Tensile Strength</b>	180,000 psi. minimum (material only)
<b>Yield Strength</b>	160,000 psi. minimum (material only)
<b>Elongation</b>	8% minimum (applies to machined specimens of length at least 4D where D equals the nominal diameter of the screw)
<b>Reduction of Area</b>	35% minimum (applies to machined specimens)
<b>Finish</b>	Screws are supplied with a thermal black finish.

<b>Finish</b>	Screws are supplied with a thermal black finish.
<b>Reduction of Area</b>	35% minimum (applies to machined specimens over 1/2" diam.)
<b>Elongation</b>	8% minimum (applies to machined specimens over 1/2" diam., of length at least 4D where D equals the nominal diameter of the screw)
<b>Yield Strength</b>	153,000 psi minimum (over 1/2" diam.)
<b>Tensile Strength</b>	Thru 1/2" diam.: 145,000 psi minimum; Over 1/2" diam.: 135,000 psi minimum
<b>Hardness</b>	Thru 1/2" diam.: Rockwell C 39 - 44; Over 1/2" diam.: Rockwell C 37 - 44
<b>Heat Treatment</b>	Screws shall be heat treated by oil quenching from above the transformation temperature and then tempered at a temperature not lower than 650°F.
<b>Material</b>	Screws shall be made from an alloy steel which conforms to the following chemical composition requirements (per product analysis)-- Carbon: 0.28 to 0.50%; Phosphorus: 0.040% maximum; Sulfur: 0.045% maximum. Also, one or more of the following elements shall be present in sufficient quantity to meet the performance requirements listed below: chromium, nickel, molybdenum or vanadium.
<b>Advantages/Applications</b>	Used when a flush mounting, high strength screw is required. Commonly used in tools and dies where moving parts pass over the fastened area.
<b>Description</b>	Similar in design to a socket button head cap screw but with an 82° countersunk flat head.

Nominal Size	Body Diameter		Head Diameter	Head Height	Protrusion Diameter		Protrusion		Hex Socket Size	Filet Transition Diam.	Tensile Strength, Lbs. Min	Single Shear Strength of Body Torques, in./lbs.	Nominal Screw Length			
	Max	Min			Max	Min	Max	Min					Max	Min	Max	Min
4	0.1120	0.1075	0.255	0.218	0.083	0.172	0.171	0.049	7/16	0.055	900	940	8.	-	-	-
5	0.1250	0.1202	0.281	0.240	0.090	0.196	0.195	0.051	5/8	0.061	1,185	1,180	12.	-	-	-
6	0.1380	0.1329	0.307	0.263	0.097	0.220	0.219	0.052	5/6	0.066	1,350	1,440	15.	-	-	-
8	0.1640	0.1585	0.359	0.311	0.112	0.267	0.266	0.055	3/32	0.076	2,085	2,030	30.	-	-	-
10	0.1900	0.1840	0.411	0.369	0.127	0.313	0.312	0.058	1/8	0.087	2,610	2,720	40.	45.	-	-
1/4	0.2500	0.2435	0.531	0.480	0.161	0.424	0.423	0.064	5/32	0.111	4,750	4,710	100.	110.	-	-
5/16	0.3125	0.3053	0.656	0.600	0.198	0.539	0.538	0.070	3/16	0.135	7,800	7,360	200.	220.	-	-
3/8	0.3750	0.3678	0.781	0.720	0.234	0.652	0.653	0.076	7/32	0.159	11,600	10,600	350.	400.	-	-
7/16	0.4375	0.4294	0.844	0.781	0.234	0.690	0.689	0.082	1/4	0.159	15,900	14,400	560.	-	-	-
1/2	0.5000	0.4919	0.938	0.872	0.251	0.739	0.738	0.119	5/16	0.172	21,200	18,850	850.	1,000.	-	-
5/8	0.6250	0.6163	1.188	1.112	0.324	0.962	0.961	0.136	3/8	0.220	33,800	29,450	1,700.	-	-	-
3/4	0.7500	0.7406	1.438	1.355	0.396	1.186	1.185	0.150	1/2	0.220	50,000	42,400	3,000.	-	-	-

**SOCKET FLAT HEAD CAP SCREWS - ALLOY STEEL** ASME B18.3-2003, Blue Devil



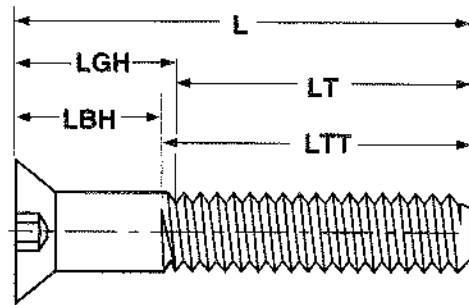
**Sockets Flat Head Socket Cap Screws Alloy Steel**



# Body & Grip Lengths

# Flat Head Socket Cap Screws

# Sockets



For screws of nominal lengths longer than those for which  $L_{GH}$  and  $L_{BH}$  values tabulated in this table and for screws over 1 inch in diameter, the maximum grip gaging length  $L_{GH}$  and the minimum body length  $L_{BH}$  of the screws shall be determined as follows:

$$L_{GH} = L - L_T$$

$$L_{BH} = L - L_{TT}$$

where  $L$  = nominal length,  $L_T$  = minimum thread length, and  $L_{TT}$  = maximum total thread length.

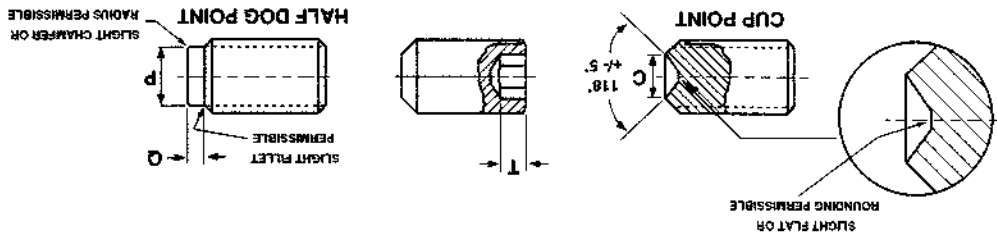
BODY AND GRIP LENGTHS OF FLAT HEAD SOCKET CAP SCREWS												ASME B18.3-2003	
Nominal Size	4		5		6		8		10		1/4		
LT MIN.	.750		.750		.750		.875		.875		1.000		
LTT MAX	0.99		1.00		1.05		1.19		1.27		1.50		
Nominal Length	LGH	LBH	LGH	LBH	LGH	LBH	LGH	LBH	LGH	LBH	LGH	LBH	
1.25	0.50	0.38	0.50	0.38	0.50	0.34	0.38	0.22					
1.50	0.50	0.38	0.50	0.38	0.50	0.34	0.38	0.22	0.62	0.42			
1.75	1.00	0.88	1.00	0.88	1.00	0.84	0.88	0.72	0.62	0.42	0.75	0.50	
2.00	1.00	0.88	1.00	0.88	1.00	0.84	0.88	0.72	1.12	0.92	0.75	0.50	
2.50					1.50	1.34	1.38	1.22	1.62	1.42	1.25	1.00	
3.00							1.88	1.72	2.12	1.92	1.75	1.50	
3.50									2.62	2.42	2.25	2.00	

Nominal Size	5/16		3/8		7/16		1/2		5/8		3/4	
LT MIN.	1.125		1.250		1.375		1.500		1.750		2.000	
LTT MAX	1.71		1.94		2.17		2.38		2.82		3.25	
Nominal Length	LGH	LBH	LGH	LBH	LGH	LBH	LGH	LBH	LGH	LBH	LGH	LBH
2.00	0.88	0.60										
2.25	0.88	0.60	1.00	0.69								
2.50	1.38	1.10	1.00	0.69	1.12	0.77	1.00	0.62				
3.00	1.88	1.60	1.50	1.19	1.62	1.27	1.00	0.62				
3.50	2.38	2.10	2.00	1.69	2.12	1.77	1.75	1.36	1.50	1.04	1.50	1.00
4.00	2.88	2.60	2.50	2.19	2.62	2.27	2.50	2.12	2.25	1.80	1.50	1.00
4.50	3.38	3.10	3.00	2.69	3.12	2.77	2.50	2.12	2.25	1.80	2.50	2.00
5.00	3.88	3.60	3.50	3.19	3.62	3.27	3.25	2.86	3.00	2.54	2.50	2.00
5.50	4.38	4.10	4.00	3.69	4.12	3.77	4.00	3.62	3.75	3.30	3.50	3.00
6.00	4.88	4.60	4.50	4.19	4.62	4.27	4.00	3.62	3.75	3.30	3.50	3.00

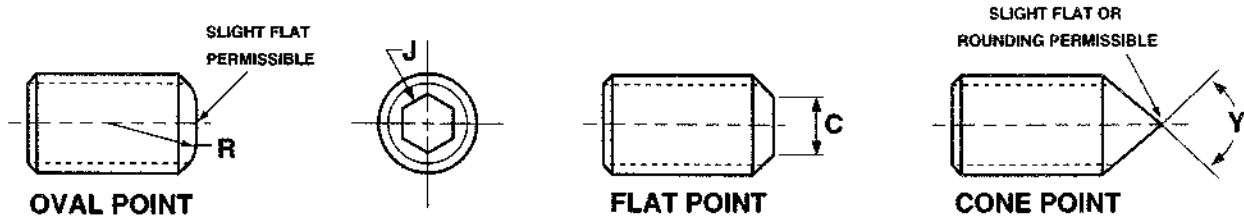
<b>Finish</b>	Screws are supplied with a thermal black finish.
<b>Torsional Strength</b>	Socket set screws of a sufficient length to be tested (as listed in the above table) shall withstand application of the test torque specified in said table without evidence of the socket reaming or the screw bursting.
<b>Hardness</b>	Rockwell C45 - 53
<b>Heat Treatment</b>	Screws shall be heat treated by oil quenching from above the transformation temperature and then tempered at a temperature sufficient to meet the hardness requirements listed below.
<b>Material</b>	Screws shall be made from an alloy steel which conforms to the following chemical composition requirements (per product analysis)-- <i>Carbon:</i> 0.28 to 0.50%; <i>Phosphorus:</i> 0.040% maximum; <i>Sulfur:</i> 0.045% maximum. Also, one or more of the following elements shall be present in sufficient quantity to meet the strength requirements listed below: chromium, nickel, molybdenum or vanadium.
<b>Applications/Advantages</b>	<b>Cup point:</b> Preferred style for frequent reset on soft or hard shafts with minimum deforming. Also chosen for permanent setting on shafts spotted, splined or grooved, and for applications where point meets shaft on an angle. Sometimes substituted for the cup point style. <b>Flat point:</b> Designed for frequent resetting or relocating on hard steel shafts and where minimal damage to shafts is necessary. Ground flats on the shaft improves the contacts. <b>Cone point:</b> For permanent setting on soft or hardened shafts. The deep penetration it offers gives this style set screw the highest torsional & axial holding power. For shafts of Rockwell hardness C15 or over, spot point half its depth. Can also be used as a pivot or hanger. When two set screws are used in a set screw collar, their holding power is determined by their location with respect to each other.
<b>Description</b>	<b>Cup point:</b> The cup point is the most used style set screw. Designed for fast, permanent and semi-permanent location of parts on shafts with hardness differential of 10-15 Rockwell C points and where cutting in of cup edge on the shaft is acceptable. <b>Half-Dog point:</b> A set screw with a protruding tip with a flat surface at the end opposite that of the hexagonal drive. <b>Oval point:</b> A set screw with an oval-shaped point at the end opposite that of the hexagonal drive. <b>Flat point:</b> A set screw with a flat surface at the end opposite that of the hexagonal drive. <b>Cone point:</b> A set screw with a sharp conical-shaped point at the opposite end from the hexagonal drive.

Nominal Size	Cup & Flat Point	Cone & Oval Point	Half Dog Point	Hex Key Size	Tightening Torque (Inch-Lbs.)	Shortest Nominal Length To Which Column T Applies	
						J	
0	0.13	0.13	0.13	.028	.86		
1	0.13	0.19	0.13	.028	.86		
2	0.13	0.19	0.19	.035	1.8		
3	0.19	0.19	0.19	.050	5.		
4	0.19	0.19	0.19	.050	5.		
5	0.19	0.19	0.19	1/16	9.5		
6	0.19	0.25	0.19	1/16	9.5		
8	0.19	0.25	0.25	5/64	19.4		
10	0.19	0.25	0.25	3/32	33.5		
1/4	0.25	0.31	0.31	1/8	77.9		
5/16	0.31	0.44	0.38	5/32	156		
3/8	0.38	0.44	0.44	3/16	273		
7/16	0.44	0.63	0.50	7/32	428		
1/2	0.50	0.63	0.63	1/4	615		
5/8	0.63	0.88	0.68	5/16	1315		
3/4	0.75	1.00	1.00	3/8	2150		
7/8	0.88	1.00	1.00	1/2	5130		
1	1.00	1.25	1.25	9/16	7010		

**SOCKET SET SCREWS - ALLOY STEEL**  
ASME B18.3-2003, Blue Devil



**Alloy Steel**  
**Socket Set Screws**  
**Sockets**



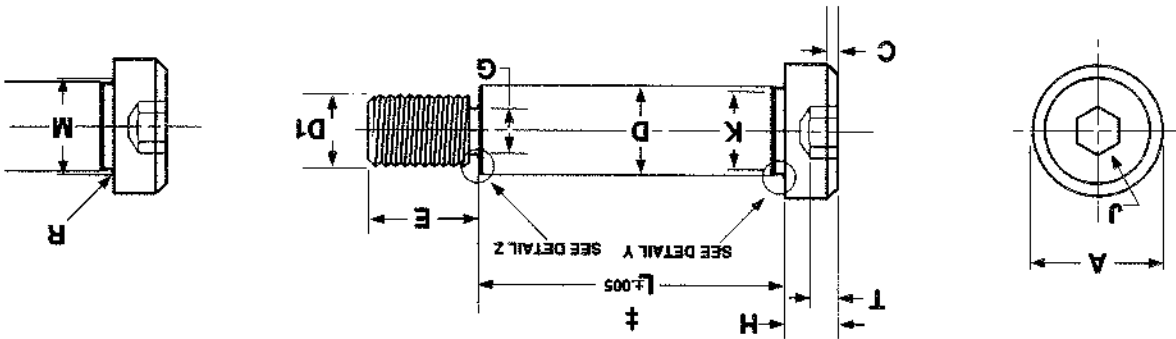
Socket Set Screws - Alloy Steel											ASME B18.3-2003
Nominal Size	J	T	C		R	Y	P				Q
	Hexagon Socket Size	Key Engagement	Cup & Flat Point Diameter		Oval Point Radius	Cone Pt. Angle 90° ±2° for these lengths and over; 118° ± 2° for shorter lengths	Half Dog Point				
	Nom	Min	Max	Min	Basic		Diameter		Length		
							Max	Min	Max	Min	
0	0.028	0.050	0.033	0.027	0.045	0.09	0.040	0.037	0.017	0.013	
1	0.028	0.060	0.040	0.033	0.055	0.09	0.049	0.045	0.021	0.017	
2	0.035	0.060	0.047	0.039	0.064	0.13	0.057	0.053	0.024	0.020	
3	0.050	0.070	0.054	0.045	0.074	0.13	0.066	0.062	0.027	0.023	
4	0.050	0.070	0.061	0.051	0.084	0.19	0.075	0.070	0.030	0.026	
5	0.062	0.080	0.067	0.057	0.094	0.19	0.083	0.078	0.033	0.027	
6	0.062	0.080	0.074	0.064	0.104	0.19	0.092	0.087	0.036	0.032	
8	0.078	0.090	0.087	0.076	0.123	0.25	0.109	0.103	0.043	0.037	
10	0.094	0.100	0.102	0.088	0.142	0.25	0.127	0.120	0.049	0.041	
1/4	0.125	0.125	0.132	0.118	0.188	0.31	0.156	0.149	0.067	0.059	
5/16	0.156	0.156	0.172	0.156	0.234	0.38	0.203	0.195	0.082	0.074	
3/8	0.188	0.188	0.212	0.194	0.281	0.44	0.250	0.241	0.099	0.089	
7/16	0.219	0.219	0.252	0.232	0.328	0.50	0.297	0.287	0.114	0.104	
1/2	0.250	0.250	0.291	0.270	0.375	0.57	0.344	0.334	0.130	0.120	
5/8	0.312	0.312	0.371	0.347	0.469	0.75	0.469	0.456	0.164	0.148	
3/4	0.375	0.375	0.450	0.425	0.562	0.88	0.562	0.549	0.196	0.180	
7/8	0.500	0.500	0.530	0.502	0.656	1.00	0.656	0.642	0.227	0.211	
1	0.562	0.562	0.609	0.579	0.750	1.13	0.750	0.734	0.260	0.240	
Tolerance on Length	Nominal Screw Length										
	Up to 0.63 in., Incl.			Over 0.63 to 2.00 in., Incl.			Over 2.00 to 6.00 in., Incl.				
	±0.01			±0.02			±0.03				

<b>Description</b>	A hex socket head screw with an enlarged, unthreaded, cylindrical shoulder under the head, the diameter of which serves as the basis for the derivation of the nominal size.
<b>Applications/Advantages</b>	For rotation or sliding applications, such as pulley shafts, in punch and die work, or for use as a bearing pin. Shoulder screws are also referred to as "stripper bolts".
<b>Material</b>	Shoulder screws shall be made fabricated from an alloy steel having one or more of the following elements: chromium, nickel, molybdenum or vanadium, in sufficient quantity to assure the hardness specified below.
<b>Heat Treatment</b>	Shoulder screws shall be heat-treated by oil quenching from above the transformation temperature and then tempered at a temperature not lower than 650°F.
<b>Hardness</b>	Rockwell C32 - 43
<b>Tensile Strength</b>	140,000 psi, minimum (material only)
<b>Yield Strength</b>	120,000 psi, minimum (material only)
<b>Elongation</b>	15% minimum (applies to all machined specimens of length at least 4D where D equals the nominal diameter of the screw)
<b>Reduction of Area</b>	45% minimum (applies to all machined specimens)
<b>Plating</b>	Shoulder screws are usually supplied with a plain finish.

Nominal Size	Shoulder Diameter		Head Diameter		Head Height		Chamfer or Radius	Hex Socket Size	Key Engagement	Fillet Transition Diameter	Head Fillet Radius	Shoulder Neck Diameter	Shoulder Neck Width
	Max	Min	Max	Min	Max	Min							
1/4	0.2480	0.2460	0.375	0.357	0.188	0.177	0.020	1/8	0.094	0.276	0.009	0.227	0.093
5/16	0.3105	0.3085	0.438	0.419	0.219	0.209	0.026	5/32	0.117	0.345	0.012	0.289	0.093
3/8	0.3730	0.3710	0.562	0.543	0.250	0.240	0.031	3/16	0.141	0.413	0.015	0.352	0.093
1/2	0.4980	0.4960	0.750	0.729	0.312	0.302	0.040	1/4	0.188	0.550	0.020	0.477	0.093
5/8	0.6230	0.6210	0.875	0.853	0.375	0.365	0.050	5/16	0.234	0.687	0.024	0.602	0.093
3/4	0.7480	0.7460	1.000	0.977	0.500	0.490	0.069	3/8	0.281	0.826	0.030	0.727	0.093

**SOCKET HEAD SHOULDER SCREWS - ALLOY STEEL** ASME B18.3-2003

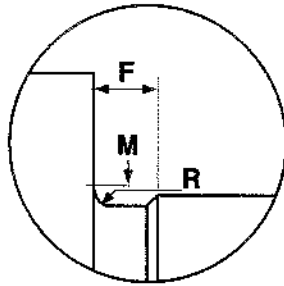
Length of a socket shoulder screw is measured from the underhead bearing surface to the plane of the shoulder at the threaded end.



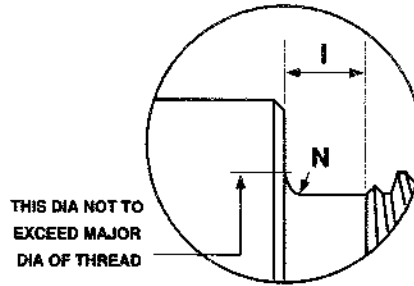
**Sockets**

**Socket Shoulder Screws**

**Alloy Steel**



**ENLARGED DETAIL Y**



**ENLARGED DETAIL Z**

SOCKET HEAD SHOULDER SCREWS - ALLOY STEEL (CONTINUED)											ASME B18.3-2003, Blue Devil	
Nominal Size	D1 Nominal Thread Size	Threads Per Inch	G Thread Neck Diameter		I Thread Neck Width	N Thread Neck Fillet		E Thread Length	Thread Section Tensile Strength (Lbs) Min	Single Shear Strength (Lbs)		Seating Torque (Inch Lbs)
			Max	Min		Max	Min			Basic	Min	
			Min	Min	Min	Min	Min	Min				
1/4	10	24	0.142	0.133	0.083	0.023	0.017	0.375	2,540	4,515	1,250	50
5/16	1/4	20	0.193	0.182	0.100	0.028	0.022	0.438	4,610	7,100	2,340	125
3/8	5/16	18	0.249	0.237	0.111	0.031	0.025	0.500	7,600	10,280	3,970	265
1/2	3/8	16	0.304	0.291	0.125	0.035	0.029	0.625	11,240	18,350	5,985	470
5/8	1/2	13	0.414	0.397	0.154	0.042	0.036	0.750	20,570	28,785	11,140	1,150
3/4	5/8	11	0.521	0.502	0.182	0.051	0.045	0.875	32,770	41,515	17,800	2,000
<b>Nominal Screw Sizes</b>												
<b>Tolerance on Thread Length</b>			Up to 3/8 in., Inclusive					Over 3/8 in.				
			-0.020					-0.030				

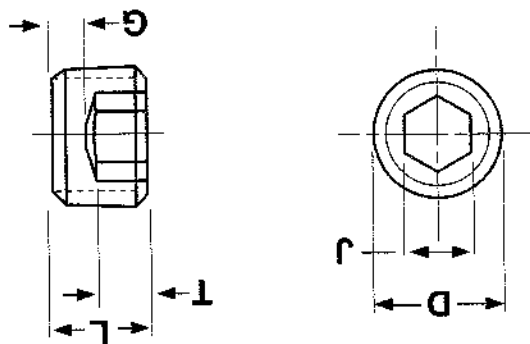
<b>Finish</b>	Plugs are supplied with a standard black finish.
<b>Hardness</b>	Rockwell C36 - 43
<b>Heat Treatment</b>	Pipe plugs shall be heat-treated by quenching in oil from above the hardening temperature and tempered to achieve the hardness requirement listed below.
<b>Material</b>	High grade alloy steel
<b>Applications/Advantages</b>	The thread trunion is closely controlled at root and crest to assure metal to metal contact, preventing spiral leakage and forming a positive seal without the use of sealing compounds. Dry seal plugs can be used in American Standard Taper Dryseal Pipe Thread (NPT) tapped holes, but for fullest protection against leakage, should be used in dryseal tapped holes which are taper reamed before tapping.
<b>Description</b>	A dry seal plug is one having a tapered (0.750" diameter per 1.2" thread extending its entire length and designed to have its threads mesh tightly with those of a taper-threaded hole. Both ends of the plug shall be flat and chamfered approximately 45°. The chamfer shall extend slightly below the root of the thread, and the edge between flat and chamfer shall be slightly rounded.

Nominal Size	Nominal Outside Diameter	Threads Per Inch	Hex Socket Size	Key Engagement	Wall Thickness	Overall Length		Tightening Torque (Inch - Lbs)	Tap Drill Size*
						Min	Max		
1/16	0.3120	27	5/32	.1400	.0620	.3240	.3000	150	15/64
1/8	0.4050	27	3/16	.1400	.0620	.3240	.3000	250	21/64
1/4	0.5400	18	1/4	.2180	.0730	.4570	.4170	600	27/64
3/8	0.6750	18	5/16	.2500	.0840	.5200	.4800	1200	9/16
1/2	0.8400	14	3/8	.3120	.0950	.5820	.5420	1800	1 1/16
3/4	1.0500	14	9/16	.3120	.1250	.6450	.6050	3000	57/64
1	1.3150	11-1/2	5/8	.3750	.1250	.7700	.7300	4200	1-1/8
1-1/4	1.6600	11-1/2	3/4	.4370	.1560	.8320	.7920	5400	37.5MM
1-1/2	1.9000	11-1/2	1	.4370	.1560	.8430	.7800	6900	43.5MM
2	2.3750	11-1/2	1	.4370	.1560	.9060	.8440	8500	2-3/16

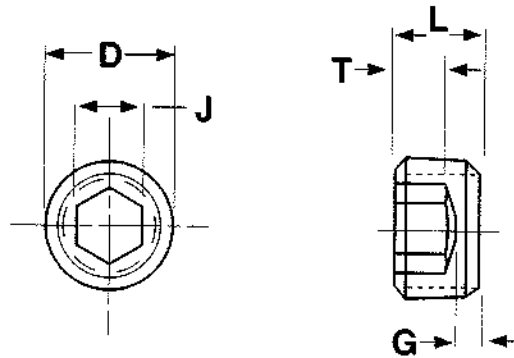
\*Taper reaming after drilling is recommended for tapping ease and to give fully formed, uniform threads.

**SOCKET PIPE PLUGS - DRY SEAL**

ANSI B1.20.3



**Sockets**  
**Pipe Plugs**  
**Dry Seal**



**SOCKET PIPE PLUGS - FLUSH TYPE**

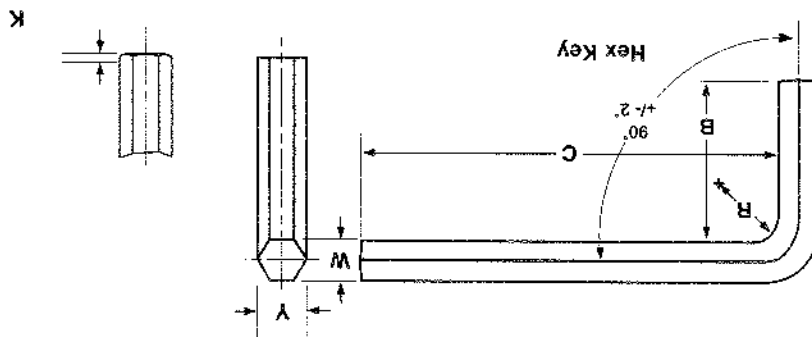
ANSI B1.20.3

Nominal Size	D	Threads Per Inch	J	T	G	L		Tightening Torque (Inch - Lbs)	Tap Drill Size*
	Nominal Outside Diameter		Hex Socket Size	Key Engagement	Wall Thickness	Overall Length			
						Min	Min		
1/16	0.307	27	5/32	.140	.052	.250	.235	150	15/64
1/8	0.401	27	3/16	.140	.049	.250	.235	250	21/64
1/4	0.529	18	1/4	.218	.045	.406	.391	600	27/64
3/8	0.667	18	5/16	.250	.040	.406	.391	1200	9/16
1/2	0.830	14	3/8	.312	.067	.531	.516	1800	11/16
3/4	1.041	14	9/16	.312	.054	.531	.516	3000	57/64
1	1.302	11-1/2	5/8	.375	.112	.656	.641	4200	1-1/8
1-1/4	1.647	11-1/2	3/4	.437	.102	.656	.641	5400	37.5MM

\*Taper reaming after drilling is recommended for tapping ease and to give fully formed, uniform threads.

<b>Description</b>	A flush type plug is one having a tapered (0.875" diametral per 12") thread extending its entire length and designed to provide a flush condition with a standard tapped hole (0.750" diametral per 12"). Both ends of the plug shall be flat and chamfered approximately 45°. The chamfer shall extend slightly below the root of the thread, and the edge between flat and chamfer shall be slightly rounded. Six equally spaced identification grooves are located equidistant between corners of the hex socket and edge of the chamfer (Note: on the 1/16-27 plug, 3 identification grooves are permitted because of limited space).
<b>Applications/ Advantages</b>	A high pressure seal is achieved through the difference in taper, with dimensions precalculated to provide a higher seating load near the large end of the plug and the threads near the top of the tapped hole. The flush type plug is preferred where high pressures are encountered and where protrusion is undesirable.
<b>Material</b>	High grade alloy steel
<b>Heat Treatment</b>	Pipe plugs shall be heat-treated by quenching in oil from above the hardening temperature and tempered to achieve the hardness requirement listed below.
<b>Hardness</b>	Rockwell C36 - 43
<b>Finish</b>	Plugs are supplied with a standard black finish.

ASME B18.3-2003													
HEX KEYS, LONG AND SHORT ARM													
Nominal Key and Socket Size	Hex Width Across the Flats		Hex Width Across the Corners		Length of Short Section		Short Arm Series		Long Arm Series		Chamfer		
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min			
	W		Y		B		C		R				
-	0.028	0.0280	0.0275	0.0314	0.0300	0.312	0.125	1.312	1.125	2.688	2.500	0.062	0.003
-	0.035	0.0350	0.0345	0.0393	0.0378	0.438	0.250	1.312	1.125	2.766	2.578	0.062	0.004
-	0.050	0.0500	0.0490	0.0560	0.0540	0.625	0.438	1.750	1.562	2.938	2.750	0.062	0.006
1/16	0.062	0.0625	0.0615	0.0701	0.0680	0.656	0.469	1.844	1.656	3.094	2.906	0.062	0.008
5/64	0.078	0.0781	0.0771	0.0880	0.0859	0.703	0.516	1.969	1.781	3.281	3.094	0.078	0.008
3/32	0.094	0.0937	0.0927	0.1058	0.1035	0.750	0.562	2.094	1.906	3.469	3.281	0.094	0.009
7/64	0.109	0.1094	0.1079	0.1238	0.1210	0.797	0.609	2.219	2.031	3.656	3.469	0.109	0.014
1/8	0.125	0.1250	0.1235	0.1418	0.1390	0.844	0.656	2.344	2.156	3.844	3.656	0.125	0.015
9/64	0.141	0.1406	0.1391	0.1593	0.1566	0.891	0.703	2.469	2.281	4.031	3.844	0.141	0.016
5/32	0.156	0.1562	0.1547	0.1774	0.1745	0.938	0.750	2.594	2.406	4.219	4.031	0.156	0.016
3/16	0.188	0.1875	0.1860	0.2135	0.2105	1.031	0.844	2.844	2.656	4.594	4.406	0.188	0.022
7/32	0.219	0.2187	0.2172	0.2490	0.2460	1.125	0.938	3.094	2.906	4.969	4.781	0.219	0.024
1/4	0.250	0.2500	0.2485	0.2845	0.2815	1.219	1.031	3.344	3.156	5.344	5.156	0.250	0.030
5/16	0.312	0.3125	0.3110	0.3570	0.3531	1.344	1.156	3.844	3.656	6.094	5.906	0.312	0.032
3/8	0.375	0.3750	0.3735	0.4285	0.4238	1.469	1.281	4.344	4.156	6.844	6.656	0.375	0.044
7/16	0.438	0.4375	0.4355	0.5005	0.4944	1.594	1.406	4.844	4.656	7.594	7.406	0.438	0.047
1/2	0.500	0.5000	0.4975	0.5715	0.5650	1.719	1.531	5.344	5.156	8.344	8.156	0.500	0.050
9/16	0.562	0.5625	0.5600	0.6420	0.6356	1.844	1.656	5.844	5.656	9.094	8.906	0.562	0.053
5/8	0.625	0.6250	0.6225	0.7146	0.7080	1.969	1.781	6.344	6.156	9.844	9.656	0.625	0.055
3/4	0.750	0.7500	0.7470	0.8580	0.8512	2.219	2.031	7.344	7.156	11.344	11.156	0.750	0.070
7/8	0.875	0.8750	0.8720	1.0020	0.9931	2.469	2.281	8.344	8.156	12.844	12.656	0.875	0.076
1	1.000	1.0000	0.9970	1.1470	1.1350	2.719	2.531	9.344	9.156	14.344	14.156	1.000	0.081



**Sockets** *Hex Keys & Bits* **Alloy Steel**



HEX KEYS AND BITS			Blue Devil®
Nominal Size	Torsional Shear Average (Inch-Pounds)	Torque Rating (Inch-Pounds)	
.028	1.1	.86	
.035	2.3	1.80	
.050	6.5	5.00	
1/16	11.9	9.50	
5/64	25.0	19.40	
3/32	43.0	33.50	
7/64	68.0	52.90	
1/8	98.0	77.90	
9/64	146.0	117.00	
5/32	195.0	156.00	
3/16	342.0	273.00	
7/32	535.0	428.00	
1/4	770.0	615.00	
5/16	1,600.0	1,315.00	
3/8	2,500.0	2,150.00	
7/16	4,500.0	3,665.00	
1/2	6,300.0	5,130.00	
9/16	8,750.0	7,010.00	
5/8	12,000.0	9,810.00	
3/4	19,500.0	15,570.00	
7/8	29,000.0	23,400.00	
1	43,500.0	35,100.00	

<b>Description</b>	A hex key is a six-sided shaped bar bent at a 90° angle at one end. A hex bit is an unbent piece of such a bar.
<b>Applications/ Advantages</b>	Designed to be inserted into a like-sized, hollow recess of a socket screw to manually tighten or loosen the fastener.
<b>Material</b>	Alloy steel containing at least two of the following elements: chromium, nickel, molybdenum or vanadium, in sufficient quantity to assure that the minimum surface hardness meets the standards listed below.
<b>Heat Treatment</b>	Hex keys are hardened by quenching from the austenitizing temperature and tempered.
<b>Surface Hardness</b>	<b>Sizes through 3/8":</b> Rockwell C 48 minimum <b>Sizes over 3/8":</b> Rockwell C 45 minimum
<b>Torsional Shear Strength</b>	The average torsional shear strength as listed above is the average maximum torque which standard keys and bits will transmit when tested to destruction. When tested this way, failure will occur by a clean, square shear fracture.
<b>Torque Rating</b>	Keys cut into bits for use in torque wrenches will transmit the above torques. These values are 90% of average torque required to develop a permanent visible twist in bits which have one inch of hexagon exposed between the torque wrench and the socket. These are also the torque values which keys transmit when the short arm is inserted in a socket and the long arm is deflected or bent through an angle of 25-30° by the application of force near the end of the long arm.

ANSI B1.1							
EXTERNAL THREADS - CLASS 3A							
Screw Size	Major Diameter			Pitch Diameter			Minor Diameter
	Basic	Max	Min	Basic	Max	Min	
0-80	.0600	.0600	.0568	.0519	.0519	.0506	.0447
1-72	.0730	.0730	.0695	.0640	.0640	.0626	.0560
2-56	.0860	.0860	.0819	.0744	.0744	.0728	.0641
3-48	.0990	.0990	.0945	.0855	.0855	.0838	.0734
4-40	.1120	.1120	.1069	.0958	.0958	.0930	.0813
4-48	.1120	.1120	.1075	.0985	.0985	.0967	.0864
5-40	.1250	.1250	.1199	.1088	.1088	.1069	.0943
6-32	.1380	.1380	.1320	.1177	.1177	.1156	.0997
6-40	.1380	.1380	.1329	.1218	.1218	.1198	.1073
8-32	.1640	.1640	.1580	.1437	.1437	.1415	.1257
8-36	.1640	.1640	.1585	.1460	.1460	.1439	.1299
10-24	.1900	.1900	.1828	.1629	.1629	.1604	.1389
10-32	.1900	.1900	.1840	.1697	.1697	.1674	.1517
1/4-20	.2500	.2500	.2419	.2175	.2175	.2147	.1887
1/4-28	.2500	.2500	.2435	.2268	.2268	.2243	.2062
5/16-18	.3125	.3125	.3038	.2764	.2764	.2734	.2443
5/16-24	.3125	.3125	.3053	.2854	.2854	.2827	.2614
3/8-16	.3750	.3750	.3656	.3344	.3344	.3311	.2983
3/8-24	.3750	.3750	.3678	.3479	.3479	.3450	.3239
7/16-14	.4375	.4375	.4272	.3911	.3911	.3876	.3499
7/16-20	.4375	.4375	.4294	.4050	.4050	.4019	.3762
1/2-13	.5000	.5000	.4891	.4500	.4500	.4463	.4056
1/2-20	.5000	.5000	.4919	.4675	.4675	.4643	.4387
5/8-11	.6250	.6250	.6129	.5660	.5660	.5619	.5135
5/8-18	.6250	.6250	.6163	.5889	.5889	.5854	.5568
3/4-10	.7500	.7500	.7371	.6850	.6850	.6806	.6273
7/8-9	.8750	.8750	.8611	.8028	.8028	.7981	.7387
1-8	1.0000	1.0000	.9850	.9188	.9188	.9137	.8466
*Class 3A threads over 1" diameter screws are Class 2A threads.							
* 1 1/4-7	1.2500	1.2478	1.2314	1.1572	1.1550	1.1476	1.0725
* 1 1/2-6	1.5000	1.4976	1.4794	1.3917	1.3893	1.3812	1.2931

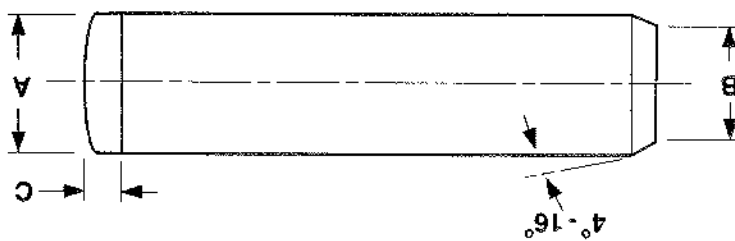
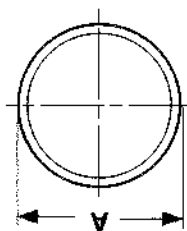
**Sockets**  
**Thread Dimensions**  
**Class 3A**

<b>Description</b>	A solid headless straight pin with a closely controlled diameter. One end is chamfered with the other end radiused to form a crown.
<b>Applications/Advantages</b>	Wide variety of uses, including as a plug gage, hinge or shaft. Precise tolerances of dowel pins make them excellent for achieving proper alignment of parts in high-speed assemblies, or as roller bearings in bus/truck wheel housings. <b>Important Note: Dowel pins should be installed by being pressed in, not struck with, an impact force.</b>
<b>Material</b>	Pins shall be made from any alloy steel capable of achieving the proper hardness requirements listed herein, having sulfur content of 0.05% maximum, and phosphorus content of 0.04% maximum.
<b>Heat Treatment</b>	Pins shall be hardened by quenching in oil from austenitizing temperature and tempering to meet the proper Rockwell hardness and case depth.
<b>Core Hardness</b>	Rockwell C 47 - 58
<b>Case Hardness</b>	Rockwell C 60 minimum
<b>Case Depth</b>	5/32 diameter & smaller: 0.010 in., minimum. 3/16 diameter and larger: 0.015 in., minimum.
<b>Finish</b>	See Appendix-A for information about the various finishes for dowel pins.

Nominal Size or Nominal Pin Diameter	Tolerance on Length									
	Basic		Pin Diameter		Point Diameter		Crown Height		Crown Radius	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
1/8	0.1252	0.1253	0.1251	0.120	0.110	0.041	0.016	1.600	0.1250	0.1245
3/16	0.1877	0.1878	0.1876	0.180	0.170	0.062	0.023	3.600	0.1875	0.1870
1/4	0.2502	0.2503	0.2501	0.240	0.230	0.083	0.031	6.400	0.2500	0.2495
5/16	0.3127	0.3128	0.3126	0.302	0.290	0.104	0.039	10.000	0.3125	0.3120
3/8	0.3752	0.3753	0.3751	0.365	0.350	0.125	0.047	14.350	0.3750	0.3745
7/16	0.4377	0.4378	0.4376	0.424	0.409	0.146	0.055	19.550	0.4375	0.4370
1/2	0.5002	0.5003	0.5001	0.486	0.471	0.167	0.063	25.500	0.5000	0.4995
5/8	0.6252	0.6253	0.6251	0.611	0.595	0.208	0.078	39.900	0.6250	0.6245
3/4	0.7502	0.7503	0.7501	0.735	0.715	0.250	0.094	57.000	0.7500	0.7495
7/8	0.8752	0.8753	0.8751	0.860	0.840	0.293	0.109	78.000	0.8750	0.8745
1	1.0002	1.0003	1.0001	0.980	0.960	0.333	0.125	102.000	1.0000	0.9995

±0.010 in. (all sizes and lengths)

**DOWEL PINS, STANDARD SERIES**  
ASME B18.8-2-2000



**Pins**  
**Dowel Pins**  
**Alloy Steel**