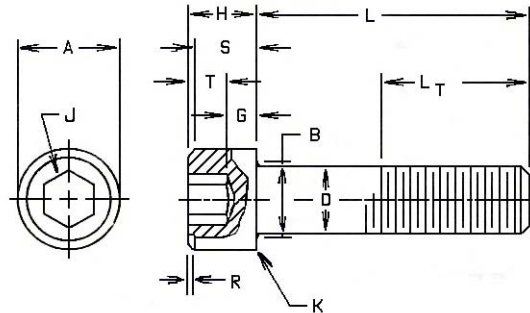


Inch Socket Head Cap Screws – 1960 Series



Nominal Size	M Splines Socket Size Nom.	J Hexagon Socket Size Nominal		T Key Engage- ment Min.	G Wall Thickness Min.	K Chamfer Or Radius		L Thread Length	
						Max.	Max.	Min.	Min.
#2	0.096	5/64	0.078	0.038	0.029	0.003	0.80	0.62	
#3	0.096	5/64	0.078	0.044	0.034	0.003	0.83	0.62	
#4	0.111	3/32	0.094	0.051	0.038	0.005	0.99	0.75	
#5	0.111	3/32	0.094	0.057	0.043	0.005	1.00	0.75	
#6	0.133	7/64	0.109	0.064	0.047	0.005	1.05	0.75	
#8	0.168	9/64	0.168	0.077	0.056	0.005	1.19	0.88	
#10	0.183	5/32	0.156	0.090	0.065	0.005	1.27	0.88	
1/4	0.216	3/16	0.188	0.120	0.095	0.008	1.50	1.00	
5/16	0.291	1/4	0.250	0.151	0.119	0.008	1.71	1.12	
3/8	0.372	5/16	0.312	0.182	0.143	0.008	1.94	1.25	
7/16	0.454	3/8	0.375	0.213	0.166	0.010	2.17	1.38	
1/2	0.454	3/8	0.375	0.245	0.190	0.010	2.38	1.50	
5/8	0.595	1/2	0.500	0.307	0.238	0.010	2.82	1.75	
3/4	0.620	5/8	0.625	0.370	0.285	0.010	3.25	2.00	
7/8	0.698	3/4	0.750	0.432	0.333	0.015	3.69	2.25	
1	0.790	3/4	0.750	0.495	0.380	0.015	4.12	2.50	
1 1/8		7/8	0.875	0.557	0.428	0.015	4.65	2.81	
1 1/4		7/8	0.875	0.620	0.475	0.015	5.09	3.12	
1 3/8		1	1.000	0.682	0.523	0.015	5.65	3.44	
1 1/2		1	1.000	0.745	0.570	0.015	6.08	3.75	
1 3/4		1 1/4	1.250	0.870	0.665	0.015	7.13	4.38	
2		1 1/2	1.500	0.995	0.760	0.015	8.11	5.00	

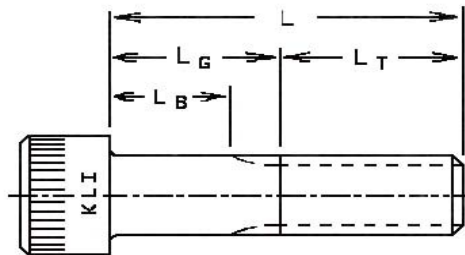
Nominal Screw Diameter	Nominal Screw Length	Standard Length Increments
#2 through 1 inch	1/8 through 1/4	1/16
	1/4 through 1	1/8
	1 through 3 1/2	1/4
	3 1/2 through 7	1/2
	7 through 10	1
Nominal Screw Diameter	Nominal Screw Length	Length Tolerance
#2 through 3/8	through 1 inch	-0.03
	Over 1 through 2 1/2	-0.04
	Over 2 1/2 through 6	-0.06
	Over 6 inches long	-0.12

Inch Socket Head Cap Screws – 1960 Series (continued)

Nominal Screw Diameter	Nominal Screw Length	Length Tolerances
7/16 through 3/4	through 1 inch	-0.03
	Over 1 through 2 1/2	-0.06
	Over 2 1/2 through 6	-0.08
	Over 6 inches long	-0.12
7/8 through 1 1/2	through 1 inch	-0.05
	Over 1 through 2 1/2	-0.10
	Over 2 1/2 through 6	-0.14
	Over 6 inches long	-0.20
Over 1 1/2 inch diameter	Over 1 through 2 1/2	-0.18
	Over 2 1/2 through 6	-0.20
	Over 6 inches long	-0.24

Applicable Standards: ASME B18.3 and ASTM A574.

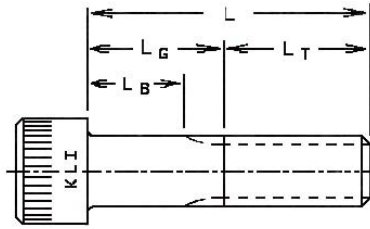
Grip and Body Lengths



Note: Lengths in Shaded Areas or shorter are threaded to the head

Nominal Size Nominal Length	#2		#3		#4		#5		#6		#8		#10	
	LG	LB	LG	LB	LG	LB	LG	LB	LG	LB	LG	LB	LG	LB
3/4														
7/8	.25	.16	.25	.15										
1	.25	.16	.25	.15	.25	.12	.25	.12						
1 1/4	.62	.54	.62	.52	.25	.12	.25	.12	.50	.34	.38	.22	.38	.17
1 1/2	.88	.79	.88	.77	.75	.62	.75	.62	.50	.34	.38	.22	.38	.17
1 3/4	1.12	1.04	1.12	1.02	.75	.62	.75	.62	1.00	.84	.88	.72	.88	.67
2	-	-	1.38	1.27	1.25	1.12	1.25	1.12	1.00	.84	.88	.72	.88	.67
2 1/4	-	-	-	-	1.25	1.12	1.25	1.12	1.50	1.34	1.38	1.22	1.38	1.17
2 1/2	-	-	-	-	-	-	1.75	1.62	1.50	1.34	1.38	1.22	1.38	1.17
2 3/4	-	-	-	-	-	-	-	-	2.00	1.84	1.88	1.72	1.88	1.67
3	-	-	-	-	-	-	-	-	-	-	1.88	1.72	1.88	1.67
3 1/4	-	-	-	-	-	-	-	-	-	-	2.38	2.22	2.38	2.17
3 1/2	-	-	-	-	-	-	-	-	-	-	-	-	2.38	2.17
3 3/4	-	-	-	-	-	-	-	-	-	-	-	-	2.88	2.67
4	-	-	-	-	-	-	-	-	-	-	-	-	2.88	2.67

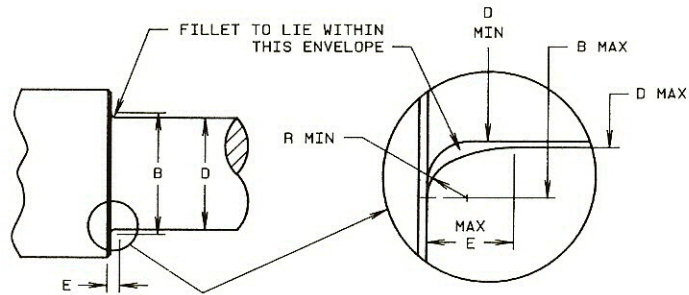
Inch Socket Head Cap Screws – 1960 Series (continued)
Grip and Body Lengths (continued)



Note: Lengths in shaded areas or shorter are threaded to the head.

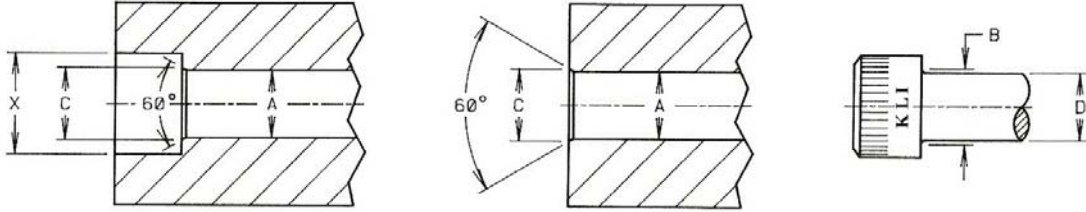
Nominal Size	1/4		5/16		3/8		7/16		1/2		5/8		3/4		7/8		1	
	LG	LB	LG	LB	LG	LB	LG	LB	LG	LB	LG	LB	LG	LB	LG	LB	LG	LB
1 ½	.50	.25																
1 ¾	.50	.25	.62	.35	.50	.19												
2	1.00	.75	.62	.35	.50	.19	.62	.27										
2 ¼	1.00	.75	1.12	.85	1.00	.69	.62	.27	.75	.36								
2 ½	1.50	1.25	1.12	.85	1.00	.69	1.12	.77	.75	.36	.75	.30						
2 ¾	1.50	1.25	1.12	.85	1.00	.69	1.12	.77	.75	.36	.75	.30						
3	2.00	1.75	1.62	1.35	1.50	1.19	1.62	1.27	1.50	1.12	.75	.30	1.00	.50				
3 ¼	2.00	1.75	2.12	1.85	2.00	1.69	1.62	1.27	1.50	1.12	1.50	1.04	1.00	.50	1.00	.44		
3 ½	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	.50	1.00	.44	1.00	.38
3 ¾	2.50	2.25	2.62	2.35	2.50	2.19	2.12	1.77	2.25	1.86	1.50	1.04	1.00	.50	1.00	.44	1.00	.38
4	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	1.50	1.00	.44	1.00	.38
4 ¼	3.00	2.75	3.12	2.85	3.00	2.69	2.62	2.27	2.25	1.86	2.25	1.80	2.00	1.50	2.00	1.44	1.00	.38
4 ½	3.50	3.25	3.12	2.85	3.00	2.69	3.12	2.77	3.00	2.62	2.25	1.80	2.00	1.50	2.00	1.44	2.00	1.38
4 ¾	3.50	3.25	3.62	3.35	3.50	3.19	3.12	2.77	3.00	2.62	3.00	2.54	2.00	1.50	2.00	1.44	2.00	1.38
5	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	2.50	2.00	1.44	2.00	1.38
5 ¼	--	--	4.12	3.85	4.00	3.69	3.62	3.27	3.75	3.36	3.00	2.54	3.00	2.50	3.00	2.44	2.00	1.38
5 ½	--	--	4.12	3.85	4.00	3.69	4.12	3.77	3.75	3.36	3.75	3.30	3.00	2.50	3.00	2.44	3.00	2.38
5 ¾	--	--	4.62	4.35	4.50	4.19	4.12	3.77	3.75	3.36	3.75	3.30	3.00	2.50	3.00	2.44	3.00	2.38
6	--	--	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	2.44	3.00	2.38
6 ¼	--	--	5.12	4.85	5.00	4.69	4.62	4.27	4.50	4.12	4.50	4.04	4.00	3.50	4.00	3.44	3.00	2.38
6 ½	--	--	--	--	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	3.38
6 ¾	--	--	--	--	5.50	5.19	5.12	4.77	5.25	4.86	4.50	4.04	4.00	3.50	4.00	3.44	4.00	3.38
7	--	--	--	--	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	3.38
7 ¼	--	--	--	--	6.00	5.69	5.62	5.27	5.25	4.86	5.25	4.80	5.00	4.50	5.00	4.44	4.00	3.38
7 ½	--	--	--	--	6.00	5.69	6.12	5.77	6.00	5.62	5.25	4.80	5.00	4.50	5.00	4.44	5.00	4.38
7 ¾	--	--	--	--	--	--	6.12	5.77	6.00	5.62	6.00	5.54	5.00	4.50	5.00	4.44	5.00	4.38
8	--	--	--	--	--	--	6.62	6.27	6.00	5.62	6.00	5.54	6.00	5.50	5.00	4.44	5.00	4.38
8 ½	--	--	--	--	--	--	7.12	6.77	7.00	6.62	6.75	6.30	6.00	5.50	6.00	5.44	6.00	5.38
9	--	--	--	--	--	--	7.62	7.27	7.00	6.62	6.75	6.30	7.00	6.50	6.00	5.54	6.00	5.38
9 ½	--	--	--	--	--	--	--	--	8.00	7.62	7.75	7.30	7.00	6.50	7.00	6.44	7.00	6.38
10	--	--	--	--	--	--	--	--	8.00	7.62	7.75	7.30	8.00	7.50	7.00	6.44	7.00	6.38
11	--	--	--	--	--	--	--	--	--	--	9.25	8.80	9.00	8.50	8.00	7.44	8.00	7.38
12	--	--	--	--	--	--	--	--	--	--	10.25	9.80	10.00	9.50	9.00	8.44	9.00	8.38
13	--	--	--	--	--	--	--	--	--	--	--	--	11.00	10.50	10.00	9.44	10.00	9.38

Inch Socket Head Cap Screws – 1960 Series (continued)
Dimensions of Underhead Fillet



Nominal Size	B Transition Diameter Max.	R Juncture Radius Min.	E Fillet Length Max.
#2	0.102	0.003	0.014
#3	0.115	0.004	0.014
#4	0.130	0.004	0.015
#5	0.195	0.005	0.017
#6	0.158	0.005	0.017
#8	0.188	0.006	0.020
#10	0.218	0.006	0.024
1/4	0.278	0.007	0.024
5/16	0.347	0.009	0.029
3/8	0.415	0.012	0.034
7/16	0.494	0.014	0.039
1/2	0.552	0.016	0.044
5/8	0.689	0.021	0.054
3/4	0.828	0.025	0.066
7/8	0.963	0.031	0.075
1	1.100	0.034	0.085
1 1/8	1.235	0.039	0.094
1 1/4	0.370	0.044	0.102
1 3/8	1.505	0.048	0.110
1 1/2	1.640	0.052	0.119
1 3/4	1.910	0.062	0.136
2	2.180	0.071	0.153

Inch Socket Head Cap Screws-1960 Series (continued)
Drill and Counterbore Sizes



Nominal Size	Basic Screw Diameter	A		A		X Counterbore Size Hole X	C Transition Diameter B Maximum (see chamfering note)
		Close Fit Nominal	Close Fit Decimal	Normal Fit Nominal	Normal Fit Decimal		
#2	0.0860	3/32	0.0937	36*	0.1065	3/16	0.102
#3	0.9900	36*	0.1065	31*	0.1200	7/32	0.115
#4	0.1120	1/8	0.1250	29*	0.1360	7/32	0.130
#5	0.1250	9/64	0.1406	23*	0.1540	1/4	0.145
#6	0.1380	23*	0.1540	18*	0.1695	9/32	0.158
#8	0.1640	15*	0.1800	10*	0.1935	5/16	0.188
#10	0.1900	5*	0.2055	2*	0.2210	3/8	0.218
1/4	0.2500	17/64	0.2656	9/32	0.2812	7/16	0.278
5/16	0.3125	21/64	0.3281	11/32	0.3437	17/32	0.346
3/8	0.3750	25/64	0.3906	13/32	0.4062	5/8	0.415
7/16	0.4375	29/64	0.4531	15/32	0.4687	23/32	0.483
1/2	0.5000	33/64	0.5156	17/32	0.5312	13/16	0.552
5/8	0.6250	41/64	0.6406	21/32	0.6562	1	0.689
3/4	0.7500	49/64	0.7656	25/32	0.7812	1 3/16	0.828
7/8	0.8750	57/64	0.8906	29/32	0.9062	1 3/8	0.963
1	1.0000	1 1/64	1.0156	1 1/32	1.0312	1 5/8	1.100
1 1/4	1.2500	1 9/32	1.2812	1 5/16	1.3215	2	1.370
1 1/2	1.5000	1 17/32	1.5312	1 9/16	1.5825	2 3/8	1.640
1 3/4	1.7500	1 25/32	1.7812	1 13/16	1.8125	2 3/4	1.910
2	2.0000	2 1/32	2.0312	2 1/16	2.0625	3 1/8	2.180

* Wire Drill Size

Chamfer or break edges of holes with transition diameter less than listed. Smaller holes than listed could interfere with the proper seating of the head, increasing the likelihood of fatigue failures.

Inch Series Socket Head Cap Screws – 1960 Series (continued)

Mechanical Properties

Nominal Size	Tensile Strength Min. psi	Yield Strength Min. psi	Elongation In 2 inches Percent min.	Reduction Of area Percent min.	Minimum Hardness Rockwell C
#2 through 1/2	180,000	162,000	8	35	39
Over 1/2 inch	170,000	153,000	10	40	37

Tensile, Yield and Shear Strengths – Inch Series SHCS

Nominal Size	Basic Screw Diameter	Thread Stress Area UNRC	Thread Stress Area UNRF	Tensile Strength Pounds Min. UNRC	Tensile Strength Pounds Min. UNRF
#2	0.0860	0.00370	0.00394	665	710
#3	0.0990	0.00487	0.00523	875	940
#4	0.1120	0.00604	0.00661	1090	1190
#5	0.1250	0.00796	0.00830	1430	1490
#6	0.1380	0.00909	0.01015	1640	1825
#8	0.1640	0.01400	0.01474	2520	2650
#10	0.1900	0.01750	0.02000	3150	3600
1/4	0.2500	0.03180	0.03640	5725	6550
5/16	0.3125	0.05240	0.05800	9430	10440
3/8	0.3750	0.07750	0.08780	13950	15805
7/16	0.4375	0.10630	0.11870	19135	21365
1/2	0.5000	0.14190	0.15990	25540	28780
5/8	0.6250	0.22600	0.25600	38400	43500
3/4	0.7500	0.33400	0.37300	56750	63400
7/8	0.8750	0.46200	0.50900	78500	86500
1	1.0000	0.60600	0.66300	103000	112700
1 1/4	1.2500	0.96900	1.07300	164700	182400
1 1/2	1.5000	1.40500	1.58100	238800	268800

Nominal Size	Yield Strength Pounds Min. UNRC	Yield Strength Pounds Min. UNRF	Single Shear Strength Body Pounds Min.	Single Shear Thread Section Pounds Min. UNRC	Single Shear Thread Section Pounds Min. UNRF
#2	600	635	625	405	315
#3	790	845	830	535	595
#4	975	1070	1060	665	750
#5	1290	1345	1325	875	940
#6	1470	1645	1615	1000	1150
#8	2270	2385	2280	1535	1670
#10	2835	3240	3060	1920	2270
1/4	5150	5900	5295	3495	4130
5/16	8490	9395	8285	5750	6575
3/8	12555	14225	11910	8510	9950
7/16	17220	19230	16200	11650	13445
1/2	22990	25905	21175	15565	18105
5/8	34550	39150	31300	23450	27400
3/4	51100	57050	45050	34650	39950
7/8	70700	77850	61350	47900	54500
1	92700	101450	80100	62850	71000
1 1/4	148250	164150	125100	100500	114900
1 1/2	214950	241900	180200	145700	169300

The mechanical properties listed are for applications at room temperature. Socket head cap screws in applications over 400 degrees F or below -20 degrees F will exhibit a reduction in the properties listed resulting in loss of some tensile, yield, and fatigue strength

Inch Series Socket Head Cap Screws Recommended Tightening Torques

Nominal Size	Basic Screw Diameter	Tension Induced In Screws Tightened as Recommended (pounds)		Recommended Tightening Torque (inch-pounds)	
		UNRC	UNRF	UNRC	UNRF
#2	0.0860	390	410	7.5	8
#3	0.0990	510	550	11	12
#4	0.1120	630	690	16	18
#5	0.1250	830	870	24	24
#6	0.1380	950	1070	30	34
#8	0.1640	1460	1550	55	58
#10	0.1900	1840	2100	79	90
1/4	0.2500	3530	4040	200	230
5/16	0.3125	5820	6450	415	460
3/8	0.3750	8620	9770	740	845
7/16	0.4375	11830	13180	1190	1305
1/2	0.5000	15760	17800	1800	2065
5/8	0.6250	23740	26890	3400	3800
3/4	0.7500	35080	39150	6000	6750
7/8	0.8750	41590	45830	8250	9200
1	1.0000	54350	59662	12500	13000
1 1/4	1.2500	87225	86600	25000	27750
1 1/2	1.5000	126450	142280	43500	49000

- These values are designed to induce approximately 75% of the screw's yield strength in steel to steel joints where the nut factor, also called "K" factor is 0.20. Plain socket head cap screws generally have a "K" factor between 0.19 and 0.25 when used in an as received condition. The "K" factor of coated or plated screws differs, as does the "K" factor of screws used with lubricants.
- Please see the section in this handbook dealing with bolted joint design for further information.

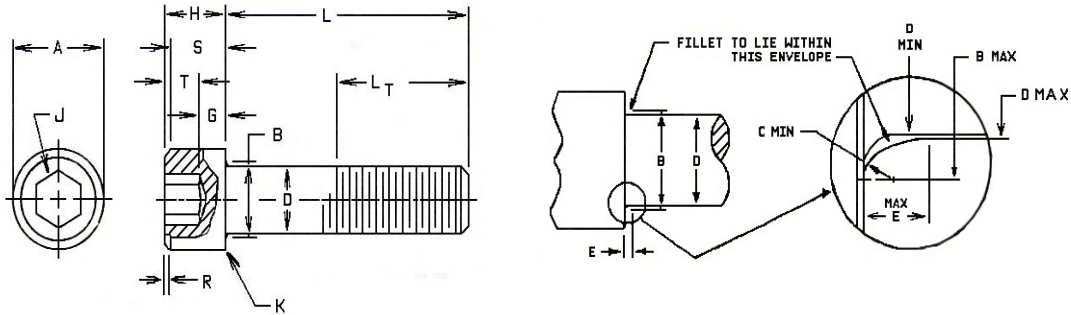
Metric Socket Products

Metric Socket Head Cap Screws- Property Class 12.9

Nominal Size	D Body Diameter		A Head Diameter		H Head Height		R Head Side Radius	J Hex Socket Size Nominal	T Key Engagem ent Min.	G Wall Thickness Min.
	Max.	Min.	Max.	Min.	Max.	Min.	Max.			
M2 x 0.4	2.00	1.86	3.80	3.65	2.00	1.91	0.20	1.5	1.00	0.68
M3 x 0.5	2.50	2.36	5.50	5.32	3.00	2.89	0.30	2.5	1.50	1.02
M4 x 0.7	4.00	3.82	7.00	6.80	4.00	3.88	0.40	3.0	2.00	1.52
M5 x 0.8	5.00	4.82	8.50	8.27	5.00	4.86	0.50	4.0	2.50	1.90
M6 x 1.0	6.00	5.82	10.00	9.74	6.00	5.85	0.60	5.0	3.00	2.28
M8 x 1.25	8.00	7.78	13.00	12.70	8.00	7.83	0.80	6.0	4.00	3.20
M10 x 1.5	10.00	9.78	16.00	15.67	10.00	9.81	1.00	8.0	5.00	4.00
M12 x 1.75	12.00	11.73	18.00	17.63	12.00	11.79	1.20	10.0	6.00	4.80
M16 x 2.0	16.00	15.73	24.00	23.58	16.00	15.76	1.60	14.0	8.00	6.40
M20 x 2.5	20.00	19.67	30.00	29.53	20.00	19.73	2.00	17.0	10.00	8.00
M24 x 3.0	24.00	23.67	36.00	35.48	24.00	23.70	2.40	19.0	12.00	9.60
M30 x 3.5	30.00	29.67	45.00	44.42	30.00	29.67	3.00	22.0	15.00	12.00
M36 x 4.0	36.00	35.61	54.00	53.37	36.00	35.64	3.60	27.0	18.00	14.40
M42 x 4.5	42.00	41.61	63.00	62.31	42.00	41.61	4.20	32.0	21.00	16.80
M48 x 5.0	48.00	47.61	72.00	71.27	48.00	47.58	4.80	36.0	24.00	19.20

Applicable Standards: ASME B18.3.1M, ASTM A574M.

Metric Socket Head Cap Screws – Property Class 12.9



Nominal Size	L _T Thread Length Min.	B Underhead Fillet Transition Diameter		E Underhead Fillet Transition Length Max.	C Underhead Juncture Radius Max.	K Chamfer Or Radius Max.	L _T Thread Length Min.
		Max.	Min.				
M2x0.4	16.0	2.6	2.2	0.51	0.10	0.08	16.0
M3x0.5	18.0	3.6	3.2	0.51	0.10	0.13	18.0
M4x0.7	20.0	4.7	4.4	0.60	0.20	0.13	20.0
M5x0.8	22.0	5.7	5.4	0.60	0.20	0.13	22.0
M6x1.0	24.0	6.8	6.5	0.68	0.25	0.20	24.0
M8x1.25	28.0	9.2	8.8	1.02	0.40	0.20	28.0
M10x1.50	32.0	11.2	10.8	1.02	0.40	0.20	32.0
M12x1.75	36.0	14.2	13.2	1.87	0.60	0.25	36.0
M16x2.0	44.0	18.2	17.2	1.87	0.60	0.25	44.0
M20x2.5	52.0	22.4	21.6	2.04	0.80	0.40	52.0
M24x3.0	60.0	26.4	25.6	2.04	0.80	0.40	60.0
M30x3.5	72.0	33.4	32.0	2.89	1.00	0.40	72.0
M36x4.0	84.0	39.4	38.0	2.89	1.00	0.40	84.0
M42x4.5	96.0	45.6	44.4	3.06	1.20	0.40	96.0
M48x5.0	108.0	52.6	51.2	3.91	1.60	0.40	108.0

Metric Socket Head Cap Screws Property Class 12.9 (continued)

Grip and Body Lengths

Note: Lengths in shaded areas or shorter are threaded to the head

Nominal Size Nominal Length	M2		M3		M4		M5		M6		M8		M10	
	LG	LB	LG	LB	LG	LB	LG	LB	LG	LB	LG	LB	LG	LB
20	4.0	2.0												
25	9.0	7.0	7.0	4.5										
30	14.0	12.0	12.0	9.5	10.0	6.5								
35	19.0	17.0	17.0	14.5	15.0	11.5	13.0	9.0	11.0	6.0				
40	24.0	22.0	22.0	19.5	20.0	16.5	18.0	14.0	16.0	11.0				
45			27.0	24.5	25.0	21.5	23.0	19.0	21.0	16.0	17.0	10.7		
50			32.0	29.5	30.0	26.5	28.0	24.0	26.0	21.0	22.0	15.7	18.0	10.5
55			37.0	34.5	35.0	31.5	33.0	29.0	31.0	26.0	27.0	20.7	23.0	15.5
60			42.0	39.5	40.0	36.5	38.0	34.0	36.0	31.0	32.0	25.7	28.0	20.5
65			47.0	44.5	45.0	41.5	43.0	39.0	41.0	36.0	37.0	30.7	33.0	25.5
70					50.0	46.5	48.0	44.0	46.0	41.0	42.0	35.7	38.0	30.5
80					60.0	56.5	58.0	54.0	56.0	51.0	52.0	45.7	48.0	40.5
90							68.0	64.0	66.0	61.0	62.0	55.7	58.0	50.5
100							78.0	74.0	76.0	71.0	72.0	65.7	68.0	60.5
110									86.0	81.0	82.0	75.7	78.0	70.5
120									96.0	91.0	92.0	85.7	88.0	80.5
130											102.0	95.7	98.0	90.5
140											112.0	105.7	108.0	100.5
150											122.0	115.7	118.0	110.5
160											132.0	125.7	128.0	120.5
180													148.0	140.5
200													168.0	160.5
220														
240														
260														
300														

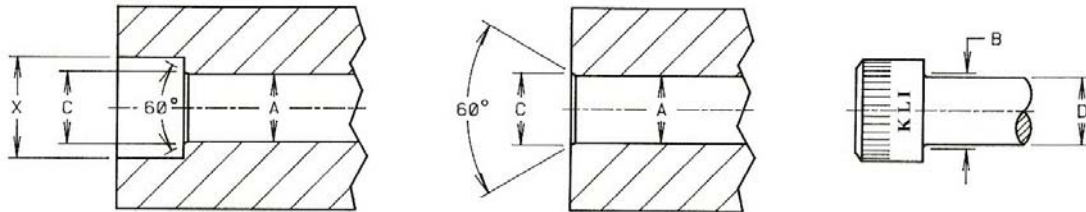
Metric Socket Head Cap Screws – Property Class 12.9 (continued)

Grip and Body Lengths Continued

Note: Lengths in shaded areas or shorter are threaded to the head

Nominal Size Nominal Length	M12		M16		M20		M24	
	LG	LB	LG	LB	LG	LB	LG	LB
20								
25								
30								
35								
40								
45								
50								
55								
60	24.0	15.2						
65	29.0	20.2						
70	34.0	25.2	26.0	16.0				
80	44.0	35.2	36.0	26.0				
90	54.0	45.2	46.0	36.0	38.0	25.5		
100	64.0	55.2	56.0	46.0	48.0	35.5	40.0	25.0
110	74.0	65.2	66.0	56.0	58.0	45.5	50.0	35.0
120	84.0	74.2	76.0	66.0	68.0	55.5	60.0	45.0
130	94.0	84.2	86.0	76.0	78.0	65.5	70.0	55.0
140	104.0	95.2	96.0	86.0	88.0	75.5	80.0	65.0
150	114.0	105.2	106.0	96.0	98.0	85.5	90.0	75.0
160	124.0	115.2	116.0	106.0	108.0	95.5	100.0	85.0
180	144.0	135.2	136.0	126.0	128.0	115.5	120.0	105.0
200	164.0	155.2	156.0	146.0	148.0	135.5	140.0	125.0
220	184.0	175.2	176.0	166.0	168.0	155.5	160.0	145.0
240	204.0	195.2	196.0	186.0	188.0	175.5	180.0	165.0
260			216.0	206.0	208.0	195.5	200.0	185.0
300			256.0	246.0	248.0	235.5	240.0	225.0

Metric Socket Head Cap Screws-Property Class 12.9 (continued)
Drill and Counterbore Sizes



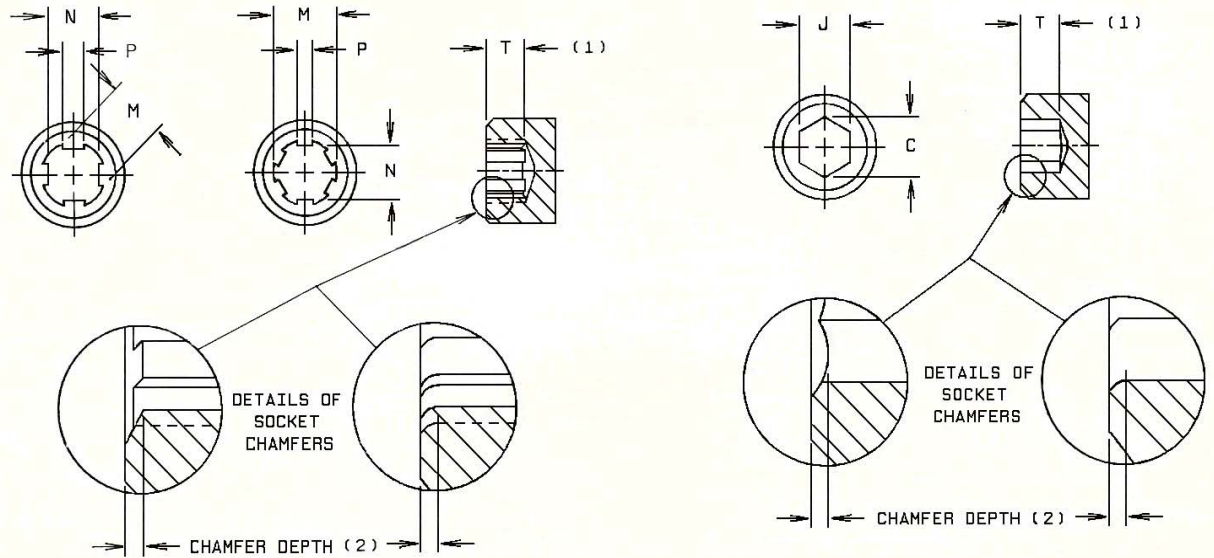
Nominal Size	A	A	X	C
	Close Fit Nominal Size	Normal Fit Nominal Size	Counterbore Size Hole X	Countersink Diameter B Maximum (see chamfering note)
M2	2.20	2.40	4.40	2.6
M3	3.40	3.70	6.50	3.6
M4	4.40	4.80	8.25	4.7
M5	5.40	5.80	9.75	5.7
M6	6.40	6.80	11.25	6.8
M8	8.40	8.80	14.25	9.2
M10	10.50	10.80	17.25	11.2
M12	12.50	12.80	19.25	14.2
M16	16.50	16.75	25.50	18.2
M20	20.50	20.75	31.50	22.4
M24	24.50	24.75	37.50	26.4
M30	30.75	31.75	47.50	33.4
M36	37.00	37.50	56.50	39.4

*** Wire Drill Size**

Chamfer or break edges of holes with transition diameter less than listed as B maximum. Smaller holes than listed could interfere with the proper seating of the head, increasing the likelihood of fatigue failures.

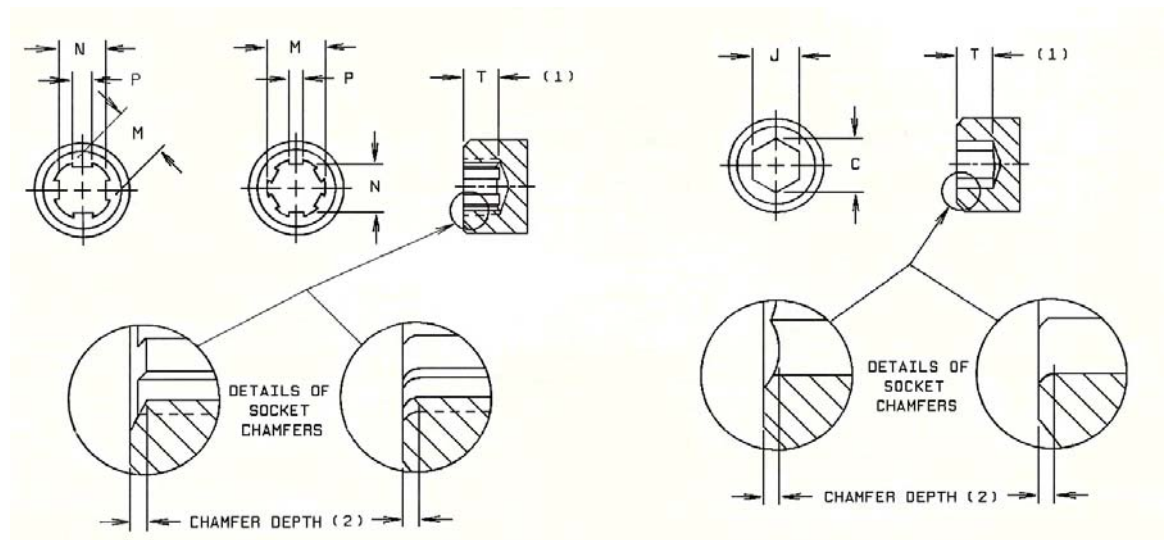
Metric Socket Head Cap Screws – Property Class 12.9 (continued)

Metric Spline Socket Dimensions



Nominal Spline Socket Size	Number Of Teeth	M Socket Major Diameter		N Socket Minor Diameter		P Width Of Tooth	
		Max.	Min.	Max.	Min.	Max.	Min.
0.84	4	0.889	0.864	0.660	0.648	0.305	0.292
1.22	6	1.270	1.245	1.041	1.016	0.279	0.254
1.52	6	1.575	1.549	1.295	1.270	0.356	0.330
2.44	6	2.489	2.464	2.083	2.032	0.559	0.533
2.82	6	2.921	2.870	2.489	2.438	0.635	0.584
3.68	6	3.785	3.734	3.251	3.200	0.813	0.762
4.65	6	4.775	4.724	4.140	4.089	0.991	0.940
5.49	6	5.613	5.563	4.826	4.775	1.270	1.219
6.38	6	6.502	6.452	5.613	5.563	1.524	1.473
9.45	6	9.652	9.576	8.103	8.026	2.337	2.261
11.53	6	11.760	11.684	9.804	9.728	2.845	2.769
15.11	6	15.342	15.265	12.929	12.852	3.505	3.404

Metric Socket Head Cap Screws – Property Class 12.9 (continued)



Metric Socket Dimensions

Nominal Socket Size	J Dimensions Across Flats		C Dimensions Across Corners
	Max.	Min.	Min.
0.7	0.724	0.711	0.803
0.9	0.902	0.889	1.003
1.3	1.295	1.270	1.427
1.5	1.545	1.520	1.730
2	2.045	2.020	2.300
2.5	2.560	2.520	2.870
3	3.071	3.020	3.440
4	4.084	4.020	4.580
5	5.084	5.020	5.720
6	6.095	6.020	6.860
8	8.115	8.025	9.150
10	10.127	10.025	11.500
12	12.146	12.032	13.800

Metric Socket Head Cap Screws– Property Class 12.9 (continued)

Tensile, Yield and Shear Strengths					
Nominal Size	Thread Stress Area mm ²	Yield Strength kN	Tensile Strength kN	Single Shear Strength Threads kN	Single Shear Strength Body kN
M2x0.4	2.07	2.28	2.53	15.7	1.99
M3x0.5	5.03	5.53	6.14	3.81	4.70
M4x0.7	8.78	9.63	10.7	6.63	8.39
M5x0.8	14.2	15.6	17.3	10.7	13.4
M6x1.0	20.1	22.1	24.5	15.2	19.5
M8x1.25	36.6	40.1	44.6	27.7	34.8
M10x1.50	58.0	63.7	70.8	43.9	55.0
M12x1.75	84.3	92.7	103	63.9	79.1
M16x2.0	157	173	192	119	142
M20x2.5	245	269	299	185	222
M24x3.0	353	388	431	267	327
M30x3.5	561	616	684	424	506
M36x4.0	817	897	997	618	729

The mechanical properties listed are for applications at room temperature. Socket head cap screws in applications over 400 degrees F or below -20 degrees F will exhibit a reduction in the properties listed resulting in loss of some tensile, yield, and fatigue strength.

Metric Socket Head Cap Screws-Property Class 12.9 (continued)

Recommended Installation Torque Values

Nominal Size	Tension Induced At Recommended Torque kN	Recommended Tightening Torque Nm
M2x0.4	1.71	0.68
M3x0.5	4.15	2.49
M4x0.7	7.22	5.78
M5x0.8	11.7	11.7
M6x1.0	16.6	19.9
M8x1.25	30.1	48.1
M10x1.50	47.8	95.6
M12x1.75	68.6	164
M16x2.0	130	416
M20x2.5	202	808
M24x3.0	291	1397
M30x3.5	462	2772
M36x4.0	672	4838

These values are designed to induce approximately 75% of the screw's yield strength in steel to steel joints where the nut factor, also called "K" factor is 0.20. Plain socket head cap screws generally have a "K" factor between 0.19 and 0.25 when used in an as received condition. The "K" factor of coated or plated screws differs, as does the "K" factor of screws used with lubricants.

Please see the section in this handbook dealing with bolted joint design for further information.