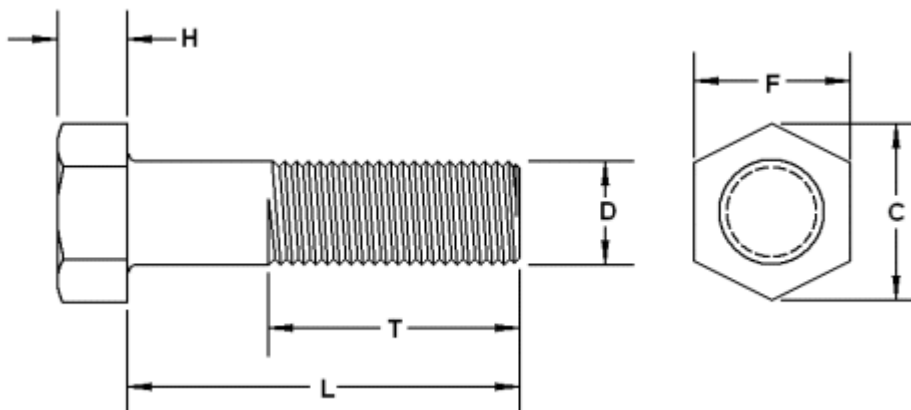


Finished Hex Head Bolts

Grade 2, 5, 8 and L9



SAE Grade 2, ASTM A307

Plain = HC020-----

Zinc = HC020-----Z1

SAE J429 Grade 5, ASTM A449

Plain = HC050-----00D

Zinc = HC050-----Z1D

SAE J429 Grade 8, ASTM A490

Plain = HC080-----00D

Zinc = HC080-----Z1D

SAE J429 Grade L9, ASTM F606 (Note 1)

Zinc = HCL90-----Z1

Tap Bolts/Fully Threaded

HCT020-----

HCT050-----

HCT080-----

Bolt Diameter	D	F			C		H	Weight
	Body Diameter	Width Across Flats			Width Across Corners		Height	Rough Estimate
	Max	Basic	Max	Min	Max	Min	Basic	Per Each
1/4	0.260	7/16	0.438	0.425	0.505	0.484	11/64	.003 + .014 x inch
5/16	0.324	1/2	0.500	0.484	0.577	0.552	7/32	.007 + .021 x inch
3/8	0.388	9/16	0.562	0.544	0.650	0.620	1/4	.012+ .030 x inch
1/2	0.515	3/4	0.750	0.725	0.866	0.826	11/32	.034 + .055inch
5/8	0.642	15/16	0.938	0.906	1.083	1.033	27/64	.063 + .084 x inch
3/4	0.768	1-1/8	1.125	1.088	1.299	1.240	1/2	.128 + .125 x inch
7/8	0.895	1-5/16	1.312	1.269	1.516	1.447	37/64	.188 + .180 x inch
1	1.022	1-1/2	1.500	1.450	1.732	1.653	43/64	.219 + .230 x inch
1-1/8	1.149	1-11/16	1.688	1.631	1.949	1.859	3/4	.353 + .280 x inch
1-1/4	1.277	1-7/8	1.875	1.812	2.165	2.066	27/32	.509 + .345 x inch
1-3/8	1.404	2-1/16	2.062	1.994	2.382	2.273	29/32	
1-1/2	1.531	2-1/4	2.250	2.175	2.598	2.480	1	.920 + .500 x inch
1-3/4	1.785	2-5/8	2.625	2.538	3.031	2.893	1-5/32	1.37 + .700 x inch
2	2.039	3	3.000	2.900	3.464	3.306	1-11/32	2.16 + .890 x inch
2-1/4	2.305	3-3/8	3.375	3.262	3.897	3.719	1-1/2	
2-1/2	2.559	3-3/4	3.750	3.625	4.330	4.133	1-21/32	

Dimensional specifications per ASME B18.2.1

STANDARD THREAD LENGTH

Bolt lengths ≤ 6":

Thread length = (2 X diameter) + 1/4"

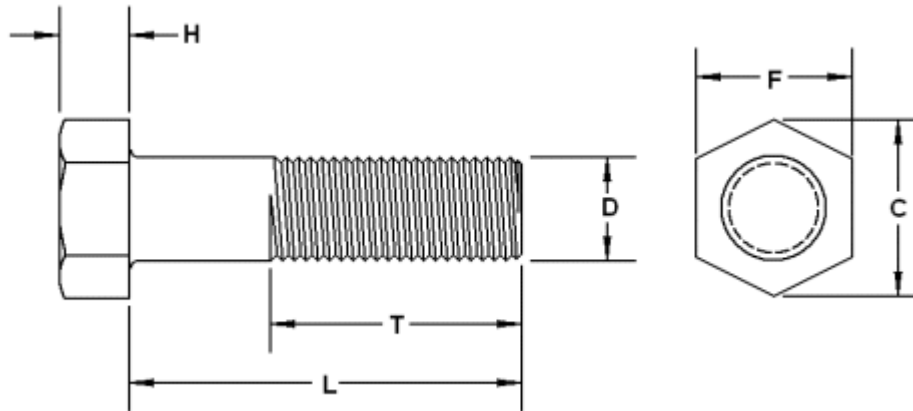
Bolt lengths > 6":

Thread length = (2 X diameter) + 1/2"

Note 1: L9 Head height is not accurate in this chart.

Heavy Hex Bolts

Grade 2



SAE Grade 2, ASTM A307B

Plain = HHC020-----

Zinc = HHC020-----Z1

Bolt Diameter	D	F			C		H	Weight
	Body Diameter	Width Across Flats		Width Across Corners		Height	Rough Estimate	
	Max	Basic	Max	Min	Per Each	Min	Basic	Per Each
1/2	0.515	7/8	0.875	0.850	1.010	0.969	11/32	.044 + .055 x inch
5/8	0.642	1-1/16	1.062	1.031	1.227	1.175	27/64	.079 + .084 x inch
3/4	0.768	1-1/4	1.250	1.212	1.443	1.383	1/2	.136 + .125 x inch
7/8	0.895	1-7/16	1.438	1.394	1.660	1.589	37/64	.226 + .180 x inch
1	1.022	1-5/8	1.625	1.575	1.876	1.796	43/64	.348 + .230 x inch
1-1/8	1.149	1-13/16	1.812	1.756	2.093	2.002	3/4	.430 + .280 x inch
1-1/4	1.277	2	2.00	1.938	2.309	2.209	27/32	.615 + .345 x inch
1-3/8	1.404	2-3/16	2.188	2.119	2.526	2.416	29/32	.740 + .420 x inch
1-1/2	1.531	2-3/8	2.375	2.300	2.742	2.622	1	1.00 + .500 x inch
1-3/4	1.785	2-3/4	2.750	2.662	3.175	3.035	1-5/32	1.38 + .700 x inch
2	2.039	3-1/8	3.125	3.025	3.608	3.449	1-11/32	2.20 + .890 x inch
2-1/4	2.305	3-1/2	3.500	3.388	4.041	3.862	1-1/2	
2-1/2	2.559	3-7/8	3.875	3.750	4.474	4.275	1-21/32	

Dimensional specifications per ASME B18.2.1

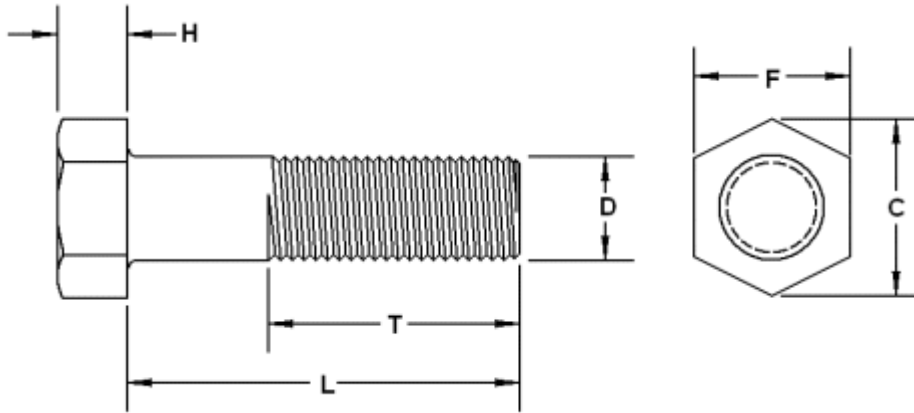
STANDARD THREAD LENGTH

Bolt lengths ≤ 6":
Bolt lengths > 6":

Thread length = (2 X diameter) + 1/4"
Thread length = (2 X diameter) + 1/2"

Structural Bolts

A325 & A490



ASTM A325
ASTM A490

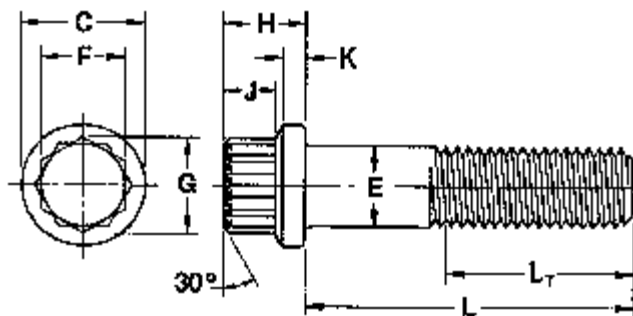
Plain = HHC325----00D Galv = HHC325----GD Zinc = HHC325----Z1D
Plain = HHC490----00D

Bolt Dia	D		F			C		H			T
	Body Diameter		Width Across Flats			Width Across Corners		Height			Thread Length
	Max	Min	Basic	Max	Min	Max	Min	Basic	Max	Min	Basic
1/2	0.515	0.482	7/8	0.875	0.850	1.010	0.969	5/16	0.323	0.302	1.00
5/8	0.642	0.605	1-1/16	1.062	1.031	1.227	1.175	25/64	0.403	0.378	1.25
3/4	0.768	0.729	1-1/4	1.250	1.212	1.443	1.383	15/32	0.483	0.455	1.38
7/8	0.895	0.852	1-7/16	1.438	1.394	1.660	1.589	35/64	0.563	0.531	1.50
1	1.022	0.976	1-5/8	1.625	1.575	1.876	1.796	39/64	0.627	0.591	1.75
1-1/8	1.149	1.098	1-13/16	1.812	1.756	2.093	2.002	11/16	0.718	0.658	2.00
1-1/4	1.277	1.223	2	2.00	1.938	2.309	2.209	25/32	0.813	0.749	2.00
1-3/8	1.404	1.345	2-3/16	2.188	2.119	2.526	2.416	27/32	0.878	0.810	2.25
1-1/2	1.531	1.470	2-3/8	2.375	2.300	2.742	2.622	15/16	0.974	0.902	2.25

Dimensional specifications per ASME B18.2.1

12-Point Flange Bolt

Alloy Steel Plain = 12800-----00D
 B8M Stainless Plain = 12B8M-----00D



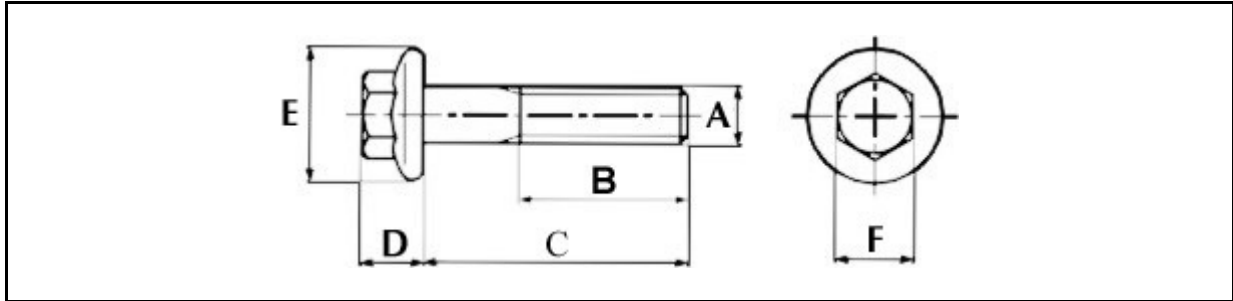
Nominal Size, Inches		C		F		H	J
		Flange Diameter		Width Across Flats		Head Height	Wrench Height
Max	Min	Max	Min	Max	Min		
1/4	.2435	.375	.365	.252	.244	.260	.15
5/16	.3053	.469	.457	.315	.306	.312	.18
3/8	.3678	.562	.550	.377	.368	.375	.21
7/16	.4294	.656	.642	.438	.429	.438	.26
1/2	.4919	.750	.735	.502	.493	.500	.29
9/16	.5538	.844	.828	.564	.555	.563	.33
5/8	.6163	.938	.921	.627	.618	.625	.36
3/4	.7406	1.125	1.107	.752	.743	.750	.44
7/8	.8647	1.312	1.293	.877	.866	.875	.51
1	.9886	1.50	1.479	1.003	.991	1.00	.60
1	1.1086	1.688	1.665	1.128	1.115	1.125	.66
1 1/8	1.2336	1.875	1.852	1.253	1.24	1.25	.73
1 1/4	1.3568	2.062	2.038	1.378	1.365	1.375	.80
1 1/2	1.4818	2.25	2.224	1.503	1.489	1.50	.87

Serrated Flange Bolt

Bolts from Hill SAE 8.2 R C = 34-42
 Bolts from Mclean 1022 case Hardened R C = 26-34

Plain = HSF010-----

Zinc = HSF010-----Z1



Diameter (A)	Thread Length		Height (D)	Flange Diameter (E)	Width A.F. (F)
	C < 6" (B)	C > 6" (B)			
1/4	0.750"	1.000"	.28"	.56"	3/8"
5/16	0.875"	1.125"	.32"	.68"	1/2"
3/8	1.000"	1.250"	.39"	.81"	9/16"
7/16	1.125"	1.375"	.46"	.93"	5/8"
1/2	1.250"	1.500"	.51"	1.07"	3/4"
9/16	1.375"	1.625"	.57"	1.19"	13/16"
5/8	1.500"	1.750"	.62"	1.33"	15/16"
3/4	1.750"	2.000"	.73"	1.59"	1 1/8"

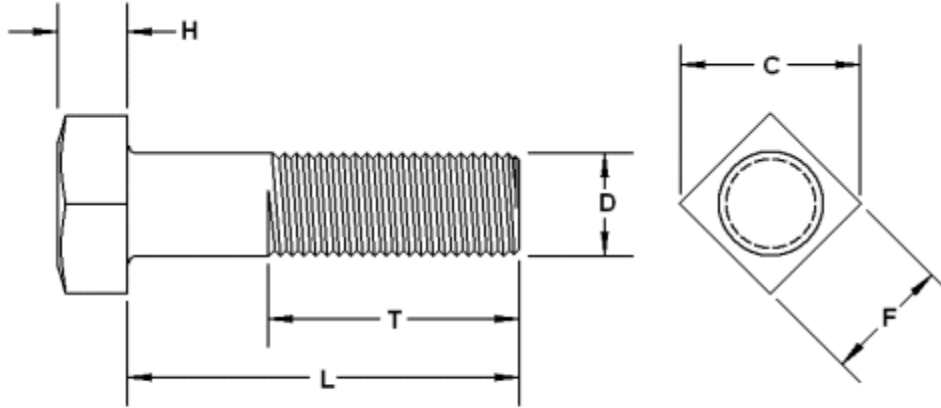
Note:

Hex Serrated Large Flange Bolts

Plain = HSLF010-----

Zinc = HSLF010-----Z1

Square Head Bolts



SAE Grade 2, ASTM A307

Plain = QB020-----
Galvanized = QB020-----GD

Zinc = QB020-----Z1

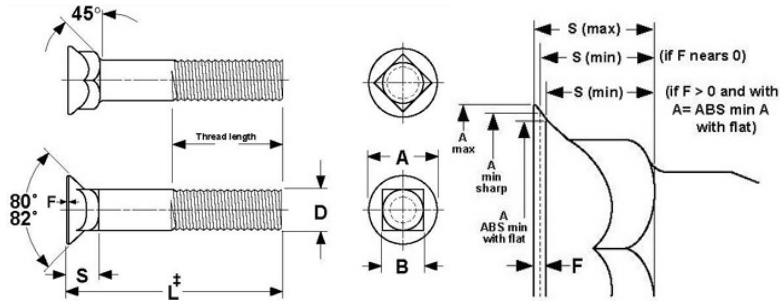
Bolt Diameter	D	F				C		H		
	Body Diameter	Width Across Flats		Width Across Corners		Height (Head)				
	Max	Basic	Max	Min	Max	Min	Basic	Max	Min	
3/8	0.388	9/16	0.562	0.544	0.795	0.747	1/4	0.268	0.232	
1/2	0.515	3/4	0.750	0.725	1.061	0.995	21/64	0.348	0.308	
5/8	0.642	15/16	0.938	0.906	1.326	1.244	27/64	0.444	0.400	
3/4	0.768	1-1/8	1.125	1.088	1.591	1.494	1/2	0.524	0.476	
7/8	0.895	1-5/16	1.312	1.269	1.856	1.742	19/32	0.620	0.568	
1	1.022	1-1/2	1.500	1.450	2.121	1.991	21/32	0.684	0.628	
1-1/8	1.149	1-11/16	1.688	1.631	2.386	2.239	3/4	0.780	0.720	
1-1/4	1.277	1-7/8	1.875	1.812	2.652	2.489	27/32	0.876	0.812	
1-3/8	1.404	2-1/16	2.062	1.994	2.917	2.738	29/32	0.940	0.872	
1-1/2	1.531	2-1/4	2.250	2.175	3.182	2.986	1	1.036	0.964	

Dimensional specifications per ASME B18.2.1

STANDARD THREAD LENGTH Bolt lengths ≤ 6": Thread length = (2 X diameter) + 1/4"
Bolt lengths > 6": Thread length = (2 X diameter) + 1/2"

Head Plow Bolts

(No. 3)



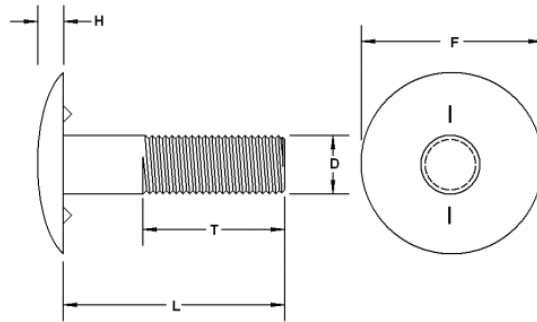
Length of plow bolt is measured from the top of the head to the extreme end of the bolt.

Plain = PB050-----

Zinc = PB050-----Z1

D Bolt Diameter	A Head Diameter	F Feed Thickness	S		B	
			Depth of Square and Head		Width of Square	
			Max	Min	Max	Min
5/16	.605	.025	.269	.243	.325	.313
3/8	.708	.031	.312	.281	.387	.375
7/16	.826	.036	.364	.328	.450	.438
1/2	.945	.042	.417	.375	.515	.500
5/8	1.147	.050	.506	.456	.640	.625
3/4	1.303	.050	.541	.491	.765	.750
7/8	1.512	.063	.626	.563	.906	.875
1	1.700	.063	.690	.627	1.031	1.000

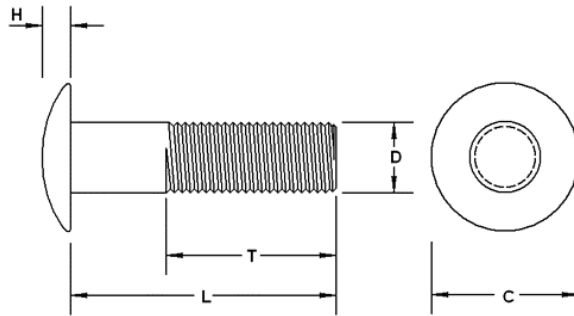
Timber Bolts



Bolt Diameter	Body Diameter D, Max	Head Diameter	Head Height
3/8	0.388	1-5/16	3/16
1/2	0.515	1-3/4	1/4
5/8	0.642	1-15/16	5/16
3/4	0.768	2-1/4	3/8
7/8	0.895	2-5/8	7/16
1	1.022	2-7/8	1/2
1-1/8	1.149	2-7/8	1/2
1-1/4	1.277	2-7/8	1/2
1-3/8	1.404	2-7/8	1/2
1-1/2	1.531	2-7/8	1/2

Button Head Bolts

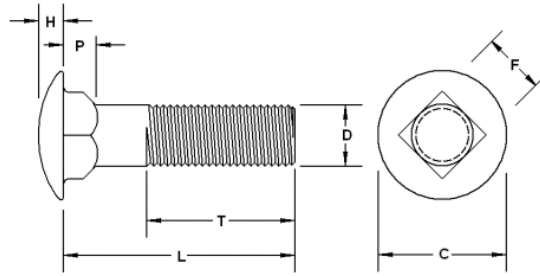
(Round Head Bolts)



Bolt Diameter	D		C		H	
	Body Diameter		Head Diameter		Head Height	
	Max	Min	Max	Min	Max	Min
3/8	0.388	0.360	0.844	0.782	0.208	0.188
1/2	0.515	0.483	1.094	1.032	0.270	0.250
5/8	0.642	0.605	1.344	1.219	0.344	0.313
3/4	0.768	0.729	1.594	1.469	0.406	0.375
7/8	0.895	0.852	1.844	1.719	0.469	0.438
1	1.022	0.976	2.094	1.969	0.531	0.500
1-1/4	1.277		2.850		0.531	0.500

Carriage Bolts

(Round Head Square Neck)



SAE Grade 2, ASTM A307
SAE J429 Grade 5, ASTM A449

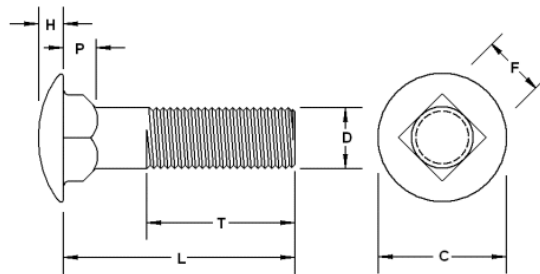
Plain = CB020-----
Plain = CB050-----

Zinc = CB020-----Z1
Zinc = CB050-----Z1

Bolt Diameter	D		C		H		F		P	
	Body Diameter		Head Diameter		Head Height		Square Width		Square Depth	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
3/8	0.388	0.360	0.844	0.782	0.208	0.188	0.388	0.368	0.219	0.188
1/2	0.515	0.483	1.094	1.032	0.270	0.250	0.515	0.492	0.281	0.250
5/8	0.642	0.605	1.344	1.219	0.344	0.313	0.642	0.616	0.344	0.313
3/4	0.768	0.729	1.594	1.469	0.406	0.375	0.768	0.741	0.406	0.375
7/8	0.895	0.852	1.844	1.719	0.469	0.438	0.895	0.865	0.469	0.438
1	1.022	0.976	2.094	1.969	0.531	0.500	1.022	0.990	0.531	0.500
1-1/4	1.277		2.850		0.531	0.500	1.250		0.625	

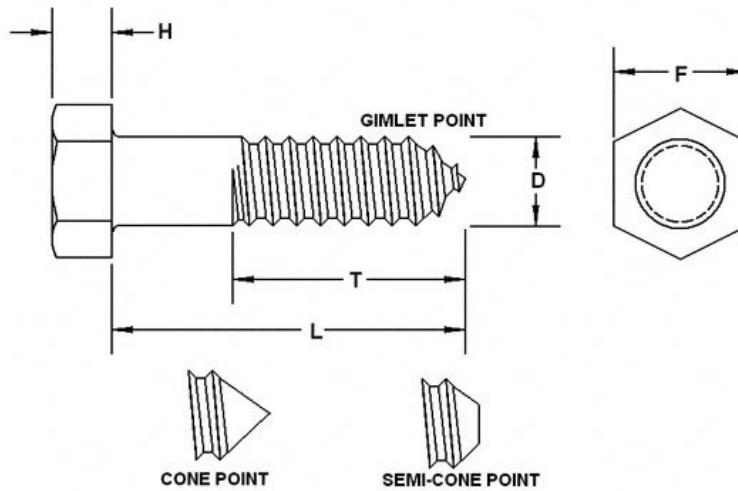
Step Bolt

(Like Carriage Bolt but bigger OD)



Bolt Diameter	D		C		H		F		P	
	Body Diameter		Head Diameter		Head Height		Square Width		Square Depth	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
10	.199	.182	.656	.625	.114	.094	.199	.185	.125	.094
1/4	.260	.237	.844	.813	.145	.125	.260	.245	.156	.125
5/16	.324	.298	1.031	1.000	.176	.156	.324	.307	.187	.156
3/8	.388	.360	1.219*	1.188	.208	.188	.388	.368	.219	.188
7/16	.452	.421	1.406	1.375	.239	.219	.452	.431	.250	.219
1/2	.515	.483	1.594	1.563	.270	.250	.515	.492	.281	.250

Hex Lag Screws



SAE Grade 2, ASTM A307
Cone Point is Standard

Plain = HL020-----

Zinc = HL020-----Z1

Bolt Diameter	D		F	H	Threads Per Inch	Thread Dimension			
	Body Diameter					Width Across Flats	Pitch	Flat At Root	Depth of Thread
	Max	Min							
3/8	0.388	0.360	9/16	1/4	7	0.143	0.062	0.055	0.265
1/2	0.515	0.482	3/4	11/32	6	0.167	0.072	0.064	0.371
5/8	0.642	0.605	15/16	27/64	5	0.200	0.086	0.077	0.471
3/4	0.768	0.729	1-1/8	1/2	4-1/2	0.222	0.096	0.085	0.579
7/8	0.895	0.852	1-5/16	37/64	4	0.250	0.108	0.096	0.683
1	1.022	0.976	1-1/2	43/64	3-1/2	0.286	0.123	0.110	0.780
1-1/8	1.149	1.098	1-11/16	3/4	3-1/4	0.308	0.133	0.119	0.887
1-1/4	1.277	1.223	1-7/8	27/32	3-1/4	0.308	0.133	0.119	1.012
1-3/8	1.404	1.346	2-1/16	29/32	3	0.333	0.143	0.128	1.119
1-1/2	1.531	1.469	2-1/4	1	3	0.333	0.143	0.128	1.244

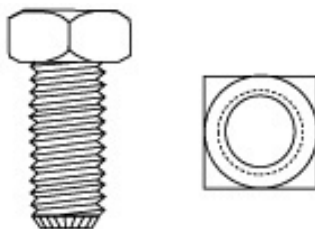
Dimensional specifications per ASME B18.2.1

STANDARD THREAD LENGTH

The minimum thread length shall be equal to half the nominal screw length plus 1/2" or 5", whichever is less.

Jack Bolt

(Square Head Set Screw)



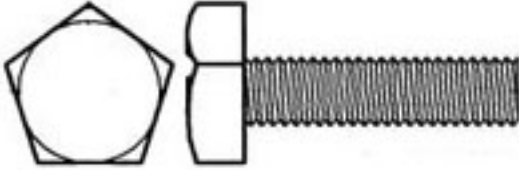
Plain = QSC010-----
Case Hardened Steel

Zinc = QSC010-----Z1

Bolt Diameter	Width Across Flats		Width Across Corners		Head Height	
	Max	Min	Max	Min	Max	Min
10	0.188	0.180	0.265	0.247	0.148	0.134
1/4	0.25	0.241	0.354	0.331	0.196	0.178
5/16	0.312	0.302	0.442	0.415	0.245	0.224
3/8	0.375	0.362	0.530	0.497	0.293	0.270
7/16	0.438	0.423	0.619	0.581	0.341	0.315
1/2	0.500	0.484	0.707	0.665	0.389	0.361
9/16	0.562	0.545	0.795	0.748	0.437	0.407
5/8	0.625	0.606	0.884	0.833	0.485	0.452
3/4	0.750	0.729	1.060	1.001	0.582	0.544
7/8	0.875	0.852	1.237	1.170	0.678	0.635
1	1.00	0.974	1.414	1.337	0.774	0.726
1-1/8	1.125	1.096	1.591	1.505	0.870	0.817
1-1/4	1.250	1.219	1.768	1.674	0.966	0.908
1-3/8	1.750	1.342	1.945	1.843	1.063	1.00
1-1/2	1.500	1.464	2.121	2.010	1.159	1.091

Miscellaneous Bolts

Penta Bolt



Material: Stainless Steel

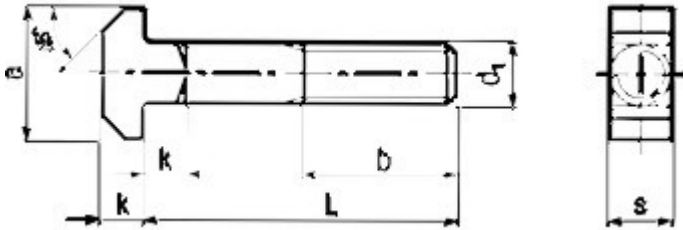
PENTAC188-----

Elevator Bolt

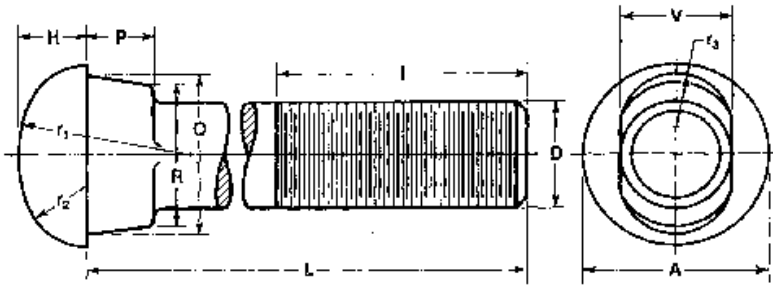


Screw Diameter	Square Width Max	Head Diameter
1/4-20	.280	31/32
5/16-18	.342	1-3/16
3/8-16	.405	1-5/16
1/2-13	.530	1-9/16
Material: Carbon Steel		EB020-----Z1

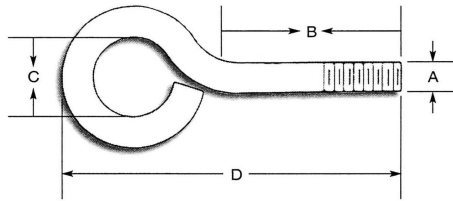
T-Head Bolt



Oval Neck Bolt



Turned Eye Bolts



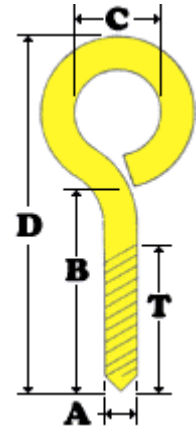
Plain = IT020----- Zinc = IT020-----Z1 Galvanized = IT020-----GD

DIMENSIONS ARE IN INCHES					MAX. LOAD In Lbs.
A	B	C	D	Thread	
1/8 (6-32)	3/4	1/4	1-1/4	5/8	22
5/32 (8-32)	1-1/8	1/4	1-11/16	1	36
3/16 (10-24)	1	3/8	1-11/16	7/8	38
3/16	1-3/8	5/16	2	1-1/4	38
3/16	2	3/8	2-11/16	1	38
3/16	3	3/8	3-11/16	1-1/2	38
7/32 (12-24)	1-1/2	3/8	2-1/4	1-3/8	52
1/4-20	1	1/2	2	7/8	74
1/4-20	1-1/2	1/2	2-1/2	1-1/4	74
1/4-20	1-7/8	7/16	2-3/4	1-5/8	74
1/4-20	2	1/2	3	1-1/4	74
1/4-20	2-1/5	1/2	3-1/2	1-1/4	74
1/4-20	3	1/2	4	1-1/2	74
1/4-20	3-1/2	1/2	4-1/2	2	74
1/4-20	4	1/2	5	2-1/2	74
1/4-20	5	1/2	6	3	74
1/4-20	6	1/2	7	4	74
5/16-18	1	5/8	2-1/8	7/8	96
5/16-18	2	5/8	3-1/8	1-1/4	96
5/16-18	2-1/4	9/16	3-3/8	2	96
5/16-18	2-1/2	5/8	3-5/8	1-1/4	96
5/16-18	3	5/8	4-1/8	1-1/2	96
5/16-18	3-1/2	5/8	4-5/8	2	96
5/16-18	4	5/8	5-1/8	2-1/2	96
5/16-18	5	5/8	6-1/8	3	96
5/16-18	6	5/8	7-1/8	4	96
5/16-18	6-1/2	7/8	7-3/4	4	96
3/8-16	1	3/4	2-1/2	7/8	144
3/8-16	2	3/4	3-1/2	1-1/4	144
3/8-16	2-1/2	21/32	3-3/4	2-1/4	144
3/8-16	2-1/2	3/4	4	1-1/2	144
3/8-16	3	3/4	4-1/2	1-1/2	144
3/8-16	3-1/2	3/4	5	2	144
3/8-16	4	3/4	5-1/2	2-1/2	144
3/8-16	5	3/4	6-1/2	3	144
3/8-16	6	3/4	7-1/2	4	144
3/8-16	8	3/4	9-1/2	4	144
3/8-16	10	3/4	11-1/2	4	144
3/8-16	12	3/4	13-1/2	4	144
7/16-14	6	7/8	7-3/4	4	216
7/16-14	8	7/8	9-3/4	4	216
1/2-13	2	1	4	1-1/2	298
1/2-13	4	1	6	2-1/2	298
1/2-13	6	1	8	4	298
1/2-13	8	1	10	4	298

1/2-13	10	1	12	4	298
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Chicago Hardware Turned Lag Eye Bolts



Turned Eye Bolts with Lag Screw Thread					
STOCK NUMBER	A	B	C	D	T
LS1	1/4	2-3/4	1/2	3-11/16	2
LS2	1/4	4	1/2	4-7/8	2
LS3	5/16	2-3/4	5/8	3-7/8	2
LS4	5/16	4-3/4	5/8	5-13/16	2
LS5	3/8	3	3/4	4-3/8	2-1/2
LS6	3/8	6	3/4	7-5/16	2-1/2
LS7	1/2	3-1/2	1	5-1/4	2-3/4
LS1	1/4	2-3/4	1/2	3-11/16	2

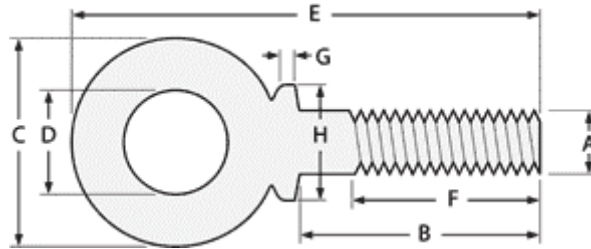
Eye Bolt With Shoulder

C-1035 Steel

Plain = ISF010-----

Zinc = ISF010-----Z1

Galvanized = ISF010-----GD



A	B	C	D	E	H	G	F	Weight per 100
Diameter	Shank Length	Outside Eye Diameter	Inside Eye Diameter	Overall Length	Shoulder Diameter	Shoulder Thickness	Thread Length	
1/4	1"	1 1/4"	3/4"	2 1/4"	17/32	5/32	1"	5
5/16	1 1/8"	1 1/2"	7/8"	2 5/8"	19/32	5/32	1 1/8"	10.5
3/8	1 1/4"	1 21/32"	1"	2 29/32"	21/32	5/32	1 1/4"	15.5
7/16	1 3/8"	1 27/32"	1 3/32"	3 7/32"	29/32	7/32	1 3/8"	20.5
1/2	1 1/2"	2 1/16"	1 3/16"	3 9/16"	1 1/32	9/32	1 1/2"	33
9/16	1 5/8"	2 9/32"	1 9/16"	3 29/32"	1 3/16	9/32	1 5/8"	44.5
5/8	1 3/4"	2 1/2"	1 3/8"	4 1/4"	1 9/16	13/32	1 3/4"	64
3/4	2"	2 13/16"	1 1/2"	4 13/16"			2"	90.5
7/8	2 1/4"	3 1/4"	1 11/16"	5 1/2"			2 1/4"	135
1	2 1/2"	3 9/16"	1 13/16"	6 1/16"			2 1/2"	190.5
1 1/8	2 3/4"	4"	2"	6 3/4"			2 3/4"	299.5
1 1/4	3"	4 7/16"	2 3/16"	7 7/16"			3"	399
1 1/2	3 1/2"	5 3/16"	2 1/2"	8 11/16"			3 1/2"	662.5

Dimensions per Chicago Hardware

Diameter and Thread	Working Limit	
	Straight Pull	45° Pull (Shoulder Only)
1/4"-20	500	125
5/16"-18	900	225
3/8"-16	1400	350
7/16"-14	2000	500
1/2"-13	2600	650
9/16"-12	3200	750
5/8"-11	4000	1000
3/4"-10	6000	1500
7/8"-9	7000	1750
1"-8	9000	2250
1 1/8"-7	12000	2500
1 1/4"-7	15000	3750
1 1/2"-6	21000	4900

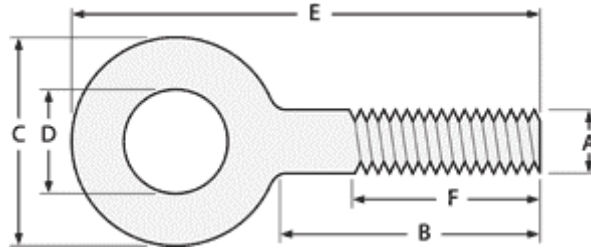
Eye Bolt No Shoulder

C-1035 Steel

Plain = IF010-----

Zinc = IF010-----Z1

Galvanized = IF010-----GD



A	B	C	D	E	F	Weight per 100
Diameter	Shank Length	Outside Eye Diameter	Inside Eye Diameter	Overall Length	Thread Length	
1/4	1"	1 1/4"	3/4"	2 1/4"	1"	5
5/16	1 1/8"	1 1/2"	7/8"	2 5/8"	1 1/8"	10.5
3/8	1 1/4"	1 21/32"	1"	2 29/32"	1 1/4"	15.5
7/16	1 3/8"	1 27/32"	1 3/32"	3 7/32"	1 3/8"	20.5
1/2	1 1/2"	2 1/16"	1 3/16"	3 9/16"	1 1/2"	33
9/16	1 5/8"	2 9/32"	1 9/16"	3 29/32"	1 5/8"	44.5
5/8	1 3/4"	2 1/2"	1 3/8"	4 1/4"	1 3/4"	64
3/4	2"	2 13/16"	1 1/2"	4 13/16"	2"	90.5
7/8	2 1/4"	3 1/4"	1 11/16"	5 1/2"	2 1/4"	135
1	2 1/2"	3 9/16"	1 13/16"	6 1/16"	2 1/2"	190.5
1 1/8	2 3/4"	4"	2"	6 3/4"	2 3/4"	299.5
1 1/4	3"	4 7/16"	2 3/16"	7 7/16"	3"	399
1 1/2	3 1/2"	5 3/16"	2 1/2"	8 11/16"	3 1/2"	662.5

Dimensions per Chicago Hardware

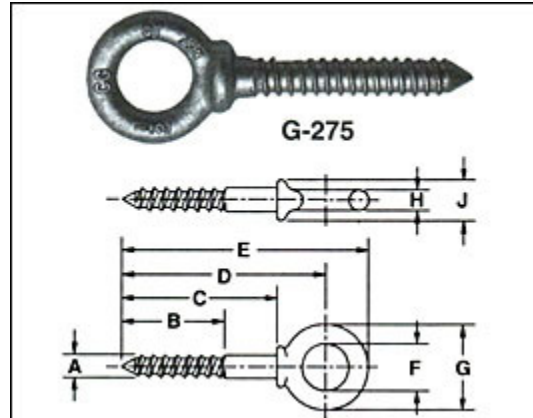
Diameter and Thread	Working Limit	
	Straight Pull	45° Pull (Shoulder Only)
1/4"-20	500	125
5/16"-18	900	225
3/8"-16	1400	350
7/16"-14	2000	500
1/2"-13	2600	650
9/16"-12	3200	750
5/8"-11	4000	1000
3/4"-10	6000	1500
7/8"-9	7000	1750
1"-8	9000	2250
1 1/8"-7	12000	2500
1 1/4"-7	15000	3750
1 1/2"-6	21000	4900

Screw Thread Eye Bolt Lag Thread

No Shoulder
With Shoulder

Plain = IFST010-----
Plain = ISFST010-----

Galvanized = IFST010-----GD
Galvanized = ISFST010-----GD



Screw Thread Eye Bolt (No Shoulder)						
Diameter (A)	Thread Length (B)	Shank Length (C)	Overall Length (E)	Inside Eye (F)	Outside Eye (G)	Weight per 100
1/4	1 1/2"	1 1/4"	3"	1/2"	1"	5.3
5/16	1 5/8"	1 1/2"	3 1/2"	5/8"	1 1/4"	9
3/8	1 3/4"	1 21/32"	4"	3/4"	1 1/2"	16
1/2	2 1/8"	2 1/16"	5 1/4"	1"	2"	39
5/8	2 1/2"	2 1/2"	6 13/16"	1 1/4"	2 5/16"	67
3/4	3"	2 13/16"	7 1/4"	1 1/2"	2 3/4"	108
7/8	3 1/4"	3 1/4"	8 1/4"	1 3/4"	3 1/2"	166
1	3 1/2"	3 9/16"	9 3/4"	2"	3 3/4"	265

Dimensions per Chicago Hardware

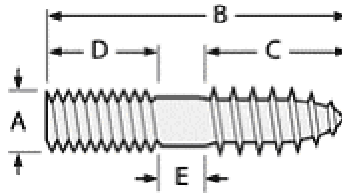
Screw Thread Eye Bolt (With Shoulder)							
Diameter (A)	Thread Length (B)	Shank Length (C)	Overall Length (E)	Inside Eye (F)	Outside Eye (G)	Shoulder Thickness (J)	Weight per 100
1/4	1 1/2"	1 1/4"	3 1/8"	1/2"	1"	5/64"	6.7
5/16	1 5/8"	1 1/2"	3 3/4"	5/8"	1 1/4"	3/32"	12
3/8	1 3/4"	1 21/32"	4 1/4"	3/4"	1 1/2"	1/8"	19
1/2	2 1/8"	2 1/16"	5 1/2"	1"	2"	5/32"	42
5/8	2 1/2"	2 1/2"	7 1/4"	1 1/4"	2 5/16"	13/64"	86
3/4	3"	2 13/16"	7 3/4"	1 1/2"	2 3/4"	1/4"	120
7/8	3 1/4"	3 1/4"	9"	1 3/4"	3 1/2"	9/32"	189
1	3 1/2"	3 9/16"	10 1/2"	2"	3 3/4"	5/16"	297

Dimensions per Chicago Hardware

Hanger Bolt

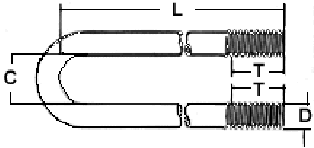
Plain = HB020-----

Zinc = HB020-----Z1



Common Sizes

A x B	C	D	E
Size	Wood Thread Length	Machine Thread Length	Shank Length
10-24 x 1-1/2	7/8	5/8	-
10-24 x 2	1	1	-
10-24 x 2-1/2	1-1/2	1	-
10-24 x 3	1-1/2	1-1/2	-
10-24 x 3-1/2	2	1-1/2	-
1/4-20 x 1-1/2	7/8	5/8	-
1/4-20 x 1-3/4	1	3/4	-
1/4-20 x 2	1	1	-
1/4-20 x 2-1/2	1-1/2	1	-
1/4-20 x 3	1-1/2	1-1/2	-
1/4-20 x 3-1/2	2	1-1/2	-
1/4-20 x 4	2	2	-
1/4-20 x 4-1/2	3	1-1/8	3/8
1/4-20 x 5	3	1-3/8	5/8
5/16-18 x 1-1/2	7/8	5/8	-
5/16-18 x 1-3/4	1	3/4	-
5/16-18 x 2	1	1	-
5/16-18 x 2-1/2	1-1/2	1	-
5/16-18 x 3	1-1/2	1-1/2	-
5/16-18 x 3-1/2	2	1-1/2	-
5/16-18 x 4	2	2	-
5/16-18 x 4-1/2	3	1-1/8	3/8
5/16-18 x 5	3	1-3/8	5/8
5/16-18 x 6	3	1-1/2	1-1/2
3/8-16 x 2	1	1	-
3/8-16 x 2-1/2	1-1/2	1	-
3/8-16 x 3	1-1/2	1-1/2	-
3/8-16 x 3-1/2	2	1-1/2	-
3/8-16 x 4	2	2	-
3/8-16 x 4-1/2	3	1-1/8	3/8
3/8-16 x 5	3	1-3/8	5/8
3/8-16 x 5-1/2	3	1-1/2	1
3/8-16 x 6	3	1-1/4	1-3/4



U-Bolt Dimensions – Inches

Grinnel 120, Standard Chicago Style

Plain = UB020---X---

Zinc = UB020---X---Z1

Diameter	C	L	T	Pipe Size	Weight Per 100 (w/ 2 nuts)
1/4" - 20	9/16"	1-1/4"	3/4"	1/4"	5
1/4" - 20	3/4"	1-1/4"	5/8"	3/8"	5
1/4" - 20	3/4"	2-1/4"	1-1/2"	3/8"	7
1/4" - 20	1"	1-3/4"	1"	1/2"	7
1/4" - 20	1-1/8"	2"	1"	3/4"	7
1/4" - 20	1-1/4"	2-1/4"	1-1/4"	3/4"	7.5
1/4" - 20	1-1/2"	2-3/4"	1-3/8"	1"	9
1/4" - 20	1-3/4"	3"	1-3/8"	1-1/4"	9
1/4" - 20	2"	3-1/4"	1-3/8"	1-1/2"	9.5
5/16" - 18	1"	2-3/16"	1-3/8"	1/2"	11
5/16" - 18	1-1/8"	2-3/16"	1"	3/4"	12
5/16" - 18	1-3/8"	2-3/16"	1"	1"	12
5/16" - 18	1-1/2"	2-3/16"	1"	1"	12
5/16" - 18	1-3/4"	2-11/16"	1-1/8"	1-1/4"	13
5/16" - 18	2"	2-11/16"	1"	1-1/2"	14
5/16" - 18	2-1/2"	3-3/16"	1"	2"	16
5/16" - 18	3"	3-11/16"	1"	2-1/2"	18
3/8" - 16	1"	2-1/4"	1-1/4"	1/2"	17.5
3/8" - 16	1-1/4"	2-1/4"	1-1/4"	3/4"	18
3/8" - 16	1-1/2"	2-1/2"	1-1/4"	1"	18.5
3/8" - 16	1-3/4"	2-3/4"	1-1/8"	1-1/4"	20
3/8" - 16	2"	2-5/8"	1-1/4"	1-1/2"	20
3/8" - 16	2-1/2"	3-1/8"	1-1/4"	2"	24.5
3/8" - 16	3"	3-5/8"	1-1/4"	2-1/2"	26
3/8" - 16	3-1/2"	4-1/8"	1-1/4"	3"	30
1/2" - 13	3"	4-1/2"	1-5/8"	2-1/2"	59
1/2" - 13	3-1/2"	5"	1-1/2"	3"	64
1/2" - 13	4"	5-1/2"	1-1/2"	3-1/2"	70
1/2" - 13	4-1/2"	6"	1-1/2"	4"	75
1/2" - 13	5-5/8"	7-1/4"	2"	5"	90
1/2" - 13	6-3/4"	8-3/8"	2"	6"	101
1/2" - 13	8-3/4"	10-3/8"	2"	8"	120
*3/4" - 10	10-7/8"	13-13/16"	4"	10"	440
*7/8" - 9	12-7/8"	16-1/16"	4-1/4"	12"	710
*7/8" - 9	14-1/8"	17-5/16"	4-1/4"	14"	755
*7/8" - 9	16-1/8"	19-5/16"	4-1/4"	16"	850
*1" - 8	18-1/8"	21-11/16"	4-3/4"	18"	1245

Grinnel 137, Long Tangent Style

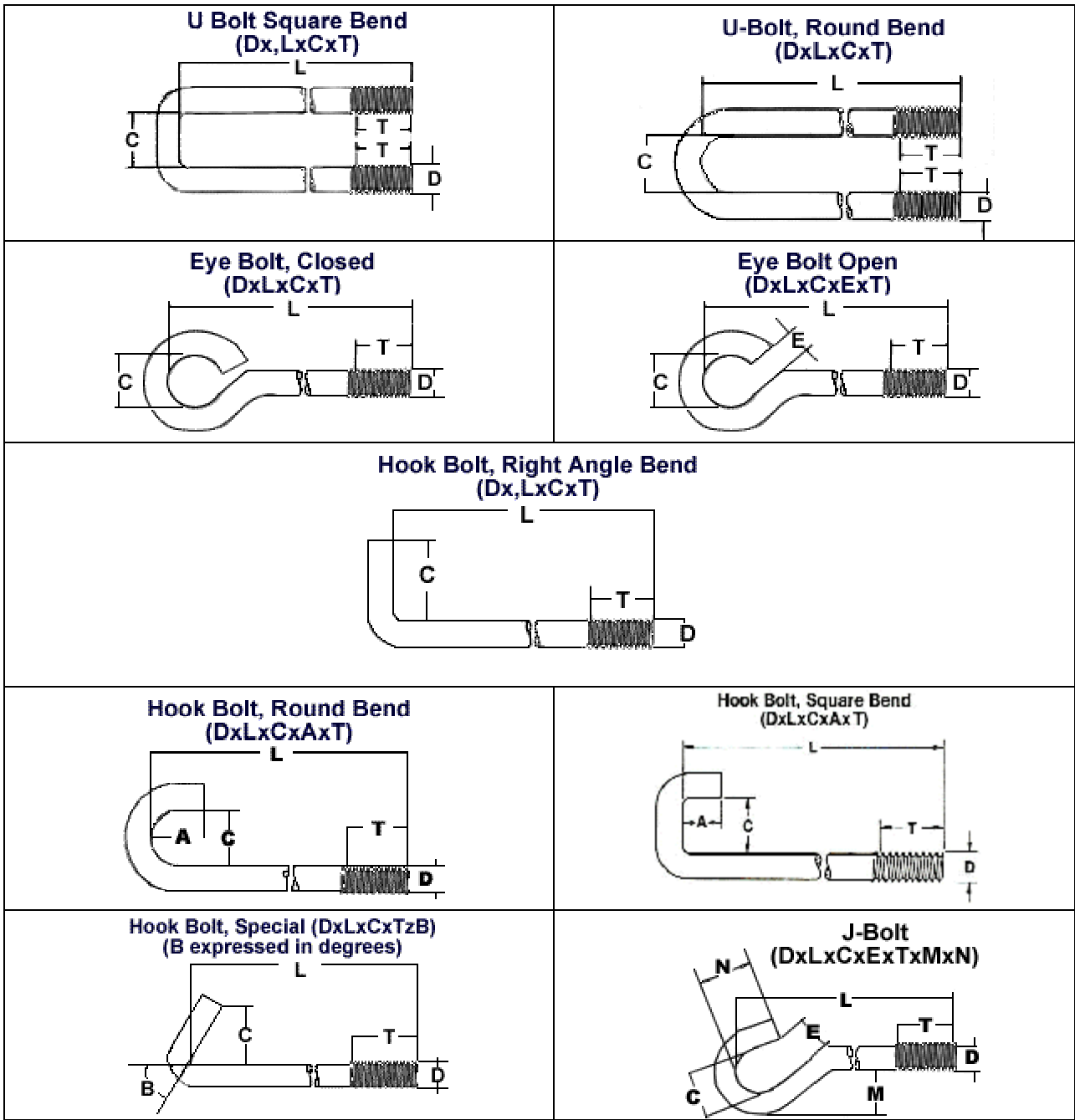
Plain = UB1020---X---

Zinc = UB1020---X---Z1

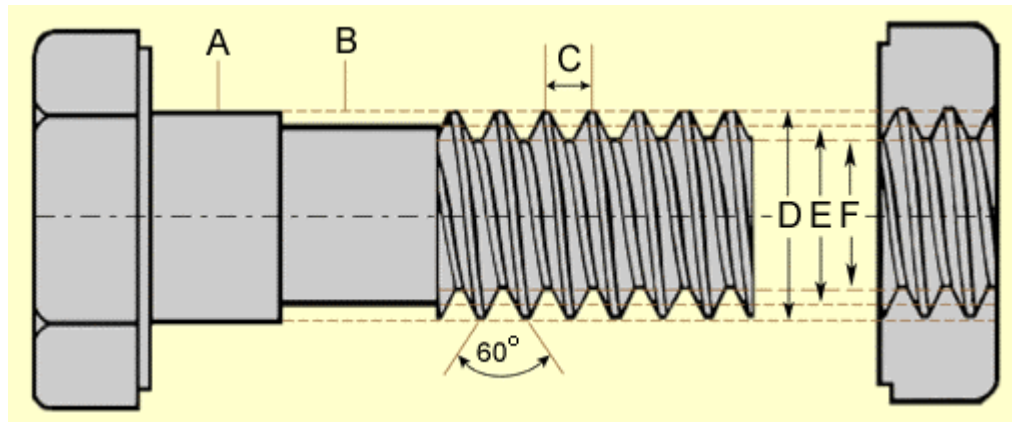
Diameter	C	L	T	Pipe Size	Weight Per 100 (w/ 2 nuts)
1/4" - 20	1"	2-3/4"	1-1/4"	1/2"	8
1/4" - 20	1-1/8"	3-1/8"	1-1/2"	3/4"	9
5/16" - 18	1-3/8"	3-5/8"	2"	1"	16
5/16" - 18	1-3/4"	4-1/2"	2"	1-1/4"	19
5/16" - 18	2"	4-3/4"	3"	1-1/2"	20
5/16" - 18	2-1/2"	5-5/8"	3"	2"	23

3/8" - 16	3"	6-5/8"	3"	2-1/2"	41
1/2" - 13	3-1/2"	8-1/2"	3"	3"	95

Bent Bolts



Thread Terminology



A. FULL DIAMETER SHANK:

Equal to major diameter of thread. Produced by cut thread or by roll thread on extruded blank. Characteristic of machine bolts and cap screws.

B. UNDERSIZED SHANK:

Equal approximately to pitch diameter of thread. Produced by roll threading a non-extruded blank. Characteristic of machine screws.

C. PITCH:

The distance from a point on the screw thread to a corresponding point on the next thread measured parallel on the axis.

D. MAJOR DIAMETER: The largest diameter of a screw thread.

E. PITCH DIAMETER: The simple, effective diameter of screw thread. Approximately half way between the major and minor diameters.

F. MINOR DIAMETER: The smallest diameter of a screw thread.

LEAD: The distance a screw thread advances axially in one turn.

CUT THREAD: Threads are cut or chased; the unthreaded portion of shank will be equal to major diameter of thread.

ROLLED THREAD: Threads are cold formed by squeezing the blank between reciprocating serrated dies. This acts to increase the major diameter of the thread over and above the diameter of unthreaded shank (if any), unless an extruded blank is used.

Classes of thread are distinguished from each other by the amounts of tolerance and allowance specified. External threads or bolts are designated with the suffix "A"; internal or nut threads with "B".

CLASSES 1A and 1B: For work of rough commercial quality where loose fit for spin-on-assembly is desirable.

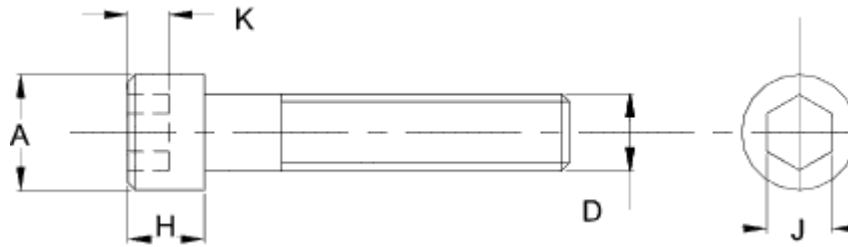
CLASSES 2A and 2B: The recognized standard for normal production of the great bulk of commercial bolts, nuts and screws.

CLASSES 3A and 3B: Used where a closed fit between mating parts for high quality work is required.

CLASS 4: A theoretical rather than practical class, now obsolete.

CLASS 5: For a wrench fit. Used principally for studs and their mating tapped holes. A force fit requiring the application of high torque for semi-permanent assembly.

Socket Head Cap Screw (1960 Series)



Socket Head Cap Screw

Plain = SC800-----

Zinc = SC800-----ZB

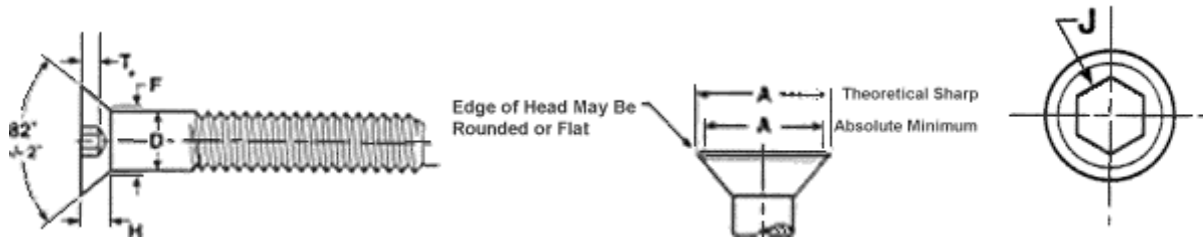
ASTM A574

#0 – 1": Class 3A Fit 1" – 4": Class 2A Fit Rockwell Hardness 38-43

Nominal Size, Inches	D		A		H		J
	Body Diameter		Head Diameter		Head Height		Socket Size
	Max	Min	Max	Min	Max	Min	
#0	.060	.0568	.096	.091	.060	.057	.050
#1	.073	.0695	.118	.112	.073	.070	.062
#2	.086	.0822	.140	.134	.086	.083	.078
#3	.099	.0949	.161	.154	.099	.095	.078
#4	.112	.1075	.183	.176	.112	.108	.094
#5	.125	.1202	.205	.198	.125	.121	.094
#6	.138	.1329	.226	.218	.138	.134	.109
#8	.164	.1585	.270	.262	.164	.159	.141
#10	.190	.184	.312	.303	.190	.185	.156
.250	.250	.2435	.375	.365	.250	.244	.188
.3125	.3125	.3053	.469	.457	.312	.306	.250
.375	.375	.3678	.562	.550	.375	.368	.312
.4375	.4375	.4294	.656	.642	.438	.430	.375
.500	.500	.4919	.750	.735	.50	.492	.375
.625	.625	.6163	.938	.921	.625	.616	.500
.750	.750	.7406	1.125	1.107	.75	.740	.625
.875	.875	.8647	1.312	1.293	.875	.864	.750
1.00	1.00	.9886	1.50	1.479	1.00	.988	.750
1.125	1.125	1.1086	1.688	1.665	1.125	1.111	.875
1.25	1.25	1.2336	1.875	1.852	1.25	1.236	.875
1.375	1.375	1.3568	2.062	2.038	1.375	1.360	1.00
1.50	1.50	1.4818	2.25	2.224	1.50	1.485	1.00
1.75	1.75	1.7295	2.625	2.597	1.75	1.734	1.25
2.00	2.00	1.978	3.00	2.97	2.00	1.983	1.50
2.25	2.25	2.228	3.375	3.344	2.25	2.232	1.75
2.50	2.50	2.4762	3.75	3.717	2.50	2.481	1.75
2.75	2.75	2.7262	4.125	4.09	2.75	2.73	2.00
3.00	3.00	2.9762	4.50	4.464	3.00	2.979	2.25
3.25	3.25	3.2262	4.875	4.837	3.25	3.228	2.25
3.50	3.50	3.4762	5.25	5.211	3.50	3.478	2.75
3.75	3.75	3.7262	5.625	5.584	3.75	3.727	2.75
4.00	4.00	3.9762	6.00	5.958	4.00	3.976	3.00

Per ANSI/ASME B18.3

Flat Socket Head Cap Screw



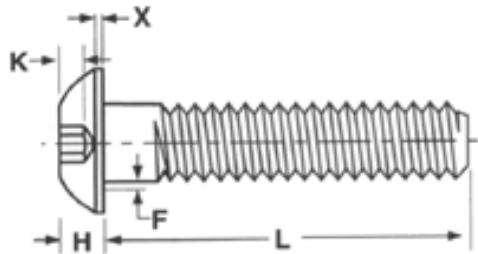
Socket Head Cap Screw
#0 - 1": Class 3A Fit

Plain = SCF800----- Zinc = SCF800-----ZB
1" - 4": Class 2A Fit Rockwell Hardness 36-43

Nominal Size, Inches	D		A		H	J	T
	Body Diameter		Head Diameter		Head Height	Hexagon Socket Size	Key Engagement
	Max	Min	Theoretical Sharp Max	Abs Min	Reference	Nominal	Min
#0	.060	.0568	.138	.117	.044	.035	.025
#1	.073	.0695	.168	.143	.054	.050	.031
#2	.086	.0822	.197	.168	.064	.050	.038
#3	.099	.0949	.226	.193	.07	.062	.044
#4	.112	.1075	.255	.218	.083	.062	.055
#5	.125	.1202	.281	.240	.090	.078	.061
#6	.138	.1329	.307	.263	.097	.078	.066
#8	.164	.1585	.359	.311	.112	.094	.076
#10	.190	.1840	.411	.359	.127	.125	.087
.250	.250	.2435	.531	.480	.161	.156	.111
.3125	.3125	.3053	.656	.600	.198	.188	.135
.375	.375	.3678	.781	.720	.234	.219	.159
.4375	.4375	.4294	.844	.781	.234	.250	.159
.500	.500	.4919	.938	.872	.251	.312	.172
.625	.625	.6163	1.188	1.112	.324	.375	.220
.750	.750	.7406	1.438	1.355	.396	.500	.220
.875	.875	.8647	1.688	1.604	.468	.562	.248
1.00	1.00	.9886	1.938	1.841	.540	.625	.297
1.125	1.125	1.1086	2.188	2.079	.611	.750	.325
1.25	1.25	1.2336	2.438	2.316	.683	.875	.358
1.375	1.375	1.3568	2.688	2.553	.755	.875	.402
1.50	1.50	1.4818	2.938	2.791	.827	1.00	.435

Per ANSI/ASME B18.3

Button Socket Head Cap Screw



Plain = SCB800-----

Zinc = SCB800-----ZB

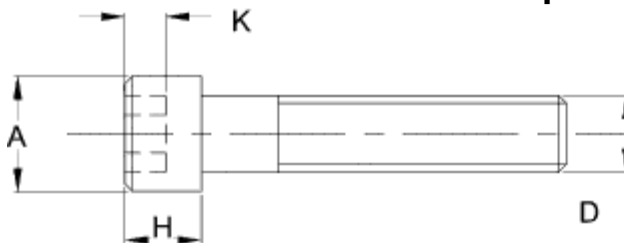
Class 3A Fit

Rockwell Hardness 36-43

Nominal Size, Inches	D		H		X	S	K	F				
	Head Diameter		Head Height					Head Side	Hexagon Socket Size	Key Depth	Fillet	
	Max	Min	Max	Min							Max	Min
0	0.114	0.104	0.032	0.026	0.010	0.035	0.020	0.010	0.005			
1	0.139	0.129	0.039	0.033	0.010	0.050	0.028	0.010	0.005			
2	0.164	0.154	0.046	0.038	0.010	0.050	0.028	0.010	0.005			
3	0.188	0.176	0.052	0.044	0.010	0.062	0.035	0.010	0.005			
4	0.213	0.201	0.059	0.051	0.015	0.062	0.035	0.010	0.005			
5	0.238	0.226	0.066	0.055	0.015	0.078	0.044	0.010	0.005			
6	0.262	0.250	0.073	0.063	0.015	0.078	0.044	0.010	0.005			
8	0.312	0.298	0.087	0.077	0.015	0.094	0.052	0.015	0.010			
10	0.361	0.347	0.101	0.091	0.020	0.125	0.070	0.015	0.010			
1/4	0.437	0.419	0.132	0.122	0.031	0.156	0.087	0.020	0.015			
5/16	0.547	0.527	0.166	0.152	0.031	0.188	0.105	0.020	0.015			
3/8	0.656	0.636	0.199	0.185	0.031	0.219	0.122	0.020	0.015			
1/2	0.875	0.851	0.265	0.245	0.046	0.312	0.175	0.030	0.020			
5/8	1.000	0.970	0.331	0.311	0.062	0.375	0.210	0.030	0.020			

Per ANSI/ASME B18.3

Low Head Socket Cap Screw



Socket Head Cap Screw

Plain = SC800-----

Zinc = SC800-----ZB

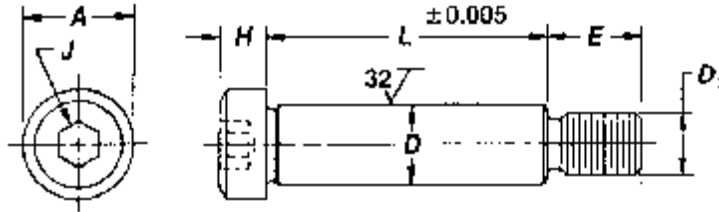
Class 3A Fit

Rockwell Hardness 38-43

Nominal Size, Inches	D		A		H		J
	Body Diameter		Head Diameter		Head Height		
	Max	Min	Max	Min	Max	Min	
#8	.164	.1585	.270	.262	.082	.079	.141
#10	.190	.184	.312	.303	.095	.092	.156
.250	.250	.2435	.375	.365	.125	.121	.188
.3125	.3125	.3053	.469	.457	.156	.152	.250
.375	.375	.3678	.562	.550	.187	.182	.312
.4375	.4375	.4294	.656	.642	.218	.213	.375

.500	.500	.4919	.750	.735	.250	.244	.375
------	------	-------	------	------	------	------	------

Socket Shoulder Bolt



Socket Shoulder Bolt Alloy Plain = SCSB800----- Zinc = SCSB800-----ZB

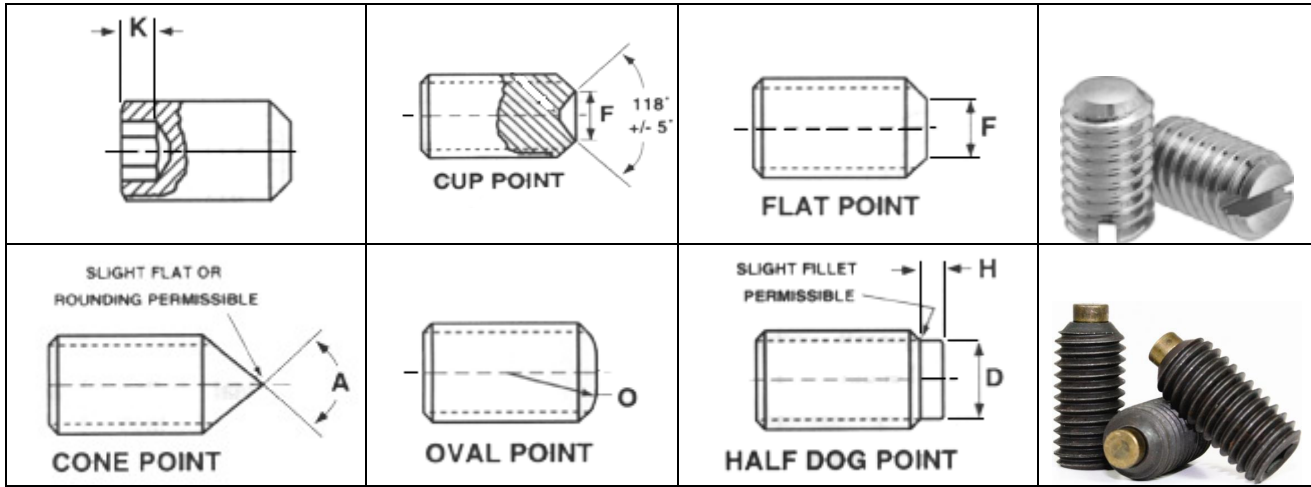
Class 3A Fit Rockwell Hardness 36-43

Socket Shoulder Bolt Stainless 18-8 = SCSB188-----

Nominal Size, Inches	D		A		H		J	D ₁		E
	Shoulder Diameter		Head Diameter		Head Height		Hexagon Socket Size	Nominal Thread Size	Threads Per Inch	Thread Length
	Max	Min	Max	Min	Max	Min	Nom			Basic
.250	.248	.246	.375	.357	.188	.177	.125	.190	24	.375
.312	.3105	.3085	.438	.419	.219	.209	.156	.250	20	.438
.375	.373	.371	.562	.543	.250	.240	.188	.3125	18	.500
.500	.498	.496	.750	.729	.312	.302	.250	.375	16	.625
.625	.623	.621	.875	.853	.375	.365	.312	.500	13	.750
.750	.748	.746	1.00	.977	.500	.490	.375	.625	11	.875
1.00	.998	.996	1.312	1.287	.625	.610	.500	.750	10	1.00
1.25	1.248	1.246	1.75	1.723	.750	.735	.625	.875	9	1.125
1.50	1.498	1.496	2.125	2.095	1.00	.980	.875	1.125	7	1.50
1.75	1.748	1.746	2.375	2.345	1.125	1.105	1.00	1.25	7	1.75
2.00	1.998	1.996	2.75	2.72	1.250	1.230	1.25	1.50	6	2.00

Per ANSI/ASME B18.3

Socket Set Screws



- | | | |
|----------------------|-----------------------|---------------------------|
| Cup Point (standard) | Alloy - SSC800----- | Stainless = SSC188----- |
| Cup Knurled Point | Alloy - SSCK800----- | Stainless = SSCK188----- |
| Flat Point | Alloy - SSFP800----- | Stainless = SSFP188----- |
| Cone Point | Alloy - SSCP800----- | Stainless = SSCP188----- |
| Oval Point | Alloy - SSOP800----- | Stainless = SSOP188----- |
| Half Dog Point | Alloy - SSHD800----- | Stainless = SSHD188----- |
| Full Dog Point | Alloy - SSFD800----- | Stainless = SSFD188----- |
| Slotted Set Screw | Steel - SSSFP020----- | Stainless = SSSFP188----- |
| Nylon Tip Set Screw | Alloy - SSNP800----- | Stainless = SSNP188----- |
| Brass Tip Set Screw | Alloy - SSBP800----- | Stainless = SSBP188----- |

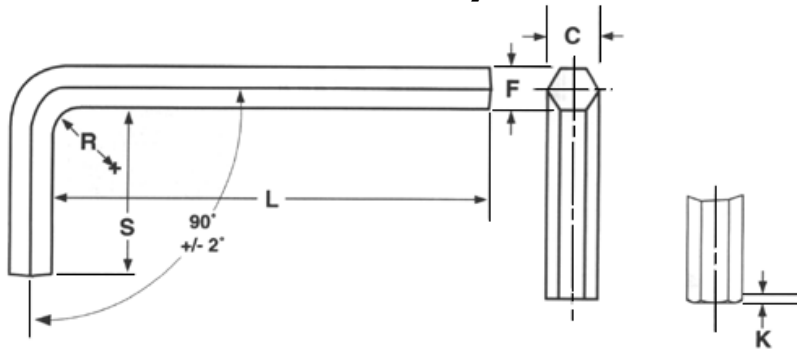
Class 3A Fit Alloy: ASTM 912, HRC Hardness 45-53

Nominal Size	S	K	F		O	D		H	
	Hexagon Socket Size	Min Key Engagement	Cup & Flat Point Diameter		Oval Point Radius	Half Dog Point			
			Max	Min		Diameter		Length	
						Max	Min	Max	Min
4	0.050	0.070	0.061	0.051	0.084	0.075	0.070	0.030	0.026
5	1/16	0.080	0.067	0.057	0.094	0.083	0.078	0.033	0.027
6	1/16	0.080	0.074	0.064	0.104	0.092	0.087	0.038	0.032
8	5/64	0.090	0.087	0.076	0.123	0.109	0.103	0.043	0.037
10	3/32	0.100	0.102	0.088	0.142	0.127	0.120	0.049	0.041
1/4	1/8	0.125	0.132	0.118	0.188	0.156	0.149	0.067	0.059
5/16	5/32	0.156	0.172	0.156	0.234	0.203	0.195	0.082	0.074
3/8	3/16	0.188	0.212	0.194	0.281	0.250	0.241	0.099	0.089
7/16	7/32	0.219	0.252	0.232	0.328	0.297	0.287	0.114	0.104
1/2	1/4	0.250	0.291	0.270	0.375	0.344	0.334	0.130	0.120
5/8	5/16	0.312	0.371	0.347	0.469	0.469	0.456	0.164	0.148
3/4	3/8	0.375	0.450	0.425	0.562	0.562	0.549	0.196	0.180
7/8	1/2	0.500	0.530	0.502	0.656	0.656	0.642	0.227	0.211
1	9/16	0.562	0.609	0.579	0.750	0.750	0.734	0.260	0.240

Per ANSI/ASME B18.3

Note: Half Dog, Full Dog and Cone points are measured in overall length.

Hex Key



¼" Short Arm Hex Import = HKS1/4
 2" Long Arm Hex Import = HKL2

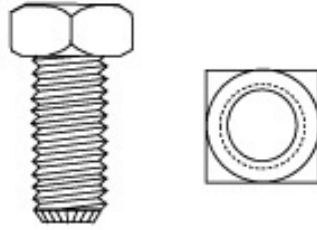
¼" Short Arm Hex Domestic = HKS1/4D
 2" Long Arm Hex Domestic = HKL2D

Less than 3/8 – HRC 48 Min
 Greater than or equal to 3/8 – HRC 45 Min

F		C		S		L				R	K
Key Size Across Flats		Across Corners		Short Arm		Long Arm				Radius	Chamfer
						Short Series		Long Series			
Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	
0.0280	0.0275	0.0314	0.0300	0.312	0.125	1.312	1.125	2.688	2.500	0.062	0.003
0.0350	0.0345	0.0393	0.0378	0.438	0.250	1.312	1.125	2.766	2.578	0.062	0.004
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	0.0615	0.0701	0.0680	0.656	0.3469	1.844	1.656	3.094	2.906	0.062	0.008
5/64	0.0771	0.0880	0.0859	0.703	0.516	1.969	1.781	3.281	3.094	0.078	0.008
3/32	0.0927	0.1058	0.1035	0.750	0.562	2.904	1.906	3.469	3.281	0.094	0.009
7/64	0.1079	0.1238	0.1210	0.797	0.609	2.219	2.031	3.656	6.469	0.109	0.014
1/8	0.1235	0.1418	0.1390	0.844	0.656	2.344	2.156	3.844	3.656	0.125	0.015
9/64	0.1391	0.1593	0.1566	0.891	0.703	2.469	2.281	4.031	3.844	0.141	0.016
5/32	0.1547	0.1774	0.1745	0.938	0.750	2.594	2.406	4.219	4.031	0.156	0.016
3/16	0.1860	0.2135	0.2105	1.031	0.844	2.844	2.656	4.594	4.406	0.188	0.022
7/32	0.2718	0.2490	0.2460	1.125	0.938	3.094	2.906	4.969	4.781	0.219	0.024
¼	0.2485	0.2845	0.2815	1.219	1.031	3.344	3.156	5.344	5.156	0.250	0.030
5/31	0.3110	0.3570	0.3531	1.344	1.156	3.844	3.656	6.094	5.906	0.312	0.032
3/8	0.3735	0.4285	0.4238	1.469	1.281	4.344	4.156	6.844	6.656	0.375	0.044
7/16	0.4355	0.5005	0.4944	1.594	1.406	4.844	4.655	7.594	7.406	0.438	0.047
½	0.4975	0.5715	0.5650	1.719	1.531	5.344	5.156	8.344	8.156	0.500	0.050
9/16	0.5600	0.6420	0.6356	1.844	1.656	5.844	5.656	9.094	8.906	0.562	0.053
5/8	0.6225	0.7146	0.7080	1.969	1.781	6.344	6.156	9.844	9.656	0.625	0.055
¾	0.7470	0.8580	0.8512	2.219	2.031	7.344	7.156	11.344	11.156	0.750	0.070
7/8	0.8720	1.0020	0.9931	2.469	2.281	8.344	8.156	12.844	12.656	0.875	0.076
1	0.9970	1.1470	1.1350	2.719	2.531	9.344	9.156	14.344	14.156	1.000	0.081
1 ¼	1.2430			3.250	2.750	11.500	11.000			1.250	0.092
1 ½	1.4930			3.750	3.250	13.500	13.000			1.500	0.104
1 ¾	1.743			4.250	3.750	15.500	15.000			1.750	0.115
2	1.9930			4.750	4.250	17.500	17.000			2.000	0.126
2 ¼	2.2430			5.250	4.750	19.500	19.000			2.250	0.137
2 ¾	2.7420			6.250	5.750	23.500	23.000			2.750	0.159
3	2.9920			6.750	6.250	25.500	25.000			3.000	0.171

Per ANSI/ASME B18.3

Square Head Set Screw (Jack Bolt)

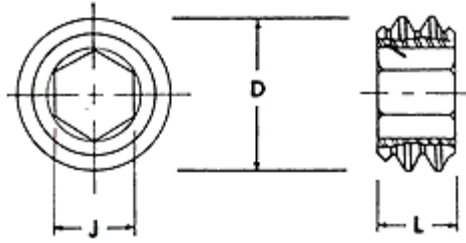


Plain = QSC010-----
Case Hardened Steel

Zinc = QSC010-----Z1

Bolt Diameter	Width Across Flats		Width Across Corners		Head Height	
	Max	Min	Max	Min	Max	Min
10	0.188	0.180	0.265	0.247	0.148	0.134
1/4	0.25	0.241	0.354	0.331	0.196	0.178
5/16	0.312	0.302	0.442	0.415	0.245	0.224
3/8	0.375	0.362	0.530	0.497	0.293	0.270
7/16	0.438	0.423	0.619	0.581	0.341	0.315
1/2	0.500	0.484	0.707	0.665	0.389	0.361
9/16	0.562	0.545	0.795	0.748	0.437	0.407
5/8	0.625	0.606	0.884	0.833	0.485	0.452
3/4	0.750	0.729	1.060	1.001	0.582	0.544
7/8	0.875	0.852	1.237	1.170	0.678	0.635
1	1.00	0.974	1.414	1.337	0.774	0.726
1-1/8	1.125	1.096	1.591	1.505	0.870	0.817
1-1/4	1.250	1.219	1.768	1.674	0.966	0.908
1-3/8	1.750	1.342	1.945	1.843	1.063	1.00
1-1/2	1.500	1.464	2.121	2.010	1.159	1.091

Socket Jam Screws



Alloy - SHJS800----

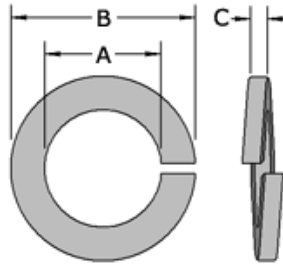
Stainless = SHJS188-----

Nominal Size	D	J		H		
	Basic Screw Diameter	Nominal Socket Size		Length		
				Nom.	Max	Min
4	0.1120		0.0500	0.0781	0.0880	0.0680
8	0.1640	5/64	0.0781	0.1094	0.1190	0.0990
10	0.1900	3/32	0.0937	0.1250	0.1350	0.1150
1/4	0.2500	1/8	0.1250	0.1250	0.1350	0.1150
5/16	0.3125	5/32	0.1562	0.1562	0.1660	0.1460
3/8	0.3750	3/16	0.1875	0.1875	0.1970	0.1770
7/16	0.4375	7/32	0.2187	0.2187	0.2280	0.2080
1/2	0.5000	1/4	0.2500	0.2500	0.2600	0.2400
5/8	0.6250	5/16	0.3125	0.3125	0.3220	0.3020
3/4	0.7500	3/8	0.3750	0.3750	0.3850	0.3650
7/8	0.8750	1/2	0.5000	0.4375	0.4470	0.4270
1	1.0000	9/16	0.5625	0.5000	0.5100	0.4900

Threads are Class 3A, UNC or UNF

Lock Washer

(Regular Pattern and Hi-Collar)



Regular Pattern

Case Hardened Steel

Grade 8

Hi-Collar Pattern

Case Hardened Steel

Heavy Pattern (not listed)

Grade 8

Plain = WS010---

Plain = WS080---

Plain = WSHC020---

Plain = WSH080---

Zinc = WS010---Z1

Zinc = WS080---Z1

Zinc = WSHC020---Z1

Zinc = WSH080---Z1

Regular Pattern

1-3/8	1.398	2.239	.344
1-7/16	1.462	2.334	.359
1-1/2	1.525	2.430	.375

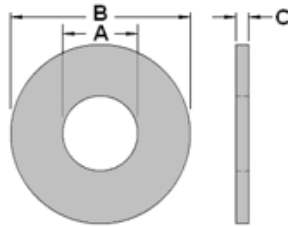
Hi-Collar Pattern

Bolt Size	A (min)	B (max)	C
2	.088	.172	.020
3	.101	.195	.025
4	.141	.209	.025
5	.127	.236	.031
6	.141	.250	.031
8	.167	.293	.040
10	.193	.334	.047
12	.220	.377	.056
1/4	.254	.489	.062
5/16	.317	.586	.078
3/8	.380	.683	.094
7/16	.443	.779	.109
1/2	.506	.873	.125
9/16	.570	.971	.141
5/8	.635	1.079	.156
11/16	.698	1.176	.172
3/4	.760	1.271	.188
13/16	.824	1.367	.203
7/8	.887	1.464	.219
15/16	.950	1.560	.234
1	1.017	1.661	.250
1-1/16	1.080	1.756	.266
1-1/8	1.144	1.853	.281
1-3/16	1.208	1.950	.297
1-1/4	1.271	2.045	.312
1-5/16	1.334	2.141	.328

Bolt Size	A (min)	B	C
4	.114	.173	.022
5	.127	.202	.030
6	.141	.216	.030
8	.167	.267	.047
10	.193	.294	.047
1/4	.254	.365	.078
5/16	.317	.460	.093
3/8	.380	.553	.125
7/16	.443	.647	.140
1/2	.506	.737	.103
5/8	.635	.923	.203
3/4	.760	1.111	.218
7/8	.887	1.296	.234
1	1.017	1.483	.250
1-1/8	1.144	1.669	.313
1-1/4	1.271	1.799	.313
1-3/8	1.398	2.041	.375
1-1/2	1.525	2.170	.375
1-3/4	1.775	2.602	.469
2	2.025	2.852	.469
2-1/4	2.275	3.352	.508
2-1/2	2.525	3.602	.508
2-3/4	2.775	4.102	.633
3	3.025	4.352	.633

Standard Flat Washers

USS Pattern and SAE Pattern



USS Pattern

Grade 2, ASTM F844

Grade 8, ASTM F436

SAE Pattern

Grade 2, ASTM F844

Grade 8, ASTM F436

Plain = WUSS020---

Plain = WUSS080---

Plain = WSAE020---

Plain = WSAE080---

Zinc = WUSS020---Z1

Zinc = WUSS080---Z1

Zinc = WSAE020---Z1

Zinc = WSAE080---Z1

ANSI 1.2 Type A – Wide Type 5

USS PATTERN

Bolt Size	A	B	C	Pounds per 100 pcs	Pieces per Pound
4					
6					
8					
10	1/4	9/16	.065	.277	361
12					
1/4	5/16	3/4	.065	.671	149
5/16	3/8	7/8	.083	1.11	90
3/8	7/16	1	.083	1.49	67
7/16	1/2	1 1/4	.083	2.44	41
1/2	9/16	1-3/8	.109	3.85	26
9/16	5/8	1 1/2	7/64	4.55	22
5/8	11/16	1-3/4	.134	7.69	13
3/4	13/16	2	.148	10.99	9.1
7/8	15/16	2-1/4	.165	14.29	7
1	1-1/16	2-1/2	.165	20	5
1-1/8	1-1/4	2-3/4	.165	22.2	4.5
1-1/4	1-3/8	3	.165	25	4
1-3/8	1-1/2	3-1/4	.180	33.3	3
1-1/2	1-5/8	3-1/2	.180	38.5	2.6
1-5/8	1-3/4	3-3/4	.180	43.5	0
1-3/4	1-7/8	4	.180	50	0
1-7/8	2	4-1/4	.180	55.56	1.8
2	2-1/8	4-1/2	.180	62.5	1.6
2-1/4	2/3/8	4-3/4	.220	83.3	1.2
2-1/2	2-5/8	5	.238	100	1
2-3/4	2-7/8	5-1/4	.259	111.11	.9
3	3-1/8	5-1/2	.284	125	.8

SAE PATTERN

Bolt Size	A	B	C	Pounds per 100 pcs	Pieces per Pound
4	1/8	5/16	1/32		
6	5/32	3/8	3/64	.126	790
8	3/16	7/16	3/64	.171	585
10	7/32	1/2	3/64	.23	435
12	1/4	9/16	1/16	.277	361
1/4	9/32	5/8	.065	.45	222
5/16	11/32	11/16	.065	.521	192
3/8	13/32	13/16	.065	.714	140
7/16	15/32	59/64	.065	.952	105
1/2	17/32	1 1/16	.095	1.82	55
9/16	19/32	1 3/16	.095	2.33	43
5/8	21/32	1 5/16	.095	2.77	36
3/4	13/16	1 1/2	.134	4.76	21
7/8	15/16	1 3/4	.134	6.25	16
1	1 1/16	2	.134	8.33	12
1-1/8	1 3/16	2 1/4	.134	10.9	9.2
1-1/4	1 5/16	2 1/2	.165	15.87	6.3
1-3/8	1 7/16	2 3/4	.165	18.87	5.3
1-1/2	1 9/16	3	.165	23.25	4.3
1-5/8					
1-3/4					
1-7/8					
2					
2-1/4					
2-1/2					
2-3/4					
3					

ANSI 1.2 Type A – Narrow Type 5

Note: F436 and Grade 8 thru hardened are interchangeable.

Flat Washers Type B

(N-Narrow, R-Regular, W-Wide)

Narrow = WSAEBN020---
Narrow = WSAEBN188---

Regular = WSAEBR020---
Regular = WSAEBR188---

Wide = WSAEBW020---
Wide = WSAEBW188---

Size	Series	ID	OD	Thk
No. 0	N	0.0680	0.1250	0.0250
	R	0.0680	0.1880	0.0250
	W	0.0680	0.2500	0.0250
No. 1	N	0.0840	0.1560	0.0250
	R	0.0840	0.2190	0.0250
	W	0.0840	0.2810	0.0320
No. 2	N	0.0940	0.1880	0.0250
	R	0.0940	0.2500	0.0320
	W	0.0940	0.3440	0.0320
No. 3	N	0.1090	0.2190	0.0250
	R	0.1090	0.3120	0.0320
	W	0.1090	0.4060	0.0400
No. 4	N	0.1250	0.2500	0.0320
	R	0.1250	0.3750	0.0400
	W	0.1250	0.4380	0.0400
No. 5	N	0.1410	0.2810	0.0320
	R	0.1410	0.4060	0.0400
	W	0.1410	0.5000	0.0400
No. 6	N	0.1560	0.3120	0.0320
	R	0.1560	0.4380	0.0400
	W	0.1560	0.5620	0.0400
No. 8	N	0.1880	0.3750	0.0400
	R	0.1880	0.5000	0.0400
	W	0.1880	0.6250	0.0630
No. 10	N	0.2030	0.4060	0.0400
	R	0.2030	0.5620	0.0400
	W	0.2030	0.7340	0.0630
No. 12	N	0.2340	0.4380	0.0400
	R	0.2340	0.6250	0.0630
	W	0.2340	0.8750	0.0630
¼	N	0.2810	0.5000	0.0630
	R	0.2810	0.7340	0.0630
	W	0.2810	1.0000	0.0630
5/16	N	0.3440	0.6250	0.0630
	R	0.3440	0.8750	0.0630
	W	0.3440	1.1250	0.0630
3/8	N	0.4060	0.7340	0.0630
	R	0.4060	1.0000	0.0630
	W	0.4060	1.2500	0.1000
7/16	N	0.4690	0.8750	0.0630
	R	0.4690	1.1250	0.0630
	W	0.4690	1.4690	0.1000
½	N	0.5310	1.0000	0.0630
	R	0.5310	1.2500	0.1000
	W	0.5310	1.7500	0.1000
9/16	N	0.5940	1.1250	0.0630
	R	0.5940	1.4690	0.1000
	W	0.5940	2.0000	0.1000
5/8	N	0.6560	1.2500	0.1000
	R	0.6560	1.7500	0.1000
	W	0.6560	2.2500	0.1600
¾	N	0.8120	1.3750	0.1000
	R	0.8120	2.0000	0.1000
	W	0.8120	2.5000	0.1600
7/8	N	0.9380	1.4690	0.1000
	R	0.9380	2.2500	0.1600
	W	0.9380	2.7500	0.1600
1	N	1.0620	1.7500	0.1000
	R	1.0620	2.5000	0.1600
	W	1.0620	3.0000	0.1600

Size	Series	ID	OD	Thk
1-1/8	N	1.1880	2.0000	0.1000
	R	1.1880	2.7500	0.1600
	W	1.1880	3.2500	0.1600
1-1/4	N	1.3120	2.2500	0.1600
	R	1.3120	3.0000	0.1600
	W	1.3120	3.5000	0.2500
1-3/8	N	1.4380	2.5000	0.1600
	R	1.4380	3.2500	0.1600
	W	1.4380	3.7500	0.2500
1-1/2	N	1.5620	2.7500	0.1600
	R	1.5620	3.5000	0.2500
	W	1.5620	4.0000	0.2500
1-5/8	N	1.7500	3.0000	0.1600
	R	1.7500	3.7500	0.2500
	W	1.7500	4.2500	0.2500
1-3/4	N	1.8750	3.2500	0.1600
	R	1.8750	4.0000	0.2500
	W	1.8750	4.5000	0.2500
1-7/8	N	2.0000	3.5000	0.2500
	R	2.0000	4.2500	0.2500
	W	2.0000	4.7500	0.2500
2	N	2.1250	3.7500	0.2500
	R	2.1250	4.5000	0.2500
	W	2.1250	5.0000	0.2500
2-1/4	N	2.3750	4.0000	0.2500
	R	2.3750	5.0000	0.2500
	W	2.3750	5.5000	0.3750
2-1/2	N	2.6250	4.5000	0.2500
	R	2.6250	5.5000	0.3750
	W	2.6250	6.0000	0.3750
2-3/4	N	2.8750	5.0000	0.2500
	R	2.8750	6.0000	0.3750
	W	2.8750	6.5000	0.3750
3	N	3.1250	5.5000	0.3750
	R	3.1250	6.5000	0.3750
	W	3.1250	7.0000	0.3750

Stainless Flat Washer

Flat Washers – Industrial 18-8 and 316 Stainless Steel

Size	OD	ID	Thickness
#12	9/16	.250	.050
1/4	5/8	.281	.050
5/16	3/4	.343	.050
3/8	7/8	.406	.050
7/16	1-1/8	.500	.062
1/2	1-1/4	.531	.062
9/16	1-3/8	.625	.078
5/8	1-1/2	.687	.078
3/4	1-7/8	.812	.109
7/8	2	.937	.109
1	2	1.062	.125
1-1/8	2-1/2	1.187	.125
1-1/4	2-3/4	1.312	.125
1-3/8	3-1/4	1.50	.140
1-1/2	3-1/4	1.562	.140
1-3/4	3-1/2	1.812	.140
2	4	2.125	.187

Note: Washers may vary +/- .007

800 Series Industrial and MS15795

Size	OD	ID	Thickness		Part Number
			Max	Min	
0	.187	.078	.025	.016	-801
2	.250	.093	.025	.016	-802
4	.250	.125	.040	.017	-803
4	.312	.125	.048	.025	-804
6	.312	.156	.065	.027	-805
6	.375	.156	.065	.036	-806
8	.375	.187	.065	.036	-807
10	.437	.218	.080	.036	-808
10	.562	.250	.080	.051	-809
*1/4	.625	.281	.080	.051	-810
1/4	.750	.312	.080	.051	-811
*5/16	.687	.343	.080	.051	-812
5/16	.875	.375	.104	.064	-813
3/8	.812	.406	.080	.051	-814
*3/8	1.000	.437	.104	.064	-815
7/16	.921	.468	.080	.051	-816
7/16	1.250	.500	.104	.064	-817
*1/2	1.062	.531	.121	.074	-818
1/2	1.375	.562	.132	.086	-819
*5/8	1.312	.656	.121	.074	-820
5/8	1.750	.687	.160	.108	-821
*3/4	1.50	.812	.160	.108	-822
3/4	2.000	.812	.177	.122	-823
7/8	1.750	.937	.160	.108	-824
7/8	2.250	.937	.192	.136	-825
1	2.000	1.062	.160	.108	-826
1	2.500	1.062	.192	.136	-827
8	4.38	.188	.065	.036	-841
*10	.500	.219	.065	.036	-842

* SAE

Flat Washers – 316 (small sizes)

Size	OD	ID	Thk
4	.312	.125	.031
6	.312	.156	.031
8	.375	.174	.031
10	.437	.203	.031

Fender Washers and Unusual OD

Size	OD	ID	Thk
#6	5/8	.149	.031
#8	3/4	.174	.040
#10	11/16	.203	.040
#10	3/4	.203	.040
#10	1	.203	.040
1/4	11/16	.281	.050
1/4	1	.281	.050
1/4	1-1/4	.281	.050
1/4	1-1/2	.281	.062
1/4	2	.281	.062
5/16	1	.343	.050
5/16	1-1/4	.343	.050
5/16	1-1/2	.343	.062
5/16	2	.343	.062
3/8	1	.406	.050
3/8	1-1/4	.406	.050
3/8	1-1/2	.406	.062
3/8	2	.406	.062
1/2	1-1/2	.531	.062
1/2	2	.531	.062
3/4	1-3/4	.812	.109
3/4	2	.812	.125

Note: Washers may vary +/- .007

900 Series - Industrial and ANC960C

Size	OD	ID	Thk
*C2	.250	.099	1/32
C2L	.250	.099	1/64
*C3	.250	.109	1/32
C3L	.250	.109	1/64
*C4	.312	.125	1/32
C4L	.312	.125	1/64
*C5	.438	.140	3/64
*C6	.375	.149	1/32
C6L	.375	.149	1/64
*C8	.375	.174	1/32
C8L	.375	.174	1/64
*C10	.437	.203	1/16
C10L	.437	.203	1/32
C416	.500	.265	1/16
C416L	.500	.265	1/32
C516	.562	.382	1/16
C516L	.562	.382	1/32
C616	.625	.390	1/16
C616L	.625	.390	1/32
C716	.750	.453	1/16
C716L	.750	.453	1/32
C816	.875	.516	1/16
C816L	.875	.516	1/32
C916	1.062	.578	1/16
C916L	1.062	.578	1/32
C1016	1.187	.641	1/16
C1016L	1.187	.641	1/32
C1216	1.312	.766	3/32
C1216L	1.312	.766	1/32
C1416	1.500	.890	3/32
C1616	1.750	1.016	3/32

*Popular Size

Stainless Flat Washer

NAS Stainless

WNAS620C---

Size	OD	ID	Thk
0	.099	.063	.016
2	.149	.089	.016
3	.180	.102	.032
3L	.180	.102	.016
4	.209	.115	.032
4L	.209	.15	.016
5	.238	.128	.032
5L	.238	.128	.016
6	.267	.143	.032
6L	.267	.143	.016
8	.304	.169	.032
8L	.304	.169	.016
10	.354	.195	.063
10L	.354	.195	.032
416	.468	.255	.063
416L	.468	.255	.032

Flat Washers – Silicon Bronze

WCOMSLB---

Size	OD	ID	Thk
6L	.375	.174	.032
8S	.375	.172	.032
10S	.437	.200	.036
12S	.500	.228	.040
1/4L	.687	.260	.040
5/16S	.750	.340	.062
5/16L	.875	.340	.062
3/8S	.875	.392	.062
3/8L	1.000	.392	.062
7/16	1.125	.500	.062
1/2S	1.250	.562	.078
5/8S	1.500	.687	.091
3/4S	1.875	.812	.102
7/8	2.250	.937	.114
1	2.500	1.062	.128

Flat Washers - Brass

WCOMBRS---

Size	OD	ID	Thk
2S	.187	.099	.020
3	.250	.101	.020
4	.281	.120	.025
5	.281	.133	.025
6S	.312	.147	.025
6L	.375	.147	.032
8S	.375	.172	.032
8L	.437	.172	.036
10S	.437	.200	.036
10L	.50	.200	.040
12S	.500	.228	.040
12L	.562	.228	.040
4S	.562	.260	.040
4L	.687	.260	.051
16S	.625	.281	.040
16L	.750	.281	.062
18S	.687	.310	.051
18L	.875	.310	.062
5/16S	.750	.340	.062
1/16L	.875	.340	.062
3/8S	.875	.392	.062
3/8L	1.000	.392	.081
7/16	1.125	.500	.081
1/2S	1.250	.562	.091
1/2L	1.375	.562	.091
9/16	1.500	.625	.091
5/8S	1.500	.687	.102
5/8L	1.75	.687	.102
3/4S	1.875	.812	.114
3/4L	2.000	.812	.114
7/8	2.250	.937	.128
1	2.500	1.062	.144
1-1/8	2.750	1.187	.156
1-1/4	3.000	1.312	.156
1-1/2	3.500	1.562	.156

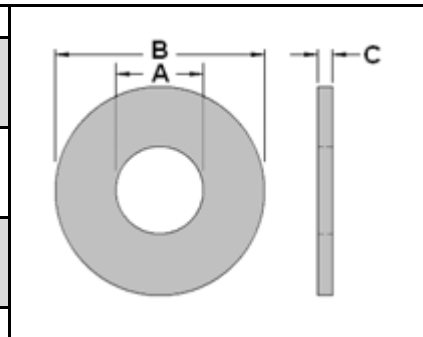
Fender Washers

Grade 2

Plain = WF020-----

Zinc = WF020-----Z1

Bolt Size	A	B	C (min)
10	7/32	3/4	.051
10	7/32	1	.051
10	7/32	1-1/4	.051
1/4	9/32	1	.051
1/4	9/32	1-1/4	.051
1/4	9/32	1-1/2	.051
5/16	11/32	1-1/2	.051
5/16	11/32	1-1/2	.051
3/8	13/32	1-1/2	.051
1/2	17/32	2	.051



Square Bevel Washers

(Square Malleable Iron)

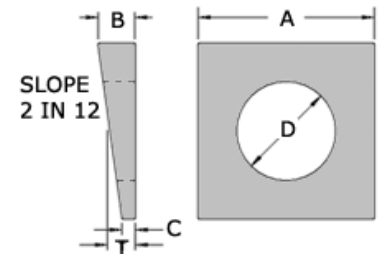
Low Carbon Steel

Plain = WQM020---

Galvanized = WQM020---GD

Zinc = WQM020---Z1

Bolt Size	A	B	C	T	D	Weight Per 100 Pieces
	Square Dimension	Thickness			Diameter	
3/8	1.25	0.34	0.12	0.23	0.44	8.6
1/2	1.25	0.34	0.12	0.23	0.56	8.8
5/8	1.50	0.38	0.12	0.25	0.69	14.3
3/4	1.50	0.44	0.19	0.31	0.81	14.3
7/8	2.00	0.56	0.22	0.39	0.94	32.8
1	2.00	0.56	0.22	0.39	1.06	30.2
1-1/8	2.25	0.62	0.25	0.44	1.25	
1-1/4	2.25	0.72	0.31	0.52	1.38	
1-3/8	2.75	0.78	0.31	0.55	1.50	
1-1/2	3.00	0.81	0.31	0.56	1.62	



Square Bevel Washers

(Hardened Steel)

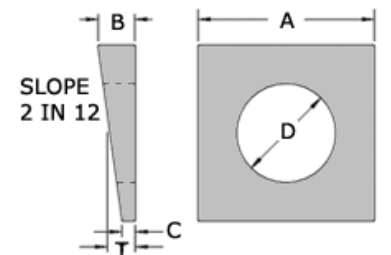
Hardened A325

Plain = WQH325---

Galvanized = WQH325---GD

Zinc = WQH325---Z1

Bolt Size	A	B	C	T	D	Weight Per 100 Pieces
	Square Dimension	Thickness			Diameter	
1/2	1.75	0.45	0.16	0.31	0.53	24.6
5/8	1.75	0.45	0.16	0.31	0.69	23.3
3/4	1.75	0.45	0.16	0.31	0.81	22.0
7/8	1.75	0.45	0.16	0.31	0.94	20.4
1	1.75	0.45	0.16	0.31	1.12	17.9
1-1/8	2.25	0.50	0.12	0.31	1.25	33.8
1-1/4	2.25	0.50	0.12	0.31	1.38	31.4
1-3/8	2.25	0.50	0.12	0.31	1.50	29.1
1-1/2	2.25	0.50	0.12	0.31	1.62	26.5

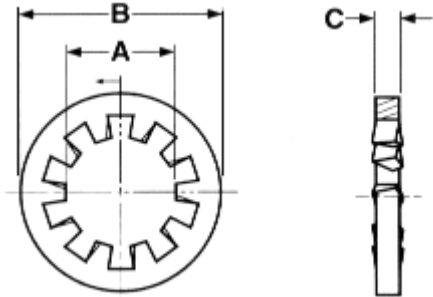


Internal and External Lock Washers

Internal Tooth

Bolt Size	A (min)	B (min)	C (min)
2	.089	.175	.010
3	.102	.215	.012
4	.115	.245	.015
5	.129	.255	.017
6	.141	.275	.017
8	.168	.325	.018
10	.195	.365	.020
12	.221	.394	.020
1/4	.256	.460	.023
5/16	.320	.594	.028
3/8	.384	.670	.032
7/16	.448	.740	.032
1/2	.512	.867	.037
5/8	.640	1.045	.042
3/4	.769	1.220	.047
7/8	.894	1.364	.052

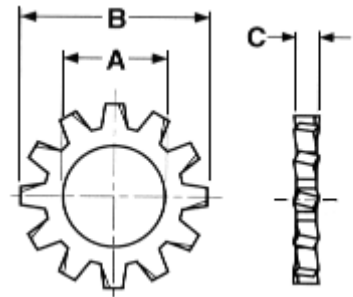
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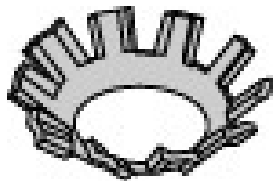
External Tooth

Bolt Size	A (min)	B (min)	C (min)
3	.102	.220	.012
4	.115	.245	.014
5	.129	.270	.015
6	.141	.305	.016
8	.168	.365	.018
10	.195	.395	.020
12	.221	.460	.023
1/4	.256	.494	.023
5/16	.320	.588	.028
3/8	.384	.670	.032
7/16	.448	.740	.032
1/2	.513	.880	.037
5/8	.641	1.045	.042
3/4	.768	1.220	.047

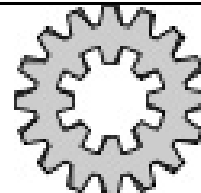
Zinc = WE010---Z1 Stainless = WE188---



External Countersunk



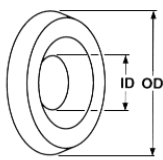
Material: Carbon Steel WEC010---Z1



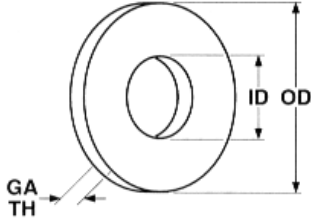
Material: Carbon Steel WEI010---Z1

External and Internal

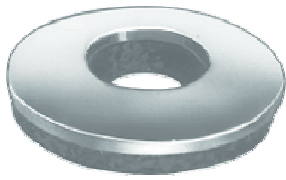
Finishing Washers

Bolt Size	OD	Inside Diameter		Height	Zinc Stainless WC020---Z1 WC188---
		Max	Min		
6	15/32	.200	.170	5/64	
8	17/32	.210	.180	7/64	
10	19/32	.265	.235	7/64	
12	21/32	.289	.259	1/8	
1/4	25/32	.335	.305	5/32	

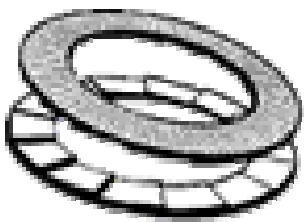
Riveting Washers

Size	OD	Height	Zinc Aluminum SS-8 AS-8
6	1/2	7/32	
7	1/2	3/16	
8	1/2	11/64	
9	7/16	5/32	
3/16 1/4	1/2 5/8	13/64 17/64	
5/16 3/8	3/4 7/8	21/64 25/64	

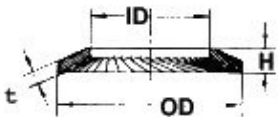
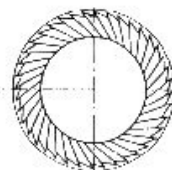
Bonded Sealing Washers (Neoprene)

Part Number	Screw Size	OD	Low Carbon Steel Stainless Aluminum WN020-----Z1 WN188----- WNALM-----
008006	8	3/8	
008008	8	1/2	
010010	10	5/8	
012008	12	1/2	
012010	12	5/8	
014010	14	5/8	
014012	14	3/4	
037016	3/8	1	
075028	3/4	1-3/4	

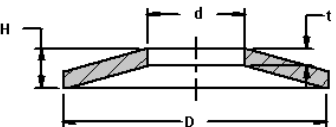
**Disc Lock Washers
(Nordlock)**

Size		Low Carbon Steel Stainless	WDISC010---Z1 WDISC316---
American	Metric		
3/16	5		
1/4	6		
5/16	8		
3/8	10		
7/16	11		
1/2	12		
9/16	14		
5/8	16		
3/4	20		
7/8	22		
1	24		
1-1/8	30		
1-1/4	33		
1-3/8	36		
1-1/2	39		

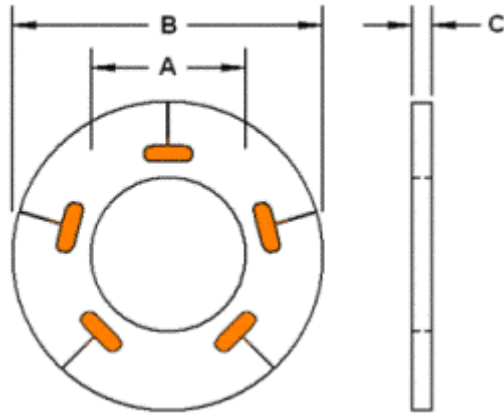
Schnorr Washers

American	Metric	Low Carbon Steel	WSCH020---
1/4	6		
3/8	10		
1/2	12.7		
5/8	16		
3/4	20		
7/8	22		

**Belleville Washer
(Compression, Solon Washers)**

Bolt Size	ID	OD	Thickness		Deflection	Load Flat	Steel WBELL010---Z1 Stainless WBELL188---
			Min	Max	Flat		
1/4	.258	.688	.025	.054	.017	1500	
5/16	.322	.813	.061	.064	.020	2000	
3/8	.386	.938	.070	.074	.022	2700	
7/16	.450	1.063	.080	.084	.026	3500	
1/2	.515	1.188	.089	.093	.028	4000	
9/16	.579	1.313	.098	.103	.031	4500	
5/8	.644	1.50	.112	.118	.036	6000	
3/4	.773	1.75	.131	.137	.043	8500	
7/8	.901	2.00	.150	.157	.048	12000	
1	1.03	2.25	.168	.176	.052	15000	
1-1/8	1.55	2.5	.187	.196	.057	18000	
1-1/4	1.27	2.75	.206	.216	.062	21000	
1-3/8	1.396	3.00	.225	.236	.068	24000	
1-1/2	1.524	3.25	.244	.256	.074	28000	

Load Indicating Washer



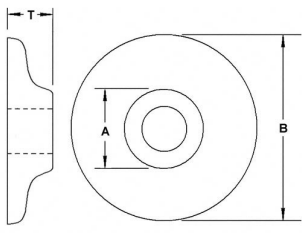
ASTM F959 Plain WLI325--- Mech Galv = WLI325---GD Zinc = WLI325---Z1
 ASTM F959 Plain WLI490--- Mech Galv = WLI490---GD Zinc = WLI490---Z1
 ASTM F959 Mechanically Galvanized Squirter = WLI490---GDS

Bolt Size	A325			A490			A325 or A490	
	Max OD (B)	Number of Protrusions	Thickness After Compression	Max OD (B)	Number of Protrusions	Thickness After Compression	ID Max (A)	PTD Max
1/2	1.187	4	0.120	1.375	5	0.120	0.527	0.788
5/8	1.375	4	0.140	1.625	5	0.140	0.658	0.956
3/4	1.625	5	0.140	1.750	6	0.160	0.790	1.125
7/8	1.875	5	0.160	2.000	6	0.180	0.921	1.294
1	2.000	6	0.180	2.250	7	0.180	1.052	1.463
1-1/8	2.250	6	0.180	2.500	7	0.180	1.183	1.631
1-1/4	2.500	7	0.180	2.750	8	0.180	1.315	1.800
1-3/8	2.750	7	0.180	3.000	8	0.180	1.446	1.969
1-1/2	3.000	8	0.180	3.250	9	0.180	1.577	2.138

Dimension specifications per ASTM F959

Ogee Washer

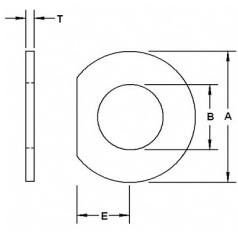
Bolt Size	A	B	T	Pounds Per 100
1/2	1-3/8	2-3/8	1/2	48
5/8	1-5/8	2-3/4	5/8	62
3/4	1-7/8	3	3/4	71
7/8	2	3-1/2	7/8	115
1	2-1/2	4	1	150
1-1/8	2-1/2	4-1/4	1-1/8	249
1-1/4	2-1/2	4-1/2	1-1/4	286
1-1/2	3	5-1/2	1-1/2	412



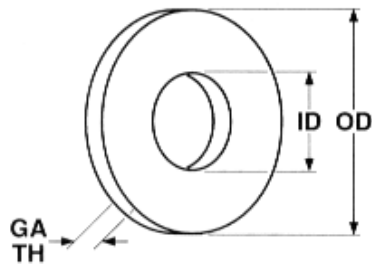
WOG020---

Clipped Hardened Washer

Bolt Size	A	B	Thickness		E	Weight Per 1,000
			Min	Max		
1/2	1-1/16	17/32	.097	.177	7/16	17
5/8	1-5/16	11/16	.122	.177	9/16	32
3/4	1-15/32	13/16	.122	.177	21/32	40
7/8	1-3/4	15/16	.136	.177	25/32	63
1	2	1-1/8	.136	.177	7/8	82
1-1/8	2-1/4	1-1/4	.136	.177	1	98
1-1/4	2-1/2	1-3/8	.136	.177	1-3/32	137
1-3/8	2-3/4	1-1/2	.136	.177	1-7/32	160
1-1/2	3	1-5/8	.136	.177	1-5/16	200
1-3/4	3-3/8	1-7/8	.178	.228	1-17/32	300
2	3-3/4	2-1/8	.178	.228	1-3/4	360



Nylon Flat Washer



Material: Nylon

WNYL-----

Torque Washer

(for Carriage Bolts)

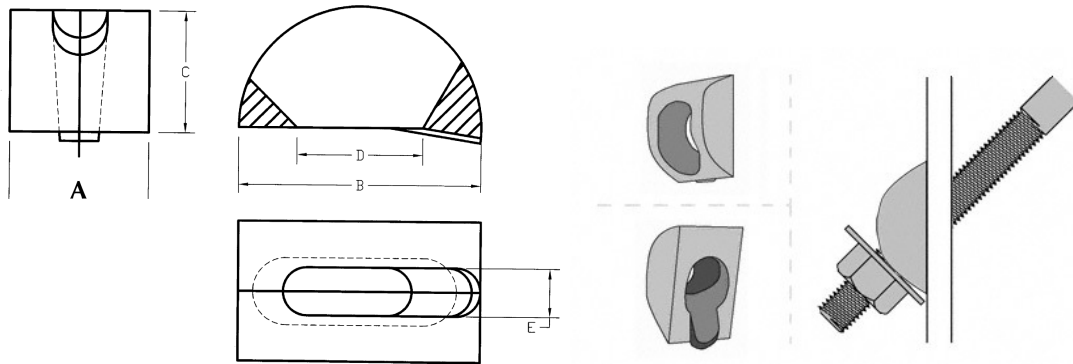


Material: Carbon Steel

WT020---Z1

Hillside Washers

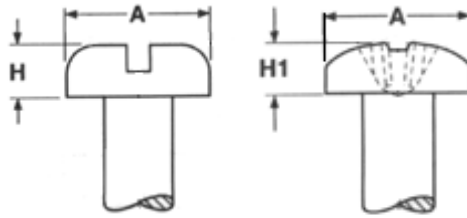
(Cast Iron)



WHILLCIO---

SIZE	A		B		C		D		E	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
3/8"	1-3/16		1-3/4		7/8		13/16		7/16	
1/2"	1.29	1.35	1.97	2.03	0.97	1/2"	1.29	1.35	1.97	2.03
5/8"	1.41	1.47	2.22	2.28	1.10	5/8"	1.41	1.47	2.22	2.28
3/4"	1.59	1.65	2.35	2.41	1.10	3/4"	1.59	1.65	2.35	2.41
7/8"	1.78	1.84	2.85	2.91	1.28	7/8"	1.78	1.84	2.85	2.91
1"	1.97	2.03	3.10	3.16	1.60	1"	1.97	2.03	3.10	3.16
1-1/4"	2-3/8		4-3/4		1-11/16		2-1/4		1-1/8	

Pan Head Machine Screws



Slotted Pan Steel
 Phillips Pan Steel
 Torx Pan Steel
 Square Pan Steel

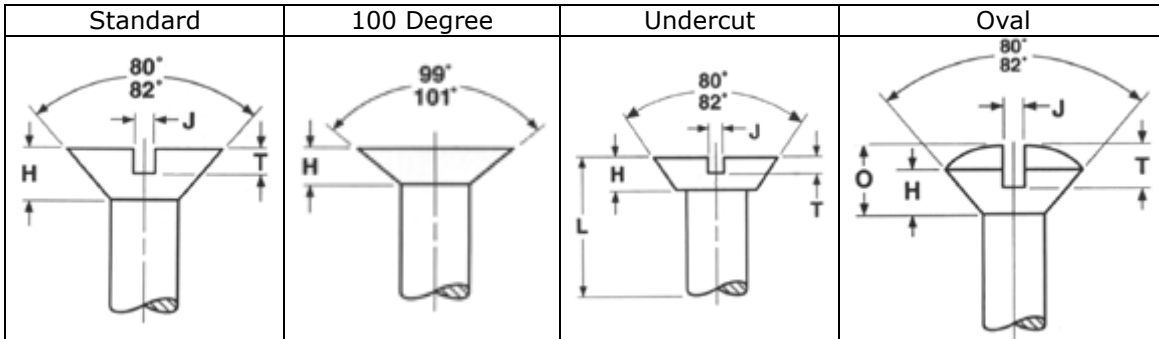
Zinc = MSP020-----Z1
 Zinc = MPP020-----Z1
 Zinc = MTP020-----Z1
 Zinc = MQP020-----Z1

Black Oxide = MSP020-----BO
 Black Oxide = MPP020-----BO
 Black Oxide = MTP020-----BO
 Black Oxide = MQP020-----BO

Nominal Size	A		H		H1		Phillips Driver Size	Torx Driver Size	Square Drive Size
	Head Diameter		Head Height Slotted		Head Height Other				
	Max	Min	Max	Min	Max	Min			
0	.116	.104	.039	.031	.044	.036	0	T8	
2	.167	.155	.053	.045	.062	.053	1		
3	.193	.180	.060	.051	.071	.062	1		
4	.219	.205	.068	.058	.080	.070	1	T10	0
5	.245	.231	.075	.065	.089	.079	2	T15	1
6	.270	.256	.082	.072	.097	.087	2		
8	.322	.306	.096	.085	.115	.105	2	T20	2
10	.373	.357	.110	.099	.133	.122	2	T25	2
12	.425	.407	.125	.1125	.151	.139	3	T30	3
1/4	.492	.473	.144	.130	.175	.162	3		
5/16	.615	.594	.178	.162	.218	.203	4		
3/8	.740	.716	.212	.195	.261	.244	4	T40	4

Dimensional specifications per ANSI B18.6.3

Flat Head Machine Screws

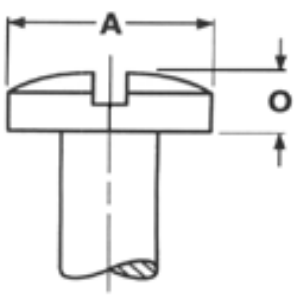


Phillips Flat	Zinc = MPF020-----Z1	Black Oxide = MPF020-----BO
Phillips Flat 100 degree	Zinc = MPF1020-----Z1	Black Oxide = MPF1020-----BO
Phillips Flat Undercut	Zinc = MPFU020-----Z1	Black Oxide = MPFU020-----BO
Phillips Oval	Zinc = MPO020-----Z1	Black Oxide = MPO020-----BO

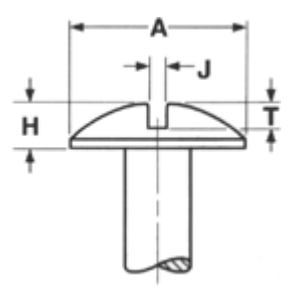
Nominal Size	A		H		100 Degree		Undercut			Oval		Phillips Driver Size
	Head Diameter		Head Height		Head Height		These Lengths or Shorter are Undercut	Head Height		Protrusion Above Gaging Diameter		
	Max	Min	Max	Min	Max	Min		Max	Min	Max	Min	
0	.112	.096	.035	.026	.026	.019	1/8	.025	.018	.047	.031	0
1	.137	.120	.043	.033			1/8	.031	.023	.053	.035	0
2	.162	.144	.051	.040	.037	.029	1/8	.036	.028	.058	.039	1
3	.187	.167	.059	.047						.064	.044	1
4	.212	.191	.067	.055	.049	.039	3/16	.047	.038	.069	.048	1
5	.237	.215	.075	.062			3/16	.053	.043	.075	.053	2
6	.262	.238	.083	.069	.060	.049	3/16	.059	.048	.080	.057	2
8	.312	.285	.100	.084	.072	.060	1/4	.070	.058	.091	.066	2
10	.362	.333	.116	.098	.083	.070	5/16	.081	.068	.102	.075	2
12	.412	.380	.132	.112			3/8	.092	.078	.113	.084	3
¼	.477	.442	.153	.131	.110	.094	7/16	.107	.092	.129	.095	3
5/16	.597	.556	.191	.165			1/2	.134	.116	.155	.117	4
3/8	.717	.670	.230	.200			9/16	.161	.140	.182	.139	4
½	.815	.765	.223	.186			3/4	.156	.130	.212	.163	4

Dimensional specifications per [ANSI B18.6.3](#)

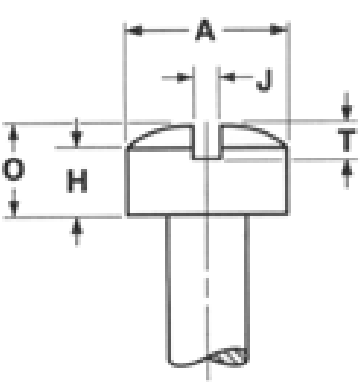
Binding Head Machine Screws

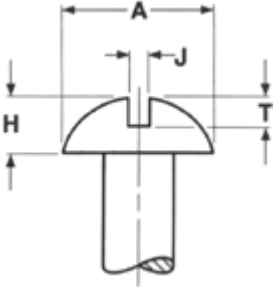
Slotted Binding Steel	Zinc = MSB020-----Z1	Black Oxide = MSB020-----BO			
Phillips Binding Steel	Zinc = MPB020-----Z1	Black Oxide = MPB020-----BO			
	Nominal Size	A	O		
		Head Diameter		Head Height	
		Max	Min	Max	Min
	2	.181	.171	.050	.043
	3	.208	.197	.059	.052
	4	.235	.223	.068	.061
	5	.263	.249	.078	.069
	6	.290	.275	.087	.078
	8	.344	.326	.105	.095
	10	.399	.378	.123	.112
1/4	.513	.488	.165	.152	

Truss Head Machine Screws

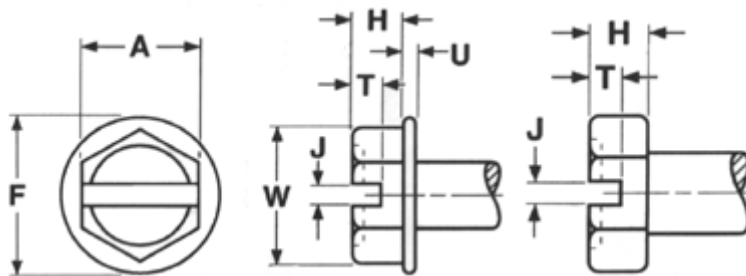
Slotted Truss Steel	Zinc = MST020-----Z1	Black Oxide = MST020-----BO			
Phillips Truss Steel	Zinc = MPT020-----Z1	Black Oxide = MPT020-----BO			
	Nominal Size	A	O		
		Head Diameter		Head Height	
		Max	Min	Max	Min
	4	.257	.241	.069	.059
	6	.321	.303	.086	.074
	8	.384	.364	.102	.088
	10	.448	.425	.118	.103
	12	.511	.487	.134	.118
	1/4	.573	.546	.150	.133
	5/16	.698	.666	.183	.162
3/8	.823	.787	.215	.191	

Fillister Head Machine Screws

Slotted Fillister Steel	Zinc = MSL020-----Z1	Black Oxide = MSL020-----BO			
Phillips Fillister Steel	Zinc = MPL020-----Z1	Black Oxide = MPL020-----BO			
	Nominal Size	A	O		
		Head Diameter		Head Height	
		Max	Min	Max	Min
	2	.140	.124	.083	.066
	3	.161	.145	.095	.077
	4	.183	.166	.107	.088
	5	.204	.187	.120	.100
	6	.226	.208	.132	.111
	8	.270	.250	.156	.133
	10	.313	.292	.180	.156
12	.357	.334	.205	.178	
1/4	.414	.389	.237	.207	
5/16	.518	.490	.295	.262	
3/8	.622	.590	.355	.315	

Round Head Machine Screws					
Slotted Round Steel	Zinc = MSR020-----Z1	Black Oxide = MSR020-----BO			
Phillips Round Steel	Zinc = MPR020-----Z1	Black Oxide = MPR020-----BO			
	Nominal Size	A		H	
		Head Diameter		Head Height	
		Max	Min	Max	Min
	2	.162	.146	.069	.059
	3	.187	.169	.078	.067
	4	.211	.193	.086	.075
5	.236	.217	.095	.083	
6	.260	.240	.103	.091	
8	.309	.287	.120	.107	
10	.359	.334	.137	.123	
12	.408	.382	.153	.139	
¼	.472	.443	.175	.160	
5/16	.590	.557	.216	.198	

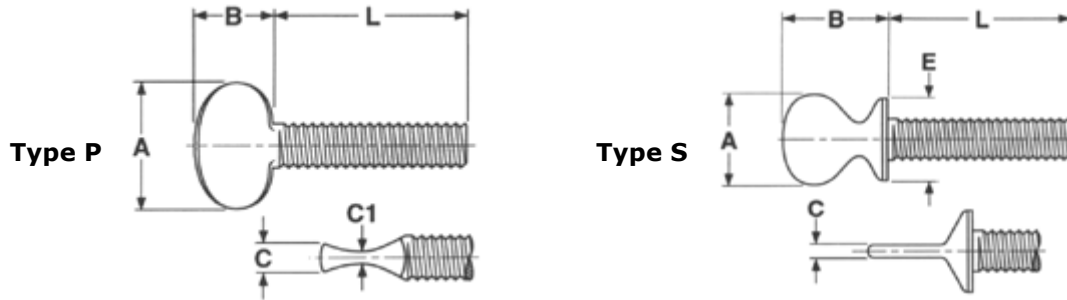
Hex Head Machine Screws



UnSlotted Hex	Zinc = MH020-----Z1	Black Oxide = MH020-----BO
Slotted Hex Steel	Zinc = MHS020-----Z1	Black Oxide = MHS020-----BO
UnSlotted Hex Washer	Zinc = MHW020-----Z1	Black Oxide = MHW020-----BO
Slotted Hex Washer	Zinc = MHWS020-----Z1	Black Oxide = MHWS020-----BO

Nominal Size	A		W	H		F		U	
	Across Flats			Head Height		Washer Diameter		Washer Thickness	
	Max	Min	Max	Min	Max	Min	Max	Min	
2	.125	.120	.134	.050	.040	.166	.154	.016	.010
4	.188	.181	.202	.060	.049	.243	.225	.019	.011
5	.188	.181	.202	.070	.058	.260	.240	.025	.015
6	.250	.244	.272	.093	.080	.328	.302	.025	.015
8	.250	.244	.272	.110	.096	.348	.322	.031	.019
10	.312	.305	.340	.120	.105	.414	.384	.031	.019
12	.312	.305	.340	.155	.139	.432	.398	.039	.022
1/4	.375	.367	.409	.190	.172	.520	.480	.050	.030
5/16	.500	.489	.545	.230	.208	.676	.624	.055	.035
3/8	.562	.551	.614	.295	.270	.780	.720	.063	.037
1/2	.750	.735	.820	.400	.367	1.040	.960	.085	.050

Thumb Machine Screws



Thumb Screw no Shoulder, Type P Zinc = T020-----Z1
 Thumb Screw with Shoulder, Type S Zinc = TS020-----Z1

Type P

Nominal Size	Thread Pitch	A		B		C		C1		L	
		Head Width		Head Height		Head Thickness		Head Thickness		Practical Screw Lengths	
		Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
8	32	0.51	0.49	0.32	0.30	0.09	0.07	0.04	0.02	1.00	0.38
10	24	0.89	0.83	0.78	0.66	0.18	0.16	0.08	0.06	2.00	0.50
¼	20	1.05	0.99	0.94	0.81	0.24	0.22	0.10	0.08	3.00	0.50
5/16	18	1.21	1.15	1.00	0.88	0.27	0.25	0.11	0.09	4.00	0.50

Type S

¼	20	0.55	0.52	0.64	0.61	0.07	0.05	0.47	0.44	1.50	0.50
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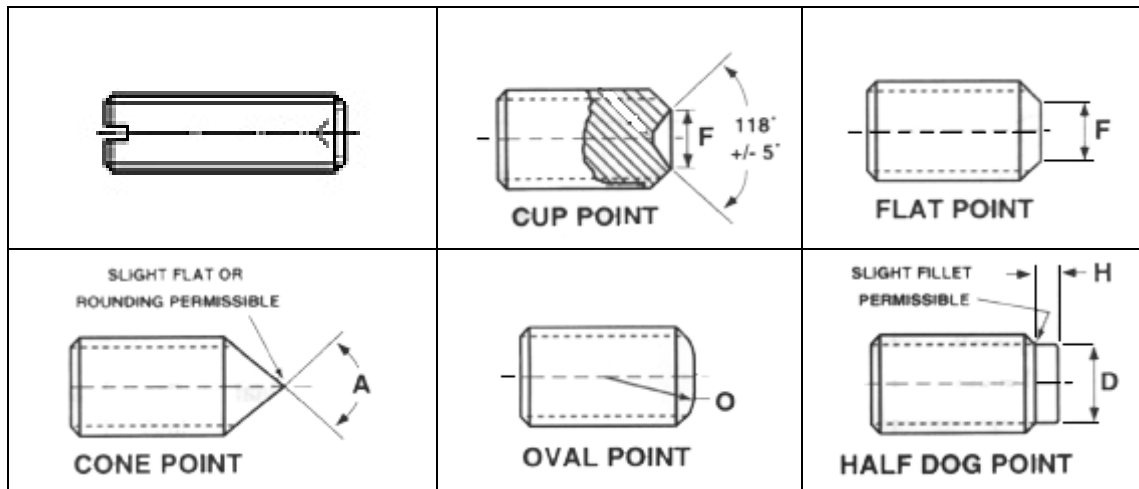
Wing Machine Screws



Shank Welded to Wing Portion
 Wing Screw Zinc = MW020-----Z1

Nominal Size	Thread Pitch	S		H		W		D		T		L	
		Wing Spread		Wing Height		Wing Thickness		Shank Diameter		Stock Thickness		Practical Screw Lengths	
		Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
8	32	0.78	0.72	0.40	0.34	0.18	0.12	0.40	0.34	0.04	0.03	0.75	0.38
10	24	0.90	0.84	0.46	0.40	0.21	0.15	0.53	0.47	0.04	0.03	1.00	0.38
¼	20	1.09	1.03	0.46	0.40	0.26	0.20	0.61	0.55	0.04	0.03	1.50	0.50
5/16	18	1.31	1.25	0.62	0.56	0.29	0.23	0.68	0.62	0.07	0.05	1.50	0.50

Slotted Set Screws



Cup Point (standard)	Alloy - SSC800-----	Stainless = SSC188-----
Flat Point	Alloy - SSFP800-----	Stainless = SSFP188-----
Cone Point	Alloy - SSCP800-----	Stainless = SSCP188-----
Oval Point	Alloy - SSOP800-----	Stainless = SSOP188-----
Half Dog Point	Alloy - SSHD800-----	Stainless = SSHD188-----
Full Dog Point	Alloy - SSFD800-----	Stainless = SSFD188-----

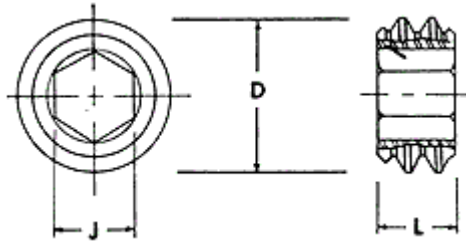
Class 3A Fit Alloy: Rockwell Hardness 38-43

Nominal Size	S	K	F		O	D		H	
	Hexagon Socket Size	Min Key Engagement	Cup & Flat Point Diameter		Oval Point Radius	Half Dog Point			
			Max	Min		Diameter		Length	
						Max	Min	Max	Min
4	0.050	0.070	0.061	0.051	0.084	0.075	0.070	0.030	0.026
5	1/16	0.080	0.067	0.057	0.094	0.083	0.078	0.033	0.027
6	1/16	0.080	0.074	0.064	0.104	0.092	0.087	0.038	0.032
8	5/64	0.090	0.087	0.076	0.123	0.109	0.103	0.043	0.037
10	3/32	0.100	0.102	0.088	0.142	0.127	0.120	0.049	0.041
1/4	1/8	0.125	0.132	0.118	0.188	0.156	0.149	0.067	0.059
5/16	5/32	0.156	0.172	0.156	0.234	0.203	0.195	0.082	0.074
3/8	3/16	0.188	0.212	0.194	0.281	0.250	0.241	0.099	0.089
7/16	7/32	0.219	0.252	0.232	0.328	0.297	0.287	0.114	0.104
1/2	1/4	0.250	0.291	0.270	0.375	0.344	0.334	0.130	0.120
5/8	5/16	0.312	0.371	0.347	0.469	0.469	0.456	0.164	0.148
3/4	3/8	0.375	0.450	0.425	0.562	0.562	0.549	0.196	0.180
7/8	1/2	0.500	0.530	0.502	0.656	0.656	0.642	0.227	0.211
1	9/16	0.562	0.609	0.579	0.750	0.750	0.734	0.260	0.240

Per ANSI/ASME B18.3

Note: Half Dog, Full Dog and Cone points are measured in overall length.

Socket Jam Screws



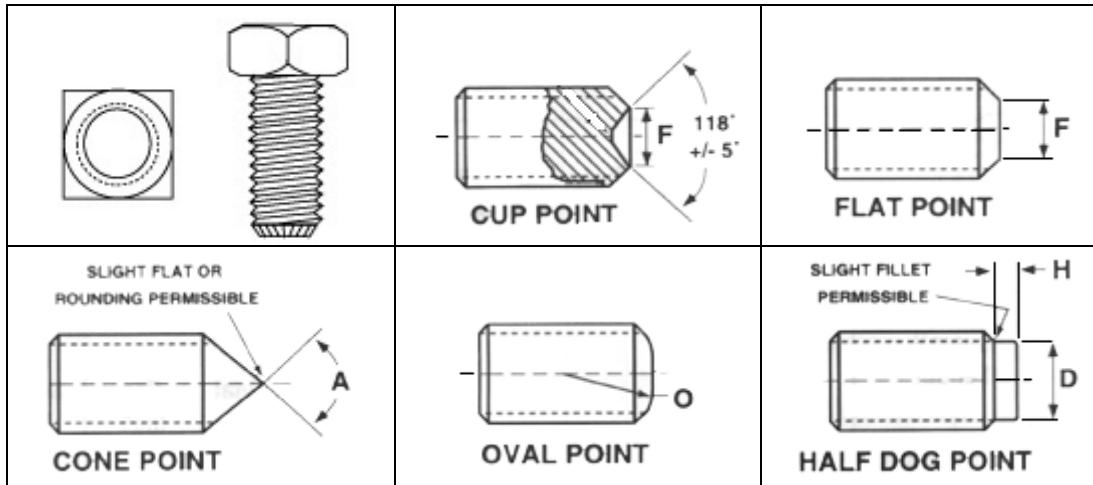
Alloy - SHJS800----

Stainless = SSC188-----

Nominal Size	D		J		H		
	Basic Screw Diameter	Nominal Socket Size	Length				
			Nom.	Max	Min		
4	0.1120		0.0500	0.0781	0.0880	0.0680	
8	0.1640	5/64	0.0781	0.1094	0.1190	0.0990	
10	0.1900	3/32	0.0937	0.1250	0.1350	0.1150	
1/4	0.2500	1/8	0.1250	0.1250	0.1350	0.1150	
5/16	0.3125	5/32	0.1562	0.1562	0.1660	0.1460	
3/8	0.3750	3/16	0.1875	0.1875	0.1970	0.1770	
7/16	0.4375	7/32	0.2187	0.2187	0.2280	0.2080	
1/2	0.5000	1/4	0.2500	0.2500	0.2600	0.2400	
5/8	0.6250	5/16	0.3125	0.3125	0.3220	0.3020	
3/4	0.7500	3/8	0.3750	0.3750	0.3850	0.3650	
7/8	0.8750	1/2	0.5000	0.4375	0.4470	0.4270	
1	1.0000	9/16	0.5625	0.5000	0.5100	0.4900	

Threads are Class 3A, UNC or UNF

Square Head Set Screws (Jack Bolt)











Cup Point (standard)	Plain - QSC010-----	Zinc - QSC010-----	Stainless = QSC188----
Flat Point	Plain - QSFP010-----	Zinc - QSFP010-----	Stainless = QSFP188---
Cone Point	Plain - QSCP010-----	Zinc - QSCP010-----	Stainless = QSCP188--
Oval Point	Plain - QSOP010-----	Zinc - QSOP010-----	Stainless = QSOP188--
Half Dog Point	Plain - QSHD010-----	Zinc - QSHD010-----	Stainless = QSHD188--
Full Dog Point	Plain - QSFD010-----	Zinc - QSFD010-----	Stainless = QSFD188--









Class 3A Fit Rockwell Hardness 38-43


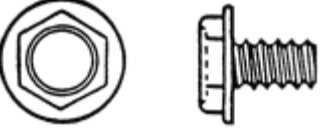
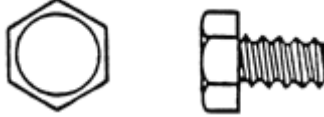
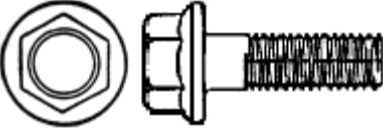
Nominal Size	Across Flats		Across Corners		Head Height	
	Max	Min	Max	Min	Max	Min
10	0.188	0.180	0.265	0.247	0.148	0.134
1/4	0.250	0.241	0.354	0.331	0.196	0.178
5/16	0.312	0.302	0.442	0.415	0.245	0.224
3/8	0.375	0.362	0.530	0.497	0.293	0.270
7/16	0.438	0.423	0.619	0.51	0.341	0.315
1/2	0.500	0.484	0.707	0.665	0.389	0.631
9/16	0.562	0.545	0.795	0.748	0.437	0.407
5/8	0.625	0.606	0.884	0.833	0.485	0.452
3/4	0.750	0.729	1.060	1.001	0.582	0.544
7/8	0.875	0.852	1.237	1.170	0.678	0.635
1	1.000	0.974	1.414	1.337	0.774	0.726
1-1/8	1.125	1.096	1.591	1.505	0.870	0.817
1-1/4	1.250	1.219	1.768	1.674	0.966	0.908
1-3/8	1.375	1.342	1.945	1.843	1.063	1.000
1-1/2	1.500	1.464	2.121	2.010	1.159	1.091

Note: Half Dog, Full Dog and Cone points are measured in overall length.

Drive Style							
							
SLOT	PHILLIPS	SLOTTED PHILLIPS COMBO	SQUARE	PHILLIPS SQUARE COMBO	PHILLIPS HEX HEAD	SLOTTED HEX	SIX LOBE

TYPES OF BOLT AND SCREW HEADS

	<p>PAN HEAD: Recommended for new designs to replace round, truss and binding heads. Provides a low large diameter head, but with characteristically high outer edge along the outer periphery of the head where drive action is most effective for high tightening torques. Slightly different head contour where supplied with recessed head. See dotted line.</p>
	<p>ROUND HEAD: Not recommended for new design (see pan head). This head was the most universally used design in the past.</p>
	<p>FILLISTER HEAD: The standard oval fillister head has a smaller diameter than the round head, but is higher with a correspondingly deeper slot. The small diameter head increases the pressure applied on the smaller area and can be assembled close to flanges and raised surfaces</p>
	<p>BINDING HEAD (Straight Side): Most generally used in electrical and radio work because of its identifying undercut beneath the head, which binds and eliminates fraying of stranded wire. A medium - low head with ordinarily sufficient bearing surface. Not recommended as a Phillips Recessed head – see Pan Head for better functional design.</p>
	<p>TRUSS HEAD: Also known as oven head, stove head, and oval binding head. A low, large diameter head that can be used to cover larger diameter clearance holes in sheet metal when additional play in assembly tolerance is required.</p>
	<p>ONE-WAY HEAD: This tamper-proof type of head, once assembled cannot be removed, yet is driven with a standard screwdriver.</p>
	<p>FLAT AND OVAL HEADS (UNDERCUT): The standard flat or oval head 80° to 82° counter sunk screw will fit a standard counterbored hole and is particularly adaptable to flush assemblies in thin stock.</p>
	<p>SQUARE SHOULDER SCREWS: An adaptation of the standard carriage bolt design. Possesses a truss head on a square shank, which resists rotation when located or driven into place.</p>

	<p>INDENTED HEXAGON: A wrench head fastener made to standard hexagon head dimensions. The hex possesses an identifying depression in the top surface of the head.</p>
	<p>INDENTED HEXAGON WASHER HEAD: The same as the standard indented hexagon head but with a washer section at the base of the head to protect the finish of the assembly from wrench disfigurement, and to economically replace a separate bolt & washer assembly.</p>
	<p>HEXAGON HEAD (TRIMMED): This is the standard type of wrench-applied hexagon head, characterized by clean, sharp corners trimmed to close tolerances. Recommended for general commercial applications.</p>
	<p>HEX FLANGE: Similar to hex washer with the exception that the top of the washer-flange shall be conical or slightly rounded within the periphery of the flange diameter. The contour of the flange edges shall be optional provided minimum flange thickness is maintained.</p>

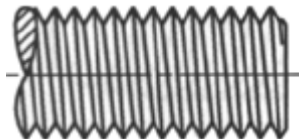
Machine Screws

External Threads - Class 2A



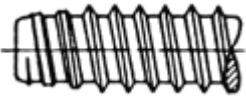
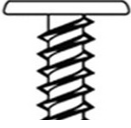
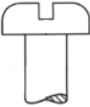


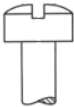



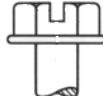
Nominal Size & Threads/Inch & Series Designation		Allowance	Major Diameter		Pitch Diameter		
			Max	Min	Max	Min	Tolerance
0-80	UNF	0.0005	0.0595	0.0563	0.0514	0.0496	0.0018
1-64	UNC	0.0006	0.0724	0.0686	0.0623	0.0603	0.0020
1-72	UNF	0.0006	0.0724	0.0689	0.0634	0.0615	0.0019
2-56	UNF	0.0006	0.0854	0.0813	0.0738	0.0717	0.0021
2-64	UNF	0.0006	0.0854	0.0816	0.0753	0.0733	0.0020
3-48	UNF	0.0007	0.0938	0.0938	0.0848	0.0825	0.0023
3-56	UNF	0.0007	0.0983	0.0942	0.0867	0.0845	0.0022
4-40	UNF	0.0008	0.1112	0.1061	0.0950	0.0925	0.0025
4-48	UNF	0.0007	0.1113	0.1068	0.0978	0.0954	0.0024
5-40	UNC	0.0008	0.1242	0.1191	0.1080	0.1054	0.0026
5-44	UNF	0.0007	0.1243	0.1195	0.1095	0.1070	0.0025
6-32	UNF	0.0008	0.1372	0.1312	0.1169	0.1141	0.0028
6-40	UNF	0.0008	0.1372	0.1321	0.1210	0.1184	0.0026
8-32	UNF	0.0009	0.1631	0.1571	0.1428	0.1399	0.0029
8-36	UNF	0.0008	0.1632	0.1577	0.1452	0.1424	0.0028
10-24	UNF	0.0010	0.1890	0.1818	0.1619	0.1586	0.0033
10-32	UNF	0.0009	0.1891	0.1831	0.1688	0.1658	0.0030
12-24	UNF	0.0010	0.2150	0.2078	0.1879	0.1845	0.0034
12-28	UNF	0.0010	0.2150	0.2085	0.1918	0.1886	0.0032
1/4-20	UNF	0.0011	0.2489	0.2408	0.2164	0.2127	0.0037
1/4-28	UNF	0.0010	0.2490	0.2425	0.2258	0.2225	0.0033
5/16-18	UNF	0.0012	0.3113	0.3026	0.2752	0.2712	0.0040
5/16-24	UNF	0.0011	0.3114	0.3042	0.2843	0.2806	0.0037
3/8-16	UNF	0.0013	0.3737	0.3643	0.3331	0.3287	0.0044
3/8-24	UNF	0.0011	0.3739	0.3667	0.3468	0.3430	0.0038
7/16-14	UNF	0.0014	0.4361	0.4258	0.3897	0.3850	0.0047
7/16-20	UNF	0.0013	0.4362	0.4281	0.4037	0.3995	0.0042
1/2-13	UNF	0.0015	0.4985	0.4876	0.4485	0.4435	0.0050
1/2-20	UNF	0.0013	0.4987	0.4906	0.4662	0.4619	0.0043
9/16-12	UNF	0.0016	0.5609	0.5495	0.5068	0.5016	0.0052
9/16-18	UNF	0.0014	0.5611	0.5524	0.5250	0.5205	0.0045
5/8-11	UNF	0.0016	0.6234	0.6113	0.5644	0.5589	0.0055
5/8-18	UNF	0.0014	0.6236	0.6149	0.5875	0.5828	0.0047
3/4-10	UNF	0.0018	0.7482	0.7353	0.6832	0.6773	0.0059
3/4-16	UNF	0.0015	0.7485	0.7391	0.7079	0.7029	0.0050
7/8-9	UNF	0.0019	0.8731	0.8592	0.8009	0.7946	0.0063
7/8-14	UNF	0.0016	0.8834	0.8631	0.8270	0.8216	0.0054
1-8	UNF	0.0020	0.9980	0.9830	0.9168	0.9100	0.0068
1-12	UNF	0.0018	0.9982	0.9868	0.9441	0.9382	0.0059
1-14	UNF	0.0017	0.9983	0.9880	0.9519	0.9463	0.0056
11/8-7	UNF	0.0022	1.1228	1.1064	1.0300	1.0228	0.0072
11/8-8	UNF	0.0021	1.1229	1.1079	1.0417	1.0348	0.0069
11/8-12	UNF	0.0018	1.1232	1.1118	1.0691	1.0631	0.0060
11/4-7	UNF	0.022	1.2478	1.2314	1.1550	1.1476	0.0074
1114-8	UNF	0.0021	1.2479	1.2329	1.1667	1.1597	0.0070

1 1/4-12	UNF	0.0018	1.2482	1.2368	1.1941	1.1879	0.0062
1 3/8-6	UNC	0.0024	1.3726	1.3544	1.2643	1.2563	0.0080
1 3/8-8	UN	0.0022	1.3728	1.3578	1.2916	1.2844	0.0072
1 3/8-12	UNF	0.0019	1.3731	1.3617	1.3190	1.3127	0.0063
1 1/2-6	UNC	0.0024	1.4976	1.4794	1.3893	1.3812	0.0081
1 1/2-8	UN	0.0022	1.4978	1.4828	1.4166	1.4093	0.0073
1 1/2-12	UNC	0.0019	1.4981	1.4867	1.4440	1.4376	0.0064
1 5/8-8	UN	0.0022	1.6228	1.6087	1.5416	1.5342	0.0074
1 3/4-5	UNC	0.0027	1.7473	1.7268	1.6174	1.6085	0.0089
1 3/4-8	UN	0.0023	1.7477	1.7327	1.6665	1.6590	0.0075
1 7/8-8	UN	0.0023	1.8727	1.8577	1.7915	1.7838	0.0077
2-4 1/2	UNC	0.0029	1.9971	1.9751	1.8528	1.8433	0.0095
2-8	UN	0.0023	1.9977	1.9827	1.9165	1.9087	0.0078
2 1/4-4.5	UNC	0.0029	2.2471	2.2251	2.1028	2.0931	0.0097
2 1/4-8	UN	0.0024	2.2476	2.2326	2.1664	2.1584	0.0080
2 1/2-4	UNC	0.0031	2.4969	2.4731	2.3345	2.3241	0.0104
2 1/2-8	UN	0.0024	2.4976	2.4826	2.4164	2.4082	0.0082
2 3/4-4	UNC	0.0032	2.7468	2.7230	2.5844	2.5739	0.0105
2 3/4-8	UN	0.0025	2.7475	2.7325	2.6663	2.6580	0.0083
3-4	UNC	0.0032	2.9968	2.9730	2.8344	2.8237	0.0107
3-8	UN	0.0026	2.9974	2.9824	2.9162	2.9077	0.0085
3 1/4-4	UNC	0.0033	3.2467	3.2229	3.0843	3.0734	0.0109
3 1/4-8	UN	0.0026	3.2474	3.2324	3.1662	3.1575	0.0087
3 1/2-4	UNC	0.0033	3.4967	3.4729	3.3343	3.3233	0.0110
3 1/2-8	UN	0.0026	3.4974	3.4824	3.4162	3.4074	0.0088
3 3/4-4	UNC	0.0034	3.7466	3.7228	3.5842	3.5730	0.0112
3 3/4-8	UN	0.0027	3.7473	3.7323	3.6661	3.6571	0.0090
4-4	UNC	0.0034	3.9966	3.9728	3.8342	3.8229	0.0113
4-8	UN	0.0027	3.9973	3.9823	3.9161	3.9070	0.0091

Nominal Screw Size	O thru I2	1/4 thru 3/4
Nominal Screw Length	Tolerance on Length	
Up to 1/2 in., Incl.	-0.02	-0.03
Over 1/2 to 1 in., Incl.	-0.03	-0.03
Over 1 to 2 in., Incl.	-0.06	-0.06
Over 2 in.	-0.09	-0.09



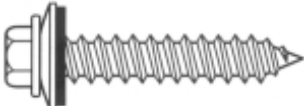

Sheet Metal Screws

Type 'A'		Type 'AB' (most common)		Type 'B'
				
Pan	Truss	Round	Fillister	
				
Binder	Oval	Hex	Hex Washer	
				

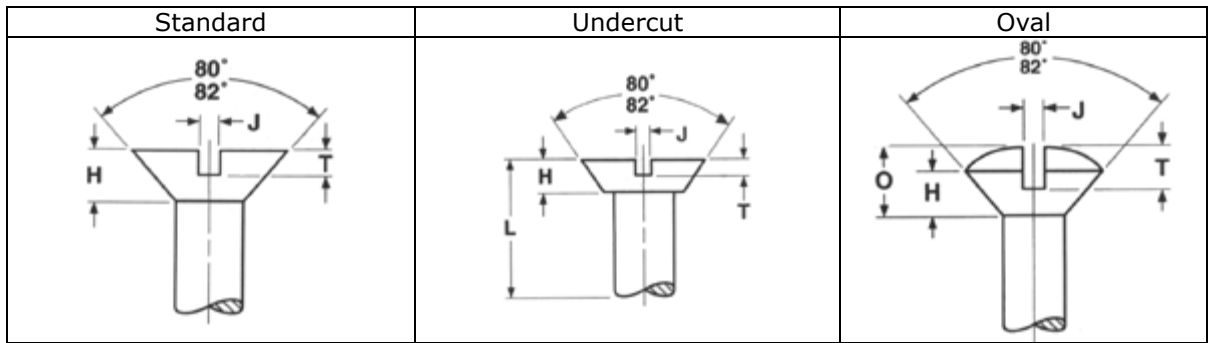
Slotted Pan	TSPK010-----Z1	Phillips Pan	TPPK010-----Z1
Slotted Flat	TSFK010-----Z1	Phillips Flat	TPFK010-----Z1
Slotted Truss	TSTK010-----Z1	Phillips Truss	TPTK010-----Z1
Slotted Round	TSRK010-----Z1	Phillips Round	TPRK010-----Z1
Slotted Fillister	TSLK010-----Z1	Phillips Fillister	TPLK010-----Z1
Slotted Binder	TSBK010-----Z1	Phillips Binder	TPBK010-----Z1
Slotted Oval	TSOK010-----Z1	Phillips Oval	TPOK010-----Z1
Hex Slotted Washer Face	TSWK010-----Z1	Phil Pankacke	TPPANK010-----Z1
Hex Unslotted	THK010-----Z1		
Hex Unslotted Washer	TWK010-----Z1		

Diameter	Computer Code	Computer Code
	Zinc	Stainless
#4	0041	0041
#6	0061	0060
#7	0071	0070
#8	0081	0080
#10	0102	0101
#12	0121	0120
#14	0141	0140

Type 'A'	Type 'AB'	Type 'B'
Examples	Examples	Examples
TPPA	TPPK	TPPB
TPBA	TPBK	TPBB
TPFA	TPFK	TPFB
THA	THK	THB
TSPA	TSPK	TSPB
TSBA	TSBK	TSBB

Hex SMS with Neoprene Bonded Washer		
	Type 'A'	TWWA010-----Z1
	Type 'B'	TWWB010-----Z1

Flat Head Sheet Metal Screws



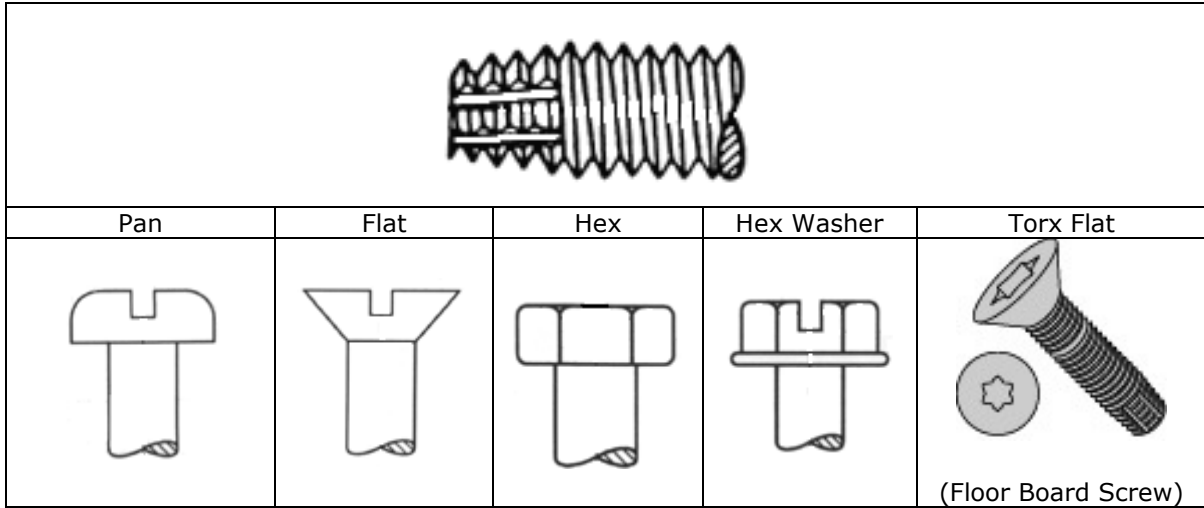
Phillips Flat Zinc = TPFK010-----Z1 Black Oxide = TPF010-----BO
 Phillips Flat Undercut Zinc = TPFUK010-----Z1 Black Oxide = TPFUK010-----BO
 Phillips Oval Zinc = TPOK010-----Z1 Black Oxide = TPOK010-----BO

Nominal Size	A		H		Undercut These Lengths or Shorter are Undercut	Head Height		Oval Protrusion Above Gaging Diameter		Phillips Driver Size
	Head Diameter		Head Height			Max	Min	Max	Min	
	Max	Min	Max	Min						
0	.112	.096	.035	.026	1/8	.025	.018	.047	.031	0
1	.137	.120	.043	.033	1/8	.031	.023	.053	.035	0
2	.162	.144	.051	.040	1/8	.036	.028	.058	.039	1
3	.187	.167	.059	.047				.064	.044	1
4	.212	.191	.067	.055	3/16	.047	.038	.069	.048	1
5	.237	.215	.075	.062	3/16	.053	.043	.075	.053	2
6	.262	.238	.083	.069	3/16	.059	.048	.080	.057	2
8	.312	.285	.100	.084	1/4	.070	.058	.091	.066	2
10	.362	.333	.116	.098	5/16	.081	.068	.102	.075	2
12	.412	.380	.132	.112	3/8	.092	.078	.113	.084	3
¼	.477	.442	.153	.131	7/16	.107	.092	.129	.095	3
5/16	.597	.556	.191	.165	1/2	.134	.116	.155	.117	4
3/8	.717	.670	.230	.200	9/16	.161	.140	.182	.139	4
½	.815	.765	.223	.186	3/4	.156	.130	.212	.163	4

Dimensional specifications per ANSI B18.6.3

Thread Cutting Screws

Type 'F'



Slotted Pan
 Slotted Flat
 Slotted Hex Washer
 Torx Floor Board

CSPF010-----Z1
 CSFF010-----Z1
 CSWF010-----Z1
 CTFF010-----

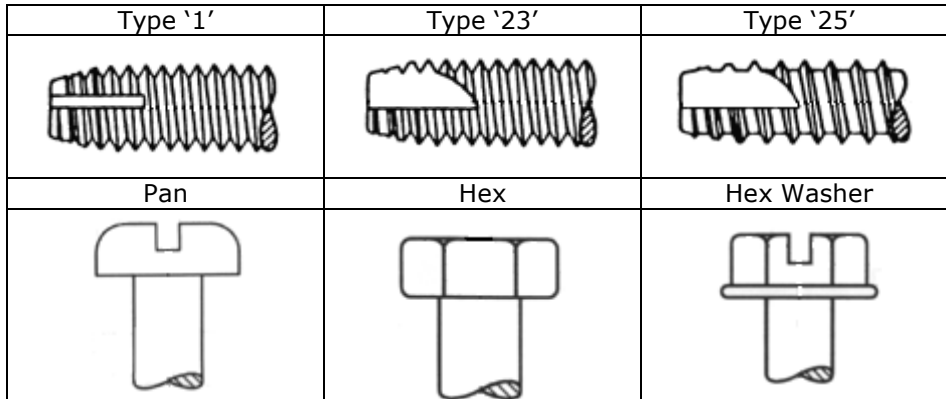
Phillips Pan
 Phillips Flat
 Hex

CPPF010-----Z1
 CPFF010-----Z1
 CHF010-----Z1

Diameter	Computer Code
#4-40	0040
#6-32	0060
#8-32	0080
#10-24	0100
#12-24	0120
#1/4-20	0250

Thread Cutting Screws

Type 1, 23 and 25



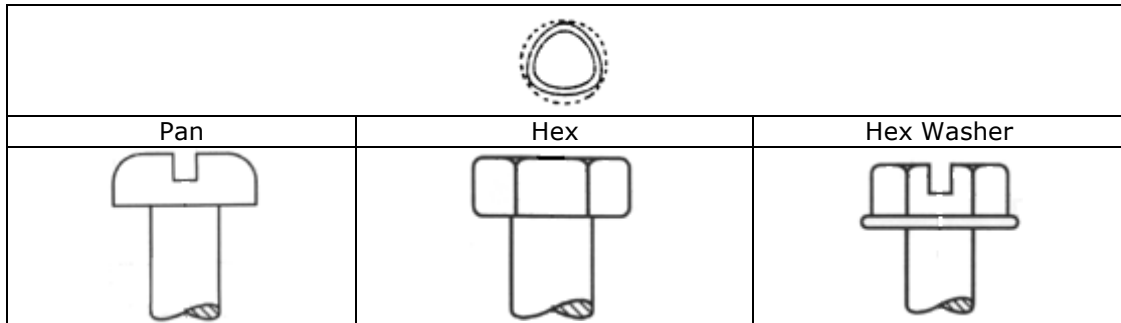
Type '1'			
Slotted Pan	CSP1010-----Z1	Phillips Pan	CPP1010-----Z1
Slotted Flat	CSF1010-----Z1	Phillips Flat	CPF1010-----Z1
Slotted Hex Washer	CSW1010-----Z1	Hex	CH1010-----Z1

Type '23'			
Slotted Pan	CSP3010-----Z1	Phillips Pan	CPP3010-----Z1
Slotted Flat	CSF3010-----Z1	Phillips Flat	CPF3010-----Z1
Slotted Hex Washer	CSW3010-----Z1	Hex	CH3010-----Z1

Type '25'			
Slotted Pan	CSP5010-----Z1	Phillips Pan	CPP5010-----Z1
Slotted Flat	CSF5010-----Z1	Phillips Flat	CPF5010-----Z1
Slotted Hex Washer	CSW5010-----Z1	Hex	CH5010-----Z1

Diameter	Computer Code
#4-40	0040
#6-32	0060
#8-32	0080
#10-24	0100
#12-24	0120
#1/4-20	0250

Thread Rolling Screws or Thread Forming Screws (Tri-Round)



Slotted Hex Washer
Hex Washer

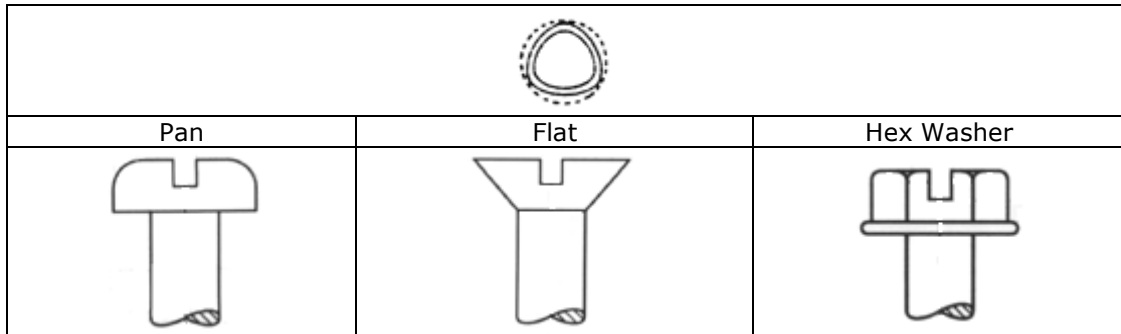
RSW010-----Z1
RW010-----Z1

Phillips Pan
Hex

RPP010-----Z1
RH010-----Z1

Diameter	Computer Code
#4-40	0040
#6-32	0060
#8-32	0080
#10-24	0100
#12-24	0120
#1/4-20	0250

Plastite Screws (Tri-Round with Type "A" SMS thread)



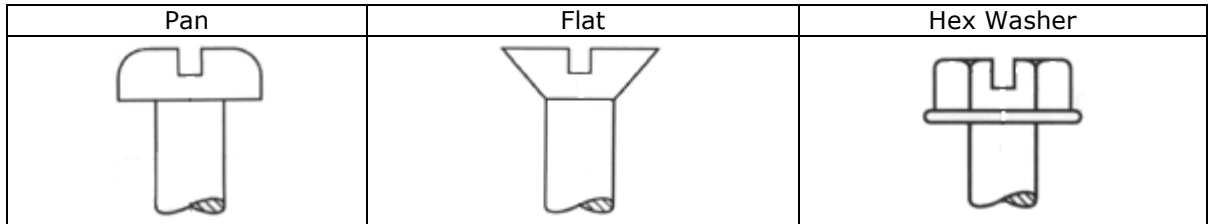
Phillips Pan
Phillips Flat

CPPP010-----Z1
CPFP010-----Z1

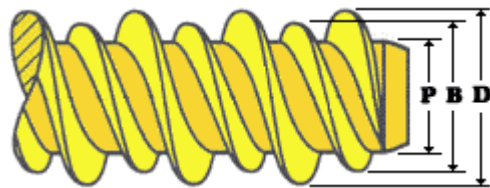
Hex Wash

CSWH010-----Z1

Hi/Low Screws











Phillips Pan Zinc = TPPHL010-----Z1 Hex Washer Zinc = TWHL010-----Z1
 Phillips Flat Zinc = TPFHL010-----Z1 Hex Slot Washer Zinc = TSWHL010-----Z1




Nominal Size	D		B	P	Pilot Hole Diameter Flexural Modulus of Plastic		Protrusion Above Gaging Diameter
	High Thread Diameter	Low Thread Diameter	Point Diameter	Up to 200,000 PSI		Minimum Torsional Strength (Lbb In)	
				200,000-400,000 PSI			
2-32	.084-.090	.069	.050-.058	.0670	.0700	4	
4-24	.105-.115	.086	.061-.070	.0810	.0860		
6-19	.135-.145	.108	.080-.090	.1015	.1100		
8-18	.160-.170	.130	.095-.105	.1200	.1285	18	
10-16	.185-.195	.145	.099-.110	.1360	.1440	30	
12-16	.210-.220	.167	.125-.137	.1570	.1660	39	
1/4-15	.250-.260	.200	.161-.175	.1890	.2010	56	

Self Drilling Screws

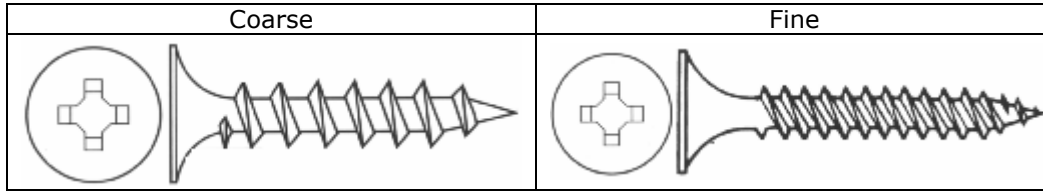
			
Pan	Bugle	Torx Wafer	Phillips Mod Truss
		 (Wall Liner Screw)	
Hex Washer	Hex with Neo Washer	Hex with Neo Washer 'Stitching'	
		 This has a larger shaft diameter to fix errors during construction	

Phillips Pan	KPP010-----Z1	Hex Washer	KH010-----Z1
Phillips Bugle	KPB010-----Z1	Hex with Neo Washer	KSW010-----Z1
Torx Wafer Head	KTV010-----Z1	Hex with Neo Washer 'Stitching'	KSW010-----Z1
Phillips Flat	KPF010-----Z1		
Phillips Mod Truss	KPMD010-----Z1		
K-Lath Screw			

Diameter	Computer Code
#4	0041
#6	0061
#7	0071
#8	0081
#10	0102
#12	0121
#14	0141


Phillips Flat Self Drill with Wings		
 (for attaching wood to metal)	12-24 X 2	KPFW0100120032Z1
	12-24 X 2 1/2	KPFW0100120040CR

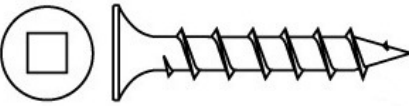
Drywall and Decking Screws



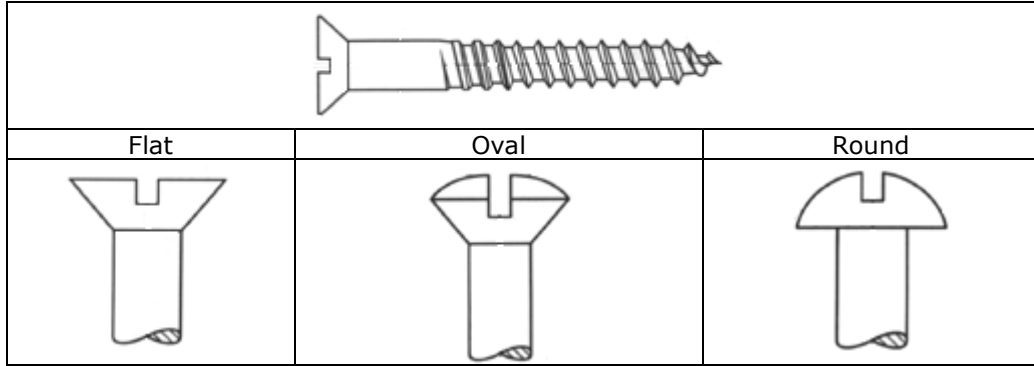
* Decking screws are commonly referred to as type #17, but type #17 have an unthreaded portion. *

	Coarse	Fine	Decking
6 X 1	DWPBC010006X016	DWPB010006X016	DPBC010006X016D1
6 X 1 1/8	DWPBC010006X018	DWPB010006X018	DPBC010006X018D1
6 X 1 1/4	DWPBC010006X020	DWPB010006X020	DPBC010006X020D1
6 X 1 5/8	DWPBC010006X026	DWPB010006X026	DPBC010006X026D1
6 X 2	DWPBC010006X032	DWPB010006X032	DPBC010006X032D1
6 X 2 1/4	DWPBC010006X036	DWPB010006X036	DPBC010006X036D1
7 X 2	DWPBC010007X032		
7 X 2 1/2	DWPBC010007X040	DWPB010007X040	
8 X 3	DWPBC010008X048	DWPB010008X048	DPBC010008X048D1
10 X 1 1/2	DWPBC010010X024	DWPB010010X024	DPBC010010X024D1
10 X 3 3/4		DWPB010010X060	DPBC010010X060D1
10 X 4 1/2		DWPB010010X072	
10 X 5		DWPB010010X080	
10 X 6		DWPB010010X096	

Phillips Modified Truss		
	Standard Zinc	DWPMT010-----Z1

Square Drive Decking Screw		
	Standard Zinc	DQBC010-----Z1
	Sq Drive Trim head	DWQT010-----
	Sq Drive #17	DQR17010-----

Wood Screws

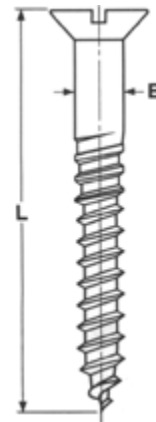


Slotted Flat	WSSF020-----Z1	Phillips Pan	TPPK020-----Z1
Slotted Oval	WSSO020-----Z1	Phillips Truss	TPTK020-----Z1
Slotted Round	WSSR020-----Z1	Phillips Round	TPRK020-----Z1

Diameter	Computer Code
#4	0040
#6	0060
#7	0070
#8	0080
#10	0100
#12	0120
#14	0140

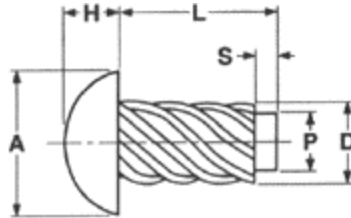
Wood Screws

Nominal Size or Basic Screw Diameter		Threads per Inch	E	
			Body Diameter	
			Max.	Min.
4	0.112	22	0.116	0.105
5	0.125	20	0.129	0.118
6	0.138	18	0.142	0.131
7	0.151	16	0.155	0.144
8	0.164	15	0.168	0.157
9	0.177	14	0.181	0.170
10	0.190	13	0.194	0.183
12	0.216	11	0.220	0.209
14	0.242	10	0.246	0.235



Drive Screw Type U

(Round Head)



Zinc

U010-----Z1

Stainless

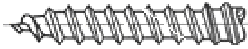
U188-----

Nominal Screw Size	Number Of Thread Starts	D		A		H		P		Recommended Hole Size	
		Outside Diameter		Head Diameter		Head Height		Pilot Diameter		Drill Size No.	Hole Diameter
		Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.		
00	6	0.060	0.057	0.099	0.090	0.034	0.026	0.049	0.046	55	0.052
0	6	0.075	0.072	0.127	0.118	0.049	0.041	0.063	0.060	51	0.067
2	8	0.100	0.097	0.162	0.146	0.069	0.059	0.083	0.080	44	0.086
4	7	0.116	0.112	0.211	0.193	0.086	0.075	0.096	0.092	37	0.104
6	7	0.140	0.136	0.260	0.240	0.103	0.091	0.116	0.113	31	0.120
7	8	0.154	0.150	0.285	0.264	0.111	0.099	0.126	0.122	29	0.136
8	8	0.167	0.162	0.309	0.287	0.120	0.107	0.136	0.132	27	0.144
10	8	0.182	0.177	0.359	0.334	0.137	0.123	0.150	0.146	20	0.161
12	8	0.212	0.206	0.408	0.382	0.153	0.139	0.177	0.173	11	0.191
14	9	0.242	0.236	0.457	0.429	0.170	0.155	0.202	0.198	2	0.221

Diameter	Computer Code
#00	0000
#0	000
#2	002
#4	004
#6	006
#7	007
#8	008
#10	010
#12	012
#14	014

SCREW POINT TYPES

Wood Screw



Wood screws taper gradually from the head to the point. Some wood screws are only partially threaded (depending on the length).

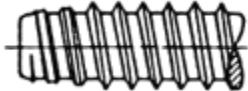
Tapping Screws (Type A, AB, B)



Type A point: A thread forming screw for use in thin metal .015 to .050 thick. Used with drilled, punched or nested holes in sheet metal, resin impregnated plywood, asbestos combinations, among others. Not recommended for new design.



Type AB point: A thread forming screw combining locating point of Type A with thread size and pitch of Type B. Normal limitations of type B apply.



Type B point: A thread forming screw for use in heavier metal .050 to .200 thick. Larger root diameter with finer thread pitch for light and heavy sheet metal non - ferrous castings, plastics, impregnated plywoods, asbestos combinations, and other materials.

Thread Cutting Screws (Type 1, 17, 23, 25, F)



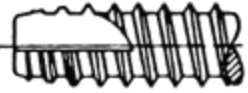
Type 1 point: A thread cutting screw with single flute for general use. Produces a fine standard machine screw thread for field replacement.



Type 17 point: A thread cutting screw for wood with a coarse tapping screw thread and a special long sharp point fluted to capture chips.



Type 23 point: A thread cutting screw in the fine thread series offering maximum thread cutting area and excellent chip clearing, with minimum tightening torques.

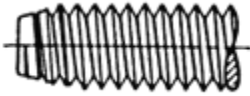


Type 25 point: A thread cutting screw similar to type 23 point except with coarse Type B thread. For plastics and other soft materials with large chip clearing and cutting edges.



Type F point: A thread cutting screw with machine screw thread with blunt tapered point, having multi - cutting edges and chip cavities. For heavy gauge sheet metal, alu - minum, zinc and lead die castings, cast iron, brass and plastic.

Thread Forming Screws (Type C, CA, Tri-Round, Lo-Driv) Screws for Plastic (Tri-Round, Round)



Type C point: A thread forming screw with either coarse or fine pitch machine screw thread and blunt tapered point. Eliminates chips and permits replacement with standard screw in the field. Higher driving torque required. Usable in heavy sheet metal and diecastings.



Type CA point: A thread forming screw with either coarse or fine pitch machine screw thread. Same as Type C except with a Gimlet point. The locating point works better than Type C where holes between two adjoining pieces of sheet metal may be somewhat misaligned.



Tri-Round: A thread forming screw in mostly coarse machine screw threads. Three vertexes perform a roll - forming process to form mating threads. Much better thread forming than Type C or CA, and drives with less torque.



Lo-Driv: A thread forming screw in mostly coarse machine screw threads. The point and body design requires low end - load for starting and low drive torque for seating. The full 360 degree body above the point provides excellent strip-to-drive ratios.

Proper Drill Bit Sizes

for Drilling Pilot Shank Holes

SCREW GAGE NUMBER	SHANK HOLE HARD & SOFT WOOD	PILOT HOLE SOFT WOOD	PILOT HOLE HARD WOOD
0	1/16"	1/64"	1/32"
1	5/64"	1/32"	1/32"
2	Mar-32	1/32"	3/64"
3	7/64"	3/64"	1/16"
4	7/64"	3/64"	1/16"
5	1/8"	1/16"	5/64"
6	9/64"	1/16"	5/64"
7	5/32"	1/16"	3/32"
8	11/64"	5/64"	3/32"
9	3/16"	5/64"	7/64"
10	3/16"	3/32"	7/64"
11	13/64"	3/32"	1/8"
12	7/32"	7/64"	1/8"
14	1/4"	7/64"	9/64"
16	17/64"	9/64"	5/32"
18	19/64"	Sep-64	3/16"
20	21/64"	11/64"	13/64"

