

BOLT PRODUCTS INC.



Engineering Guide for
Selecting the Proper Screw

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BOLT PRODUCTS INC.

Engineering Products and Fastening System Solutions

At Bolt Products Inc., we are committed to having the most knowledgeable sales staff in the industry to help guide you to make the most informed choices for your needs in a demanding world.

WE ALSO PROUDLY CARRY THE FOLLOWING QUALITY LINES



ENGINEERING SAMPLES AVAILABLE

Series of horizontal dotted lines for taking notes.

NOTES

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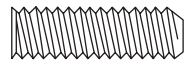
Gage Numbers	Steel Tubing (Incl. Galv. Tube) ... Birmingham (or Stubs Iron) Wire Gage, B.W.G.	Aluminum ... American - or Brown and Sharpe	Wiped Galv. Galvannealed J.P. Weirkote Aluminized Type 1 ... Galvanized Steel Sheet Gage	Cold Rolled & Hot Rolled Paintlok Stainless Steel ... Manufacturer's Standard Gage for Steel Sheet U. S. Standard (Revised)
00000	.500	.51654375
0000	.454	.4600	...	.40625
000	.425	.4096	...	.3750
00	.380	.3648	...	.34375
0	.340	.3249	...	.3125
1	.300	.2893	...	.28125
2	.284	.2576	...	.26562
3	.259	.2294	...	.2391
4	.238	.2043	...	.2242
5	.220	.1819	...	.2092
6	.203	.1620	...	.1943
7	.180	.1443	...	.1793
8	.165	.1285	.1681	.1644
9	.148	.1144	.1532	.1495
10	.134	.1019	.1382	.1345
11	.120	.09074	.1233	.1196
12	.109	.08081	.1084	.1046
13	.095	.07196	.0934	.0897
14	.083	.06408	.0785	.0747
15	.072	.05707	.0710	.0673
16	.065	.05082	.0635	.0598
17	.058	.04526	.0575	.0538
18	.049	.04030	.0516	.0478
19	.042	.03589	.0456	.0418
20	.035	.03196	.0396	.0359
21	.032	.02846	.0366	.0329
22	.028	.02535	.0336	.0299
23	.025	.02257	.0306	.0269
24	.022	.0201	.0276	.0239
25	.020	.0179	.0247	.0209
26	.018	.01594	.0217	.0179
27	.016	.01420	.0202	.0164
28	.014	.01264	.0187	.0149
29	.013	.01126	.0172	.0135
30	.012	.01003	.0157	.0120
31	.010	.00893	...	.01094
32	.009	.00795	...	.01016
33	.008	.00708	...	.00938
34	.007	.006304	...	.00859
35	.005	.005614	...	.00781
36	.004	.005	...	.00703
37	...	.004453	...	.00664
38	...	.003965	...	.00625

Kind of Material	Thread Forming					Thread Cutting					Self Drilling					Taprite	Plastite
	Type A	Type B	Type AB	Type U	Swage Form	Type 1	Type 23	Type 25	Type F	Type BF	Wedjit	Teks®	Type 17	Hi-Lo®	Go-Fast Gypsum Screw		
Sheet Metal .015 to .050 Any Material																	
Sheet Metal .050 to .200 Any Material																	
Heavy or Structural Steel .200 and up																	
Castings Non-Ferrous																	
Castings Ferrous																	
Forgings Any Material																	
UREA FORMALDEHYDE: Molded: Plaskon, Beetle, etc. MALAMINE FORMALDEHYDE: Melantite, Melamac																	
PHENOL FORMALDEHYDE: Molded: Bakelite, Durez, etc. Cast: Catalin, Marblette, etc. Laminated: Formica, Textolite, etc.																	
CELLULOSE ACETATES and NITRATES: Tenite, Lumarith, Plastacele Pyralin, Celanese, etc. ACRYLIC & STYRENE RESINS: Lucite, Plexiglass, Styron, etc.																	
NYLON PLASTICS: Nylon, Zytel																	
Drywall																	
Particle and Chip Board																	
Hard and Soft Wood																	

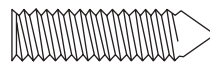
POINT TERMINOLOGY



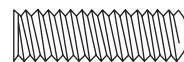
PINCH POINT (GIMLET)
Sharp threaded point. Used where point is needed in punched holes or without holes. Self tapping type A screw.



HEADER POINT
Inexpensive pointing applied at time of heading. End chamfer has smaller diameter than root diameter of thread. Chamfer angle of 30° to 45°.



CONE POINT
Cut-pointing operation providing any required included angle. A smooth surface and sharp round point. May be made to any desired contour.



ROUND POINT
A dome like rounded surface end. Used where end friction without cutting action is desirable. Dome puts pressure against other surface without disfigurement.



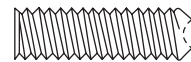
NAIL POINT (PINCHED)
Point with approximately 45° angle, very sharp and with slightly squared surface. Used for locking against a soft material



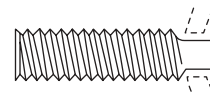
ROLLED POINT
Method producing end chamfer similar to Die Point. Last thread and a half slightly cupped by thread roll-over operation.



DOG POINT
A straight section with smaller diameter than root diameter of the thread. Extends about two-thirds the diameter of thread. Easy starting, also prevents stripping.

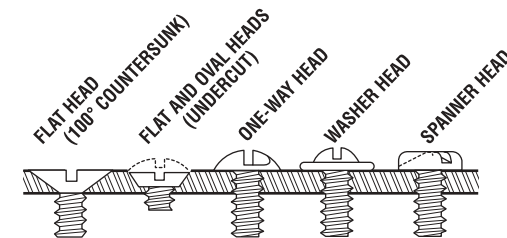
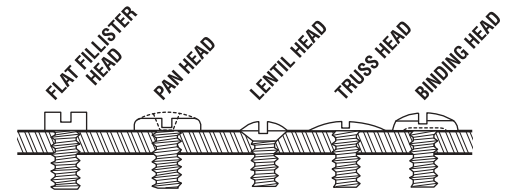
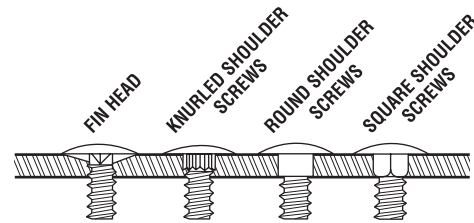
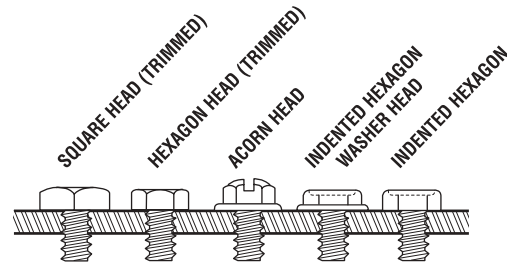
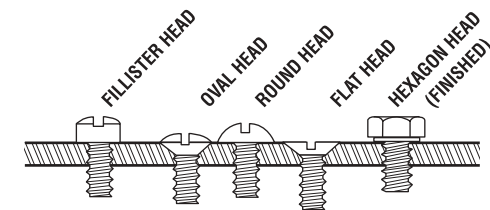


CUPPED POINT
A special cup section with a depression in the end to reduce contact area with another surface. This increases holding power under pressure.

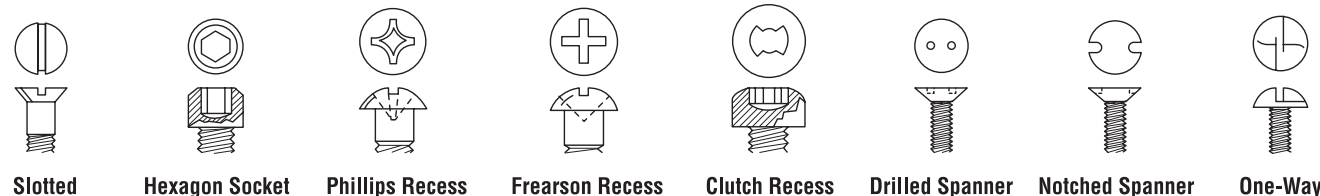


CUT POINTS
A wide variety of cut point ends may be made wherever the diameter of the straight ends are smaller than the root diameter of the threads. Excellent for free turning bearing or pressure surfaces. May be grooved, cupped or machined to a variety of contours.

HEAD TERMINOLOGY



DRIVING RECESSES



Slotted Hexagon Socket Phillips Recess Frearson Recess Clutch Recess Drilled Spanner Notched Spanner One-Way

TYPES OF CORROSION

Corrosion is a process of deterioration of a metal in which the metal combines chemically with substances in its environment.

1. UNIFORM CORROSION:

Called rust in iron or steel. This is slow oxidation of the parent metal.

2. GALVANIC CORROSION:

Caused by the coupling of unlike metals in an electrolyte that causes an electrical transfer of particles from one metal to another. Metals grouped together in the Galvanic Series are fairly safe with each other. When metals from different groups are coupled they corrode by galvanic action. The farther apart they are in the series the more will be the corrosion.

3. PITTING:

A localized breakdown in a metal that becomes the

anode and loses meta locally to the cathodic surrounding areas. The result is pitting.

4. STRESS CORROSION:

Internal or external stresses in a fastener will create paths within the grain of the metal. Corrosion is accelerated along these paths.

5. CORROSION FATIGUE:

Similar to stress corrosion but with cyclic stresses. Usually occurs faster than stress corrosion.

6. STRAY CURRENTS:

Corrosion started by outside stray electric currents or from being in contact with solutions.

GALVANIC SERIES

CORRODED END- ANODE (Last Noble)	
Magnesium	Nickel (active)
Magnesium alloys	Inconel (active)
Zinc	Brasses
Aluminum 2 S	Copper
Cadmium	Bronzes
Aluminum 21S-T4	Copper-nickel alloys
Steel or Iron	Monel
Cast Iron	Silver solder
Chromium-iron (active)	Nickel (passive)
Ni-Resist	Inconel (passive)
Type 304 Stainless (active)	Chromium-iron (passive)
Type 316 Stainless (active)	Type 304 Stainless (passive)
Lead-tin solders	Type 316 Stainless (passive)
Lead	Silver
Tin	Graphite
	Gold
	Platinum
	PROTECTED END- CATHODE (Most Noble)

PLATINGS AND FINISHES

FINISH	COLOR	ANTI-CORROSION PROPERTIES	USED WITH	CHARACTERISTICS AND USES	
BLACK ZINC	Black	Excellent	All metals	Rich and lustrous. With or without lacquering.	
CADMIUM	Bright Silver-gray Dull or burnished	Very good	Most metals	Non-porous metallic plating. Rich appearance, good rust resistance, low cost, good electrical conductivity. Bright silver gray, dull gray, or black electroplated finish.	
CHROMIUM	Bright blue-white	Excellent	All metals	Used wherever a beautiful finish is desired. Bright blue-white lustrous appearance. Electroplated.	
DICHROMATE DIP	Rainbow	Excellent	All metals	A yellow, brown, green or iridescent colored coating. This dipping process greatly increases rust resistance. Add to Zinc or Cadmium plating.	
IRIDITE	Green Olive drab Bronze	Blue Red Black	Excellent	All metals	A coloring dip which also adds rust resistance. Usually applied on Zinc or Cadmium.
NICKEL	Silver	Very good	All metals	A hard, stable, dull white or bright burnished finish. Used for appliances and hardware.	
PARKERIZING	Dull gray or black	Excellent	Ferrous metals	A chemical process of rust-proofing steel.	
PASSIVATING	---	Excellent	Stainless steels	For stainless steels. A nitric acid dip to remove foreign material and brighten finish.	
ZINC ELECTROGALVANIZED	Gray	Very good	All metals	A commonly used finish with good rust resistance, appearance and low cost.	

Also available for fasteners are the following finishes:
 ANODIZING BLUING BRASS PLATE BRONZE COPPER GOLD LEAD
 BLACK NICKEL BONDERIZING BRIGHT POLISHING CARBON BLACK EBONIZING GRAPHITE LUBRICANT SILVER
 HOT DIP ZINC LACQUERING TINNING

PLATING INFORMATION

FINISH	THICKNESS	SALT SPRAY	FINISH	THICKNESS	SALT SPRAY
Cadmium	.0001	50 Hours	Zinc	.0001	25 Hours
Cadmium	.0002	100 Hours	Zinc	.0002	36 Hours
Cadmium	.0003	150 Hours	Zinc	.0003	48 Hours
Cadmium	.0004	200 Hours	Zinc (Mechanical)	.0004	24 Hours
Cadmium (Mechanical)	.0004	48 Hours	Clear Chromate	---	Adds 24 Hours to Cad or Zinc
Chromium	.0002	16 Hours	Dichromate Dip	---	Adds 72 Hours to Cad or Zinc
Chromium	.0003	25 Hours	Olive Drap Iridite	---	Adds 100 Hours to Cad or Zinc
Nickel	.0001	12 Hours			
Nickel (Black)	.0002	25 Hours			
Parkerize & Oil	.0001	48 Hours			
Phosphate & Oil	.0001	48 Hours			

SUGGESTED HOLE SIZES AT PERCENTAGES OF THREAD ENGAGEMENT

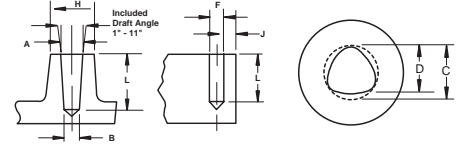
Inch Sizes	Norm Screw Size	PERCENT THREAD ENGAGEMENT PILOT HOLE SIZE													
		100	95	90(1)	85(1)	80	75	70	65	60	55	50	45	40	35
		2-56	.0744	.0750	.0756	.0761	.0767	.0773	.0779	.0785	.0790	.0796	.0802	.0808	.0814	.0819
3-48	.0855	.0861	.0868	.0875	.0882	.0888	.0895	.0902	.0909	.0916	.0922	.0929	.0936	.0943	
4-40	.0958	.0966	.0974	.0982	.0990	.0998	.1006	.1014	.1023	.1031	.1039	.1047	.1055	.1063	
5-40	.1088	.1096	.1104	.1112	.1120	.1128	.1136	.1144	.1153	.1161	.1169	.1177	.1185	.1193	
6-32	.1177	.1187	.1197	.1207	.1217	.1228	.1238	.1248	.1258	.1268	.1278	.1289	.1299	.1309	
8-32	.1437	.1447	.1457	.1467	.1478	.1488	.1498	.1508	.1518	.1528	.1538	.1549	.1559	.1569	
10-24	.1629	.1643	.1656	.1670	.1683	.1697	.1710	.1724	.1738	.1751	.1765	.1778	.1792	.1805	
10-32	.1697	.1707	.1717	.1727	.1738	.1748	.1758	.1768	.1778	.1788	.1798	.1809	.1819	.1829	
12-24	.1889	.1903	.1916	.1930	.1943	.1957	.1970	.1984	.1998	.2011	.2025	.2038	.2052	.2065	
1/4-20	.2175	.2191	.2208	.2224	.2240	.2256	.2273	.2289	.2305	.2321	.2338	.2354	.2370	.2386	
5/16-18	.2764	.2782	.2800	.2818	.2836	.2854	.2872	.2890	.2908	.2926	.2944	.2963	.2981	.2999	
3/8-16	.3344	.3364	.3384	.3405	.3425	.3445	.3466	.3486	.3506	.3527	.3547	.3567	.3588	.3608	
7/16-14	.3911	.3934	.3957	.3980	.4004	.4027	.4050	.4073	.4096	.4120	.4143	.4166	.4189	.4213	
1/2-13	.4500	.4525	.4550	.4575	.4600	.4625	.4650	.4675	.4700	.4725	.4750	.4775	.4800	.4825	

SUGGESTED THREAD ENGAGEMENT GUIDELINES
 Powdered Metal or Cast Iron 50 - 65% Aluminum 70 - 80%
 Cold Rolled Steel 65 - 70% Thin Sheet Metals 80 - 95%

EXAMPLE: A 10-52 TAPTITE fastener with a 70% thread engagement requires a .1758 pilot hole.
 * Hole data accurately decreases for engagements less than 70%. This is because the above data is based on a linear relation between hole size and percentage of thread engagement. * Nominal screw diameters are used when calculating hole sizes. Hole sizes are based on the U.S. basic thread depth of .6495 times the pitch. * Hole = D - (.6495 x P x %). In this equation, D is equal to the nominal screw diameter. * (1) Pilot holes listed under the 90% and 85% thread engagement columns are recommended for single punch extruded holes. * For pilot hole tolerance, +5% to -10% of the nominal value is recommended.

SUGGESTED HOLE SIZES FOR ALUMINUM OR ZINC DIE CASTING

In order to utilize as much available screw strength as possible, the minimum length of thread engagement should be equal to twice the diameter of the screw. For optimum performance, the hole diameter should provide 70% to 75% thread engagement.



Inch Sizes	HOLE DIA. AS CAST STD. TAPER				F Hole Diameter as Drilled	L Length of Thread Engagement	H Boss Diameter Dia. Min.	J Distance to Edge w/o Measurable Distortion Min.
	Top A		Bottom B					
	Screw Size	Max.	Min.	Max.					Min.
2-56	.081	.078	.077	.074	.077	.172	.197	.046
3-48	.093	.090	.088	.085	.088	.198	.208	.054
4-40	.105	.102	.099	.096	.099	.224	.220	.065
5-40	.118	.115	.112	.109	.112	.250	.323	.065
6-32	.128	.125	.122	.119	.122	.276	.242	.081
8-32	.155	.152	.148	.145	.148	.328	.272	.081
10-24	.177	.174	.168	.165	.168	.380	.315	.108
10-32	.182	.179	.174	.171	.174	.380	.315	.108
12-24	.203	.200	.194	.191	.194	.432	.359	.108
1/4-20	.235	.232	.224	.221	.224	.500	.415	.230
5/16-18	.297	.294	.284	.281	.284	.625	.519	.144
3/8-16	.359	.356	.343	.340	.343	.750	.623	.162
7/16-14	.419	.416	.400	.397	.400	.875	.726	.186
1/2-13	.481	.478	.460	.457	.460	1.000	.830	.200

TYPICAL TORQUE PERFORMANCE - TAPTITE

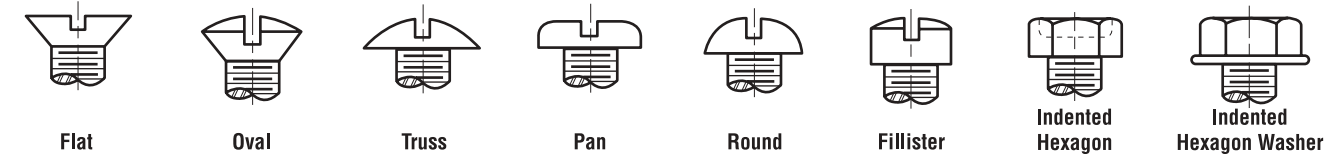
In Cold Rolled Steel (R_p 75-90)

Inch Sizes	Screw Size	Plate Thickness (inch)	Hole Size (inch)	Nearest Drill Size	Thread Forming Torque (lbs.in.)	Prevailing First Removal Torque (lbs.in.)	Recom. Ass'y Torque (lbs.in.)	Failure Torque (lbs.in.)
2-56		.0469	.075	1.9mm	1-2	.5-1	4	6.7*
		.0625	.076	#48	1-2	.5-1	4	8-10*
		.0938	.079	#47	1-2	.5-1	5	11-14*
3-48		.0625	.087	2.2mm	3-4	1-2	6	14-15*
		.0938	.089	#43	3-5	1-2	7	15-16*
		.0900	.090	#43	4-6	1-2	7	15-18*
4-40		.0312	.098	#40	2-3	1-2	6	8-11*
		.0625	.102	2.6mm	3-4	1-2	9	15-18*
		.0938	.102	2.6mm	3-4	1-2	11	22-27*
5-40		.0625	.111	#34	4-5	2-3	12	22-29*
		.0938	.113	#33	4-7	3-4	18	31-41*
		.1250	.116	#32	6-8	4-5	20	38-46*
6-32		.0625	.120	#31	4-7	3-4	14	25-30*
		.0938	.120	#31	6-9	3-5	20	35-45*
		.1250	.125	1/8	6-9	4-6	22	39-45*
8-32		.0938	.147	#26	10-13	5-7	30	65-75*
		.1250	.150	3.8mm	11-14	4-7	45	75-85*
		.1875	.150	3.8mm	16-20	8-11	45	75-95*
10-24		.0938	.172	11/64	14-18	5-8	35	65-80*
		.1250	.172	11/64	14-18	5-8	45	80-90*
		.1875	.172	11/64	17-22	9-13	55	100-115*
10-32		.0938	.173	#17	11-14	9-13	35	80-95*
		.1250	.177	#16	12-16	9-13	50	100-120*
		.1875	.177	#16	19-25	12-16	70	115-140*
12-24		.1250	.196	#9	19-24	9-12	65	95-115*
		.1875	.199	#8	21-26	9-13	75	135-155*
		.2500	.203	13/64	21-26	10-14	85	150-170*
1/4-20		.1250	.224	5.7mm	30-36	18-25	85	170-195*
		.1875	.224	5.7mm	45-55	25-35	125	205-235*
		.2500	.228	#1	55-65	25-35	125	205-235*
5/16-18		.1875	.281	K	75-85	40-50	160	380-410*
		.2500	.285	7.25mm	75-85	40-50	225	425-465*
		.3125	.285	7.25mm	80-90	55-65	250	450-500*
3/8-16		.2500	.348	S	90-100	45-55	350	825-875*
		.3125	.348	S	110-125	50-60	400	950-1000*
		.3750	.254	9mm	95-110	30-45	450	950-1000*
7/16-14		.3125	.404	Y	145-165	75-95	500	1000-1150*
		.3750	.406	13/32	145-170	60-90	600	1200-1350*
		.5000	.406	13/32	195-220	75-105	700	1400-1600*
1/2-13		.2500	.465	29/64	150-180	60-80	500	975-1075*
		.3750	.469	15/32	185-215	60-90	850	1600-1800*
		.5000	.469	15/32	235-275	75-105	1000	1900-2200*

TORQUE VALUES

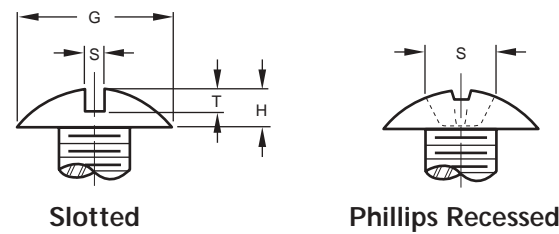
The values shown are based on zinc plated hex washer head screws. This information is only an estimate of how variables, such as hole size, nut member thickness or fastener size, influence torque performance. It is important that proper testing is performed when designing an application.

- For each group of assembly variables, clamp load should be determined
- ◆ Indicates threads will most likely strip
- ✱ Indicates the fastener will most likely break



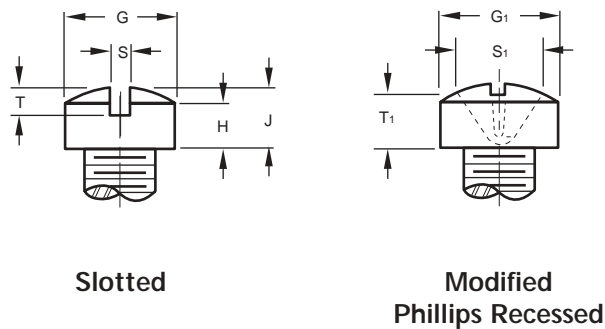
SCREW SIZE AND LENGTH	WEIGHT/THOUSAND PIECES IN LBS.							
	HEAD TYPE							
	Flat	Oval	Truss	Pan	Round	Fillister	Hex	Hex Washer
2 x 3/16	.40	.48	.50	.58	.51	.46		
2 x 1/4								
2 x 5/16	.47	.55	.57	.65	.58	.54		
2 x 3/8	.54	.62	.64	.72	.65	.61		
2 x 7/16	.61	.69	.71	.79	.72	.69		
2 x 1/2	.68	.76	.78	.86	.79	.76		
2 x 9/16	.75	.83						
2 x 5/8	.82	.90						
3 x 3/16				.56	.49	.56		
3 x 1/4	.47	.50	.57	.66	.59	.66		
3 x 5/16	.57	.59	.66	.76	.68	.75		
3 x 3/8	.66	.69	.76	.86	.78	.85		
3 x 7/16	.76	.79	.86	.95	.88	.95		
3 x 1/2	.86	.89	.96	1.05	.98	1.05		
3 x 9/16	.96	.99						
3 x 5/8	1.06	1.09						
4 x 3/16						.81	.90	
4 x 1/4	.64	.77	.77	.85	.80	.93	1.02	
4 x 3/8	.88	1.02	1.02	1.10	1.05	1.18	1.27	
4 x 7/16	1.01	1.14	1.14	1.22	1.17	1.31	1.39	
4 x 1/2	1.13	1.27	1.27	1.34	1.29	1.43	1.52	
4 x 9/16	1.26	1.39	1.39	1.47	1.42	1.55	1.64	
4 x 5/8	1.38	1.51	1.51	1.59	1.54	1.68	1.77	
4 x 3/4	1.63	1.76	1.76	1.84	1.79	1.92	2.01	
4 x 7/8	1.88	2.01	2.01	2.09	2.04			
4 x 1	2.12	2.26	2.26	2.34	2.29			
6 x 3/16					1.13	1.40	1.26	
6 x 1/4				1.45	1.32	1.59	1.45	2.02
6 x 5/16	1.23	1.48	1.43	1.64	1.51	1.78	1.64	2.21
6 x 3/8	1.42	1.67	1.62	1.83	1.70	1.97	1.83	2.39
6 x 7/16	1.61	1.86	1.81	2.02	1.88	2.15	2.01	2.58
6 x 1/2	1.79	2.05	2.00	2.20	2.08	2.34	2.20	2.77
6 x 9/16	1.98	2.23	2.18	2.39	2.26	2.53	2.39	2.96
6 x 5/8	2.17	2.42	2.37	2.58	2.45	2.71	2.58	3.14
6 x 3/4	2.54	2.80	2.75	2.96	2.83	3.09	2.96	3.52
6 x 7/8	2.92	3.18	3.13	3.33	3.20	3.47	3.33	3.90
6 x 1	3.30	3.55	3.50	3.71	3.58	3.85	3.71	4.27
6 x 1-1/8	3.66	3.91	3.86	4.07	3.94	4.21	4.07	4.64
6 x 1-1/4	4.05	4.30	4.25	4.46	4.33	4.60	4.46	5.02
6 x 1-1/2	4.80	5.06	5.01	5.21	5.08		5.08	5.78
8 x 3/16					1.80	2.31	2.26	
8 x 1/4				2.25	2.08	2.59	2.54	2.62
8 x 5/16	1.91	2.33	2.22	2.53	2.36	2.87	2.82	2.90
8 x 3/8	2.19	2.61	2.50	2.81	2.64	3.15	3.10	3.18
8 x 7/16	2.47	2.89	2.78	3.09	2.92	3.43	3.38	3.46
8 x 1/2	2.75	3.17	3.06	3.37	3.20	3.71	3.66	3.74
8 x 9/16	3.03	3.45	3.34	3.65	3.48	3.99	3.94	4.02
8 x 5/8	3.31	3.73	3.62	3.93	3.76	4.27		

Truss Head Specifications



SCREW SIZE	2		3		4		5		6		8		10		12		1/4		5/16		3/8		
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	
G	Head Diameter	.194	.226	.257	.289	.321	.384	.448	.511	.573	.698	.823											
H	Head Height	.053	.061	.069	.078	.086	.102	.118	.134	.150	.183	.215											
S	Slot Width	.031	.035	.039	.043	.048	.054	.060	.067	.075	.084	.094											
T	Slot Depth	.031	.036	.040	.045	.050	.058	.068	.077	.087	.106	.124											
S1	Recess Diameter	.104	.110	.112	.128	.158	.173	.188	.248	.263	.352	.388											
	Penetration Gaging Depth	.052	.059	.062	.078	.073	.088	.104	.111	.126	.173	.219											
	Driver Size	1	1	1		2	2	2	3	3	4	4											

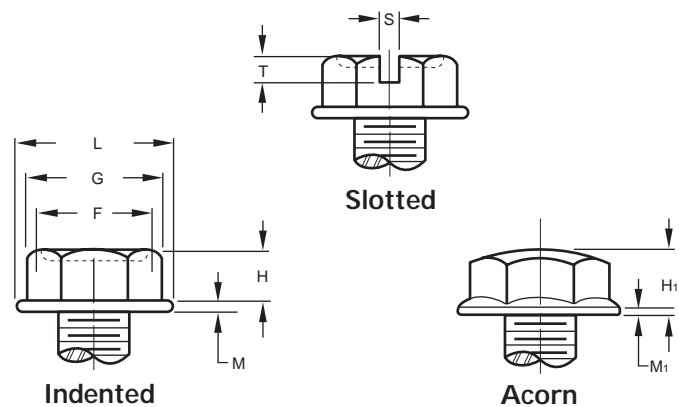
Fillister Head Specifications



SCREW SIZE	2		3		4		5		6		8		10		12		1/4		5/16		3/8		
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	
G	Head Diameter	.140	.161	.183	.205	.226	.270	.313	.357	.414	.518	.622											
H	Head Height	.062	.070	.079	.088	.096	.113	.130	.148	.170	.211	.253											
J	Total Head Height	.083	.095	.107	.120	.132	.156	.180	.205	.237	.295	.355											
S	Slot Width	.031	.035	.039	.043	.048	.054	.060	.067	.075	.084	.094											
T	Slot Depth	.037	.043	.048	.054	.060	.071	.083	.094	.109	.137	.164											
G1	Head Diameter*	.146	.169	.193	.217	.240	.287	.334	.382	.443	.557	.670											
S1	Recess Diameter*	.100	.109	.118	.154	.162	.178	.195	.249	.268	.308	.387											
T1	Penetration Gaging Depth*	.046	.055	.065	.063	.073	.090	.108	.108	.130	.170	.208											
	Driver Size	1	1	1	2	2	2	2	3	3	3	4											

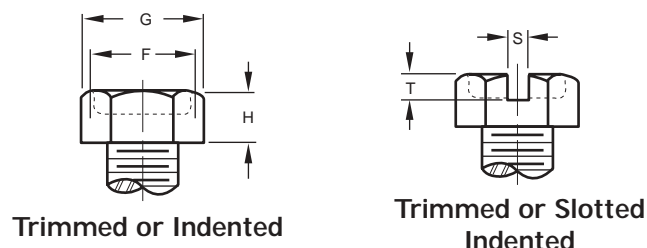
*These dimensions refer to Modified Phillips Fillister Heads and not to ASA Phillips Fillister Heads.

Hexagon Washer Head Specifications



SCREW SIZE	2		3		4		5		6		8		10		12		1/4		5/16		3/8		
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	
F	Across Flats		.181	.187	.250	.250	.312	.312	.375	.500	.562												
G	Across Corners	Min.		.202	.202	.272	.272	.340	.340	.409	.545	.614											
H	Head Height	Max.	.060	.070	.093	.110	.120	.155	.190	.230	.295												
L	Washer Diameter	Max.	.243	.260	.328	.348	.414	.432	.520	.676	.780												
M	Washer Thickness	Max.	.019	.025	.025	.031	.031	.039	.050	.055	.063												
S	Slot Width	Max.	.039	.043	.048	.054	.060	.067	.075	.084	.094												
T	Slot Depth	Max.	.042	.049	.053	.074	.080	.103	.111	.134	.168												
H1	Overall Height	Max.				.120	.135	.160	.190	.225	.325												
M1	Washer Thickness	Max.			.025	.026	.030	.031	.041	.045	.047												

Hexagon Head Specifications

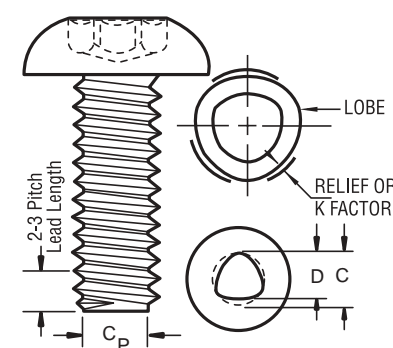


SCREW SIZE	2		3		4		5		6		8		10		12		1/4		5/16		3/8		
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	
F	Across Flats	.125	.187	.187	.187	.250	.250	.312	.312	.375	.500	.562											
G	Across Corners	Min.	.134	.202	.202	.272	.272	.340	.340	.409	.545	.614											
H	Head Height	Max.	.050	.055	.060	.070	.093	.100	.120	.155	.190	.230											
S	Slot Width	Max.		.039	.043	.048	.054	.060	.067	.075	.084	.094											
T	Slot Depth	Max.		.036	.042	.046	.066	.072	.093	.101	.122	.156											

STANDARD TAPTITE	OVERSIZE TAPTITE	POWERLOK	DUO TAPTITE
<p>2-1/2 - 3-1/2 LEADS</p> <p>APPROXIMATELY 2B DIMENSIONS WITH 60° THREAD ANGLE</p> <p>TAPPING ONLY</p>	<p>2-1/2 - 3-1/2 LEADS</p> <p>LOCK IN MAX. 2B THREAD PITCH DIA. INTERFERENCE WITH 60° THREAD ANGLE</p> <p>TAPPING OR LOCKING</p>	<p>2-1/2 - 3-1/2 LEADS</p> <p>LOCK IN MAX. 2B THREAD MAJOR DIA. INTERFERENCE WITH 30° - 60° THREAD ANGLE</p> <p>LOCKING ONLY</p>	<p>UNTHREADED POINT FULL BLANK DIAMETER AT LEAST 1/4 PITCHES LONG</p> <p>1/2K FACTOR LEAD POINT IS DOUBLE K FACTOR</p> <p>APPROXIMATELY 2B DIMENSIONS WITH 60° THREAD ANGLE 1/2 K BODY DOUBLE K POINT</p> <p>TAPPING ONLY - HAS LOWER DRIVE TORQUE AND END LOAD AND EASIER STARTING THAN TAPTITE</p>

DIMENSIONS AND TECHNICAL DATA

Screw Body Dimensions

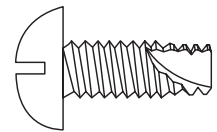


Inch Sizes	Nominal Screw Size	C		D		Point Cp Max.
		Max.	Min.	Max.	Min.	
	00-90	.0481	.0461	.0459	.0439	.037
	0-80	.0613	.0593	.0588	.0568	.049
	1-64	.0745	.0725	.0710	.0690	.059
	2-56	.0875	.0840	.0840	.0805	.070
	3-48	.1010	.0975	.0970	.0935	.081
	4-40	.1145	.1115	.1095	.1060	.090
	5-40	.1275	.1240	.1225	.1190	.103
	6-32	.1410	.1360	.1350	.1300	.111
	8-32	.1670	.1620	.1610	.1560	.137
	10-24	.1940	.1890	.1850	.1800	.153
	10-32	.1930	.1880	.1870	.1820	.163
	12-24	.2200	.2150	.2110	.2060	.179
	1/4-20	.2550	.2500	.2450	.2400	.206
	5/16-18	.3180	.3130	.3070	.3020	.264
	3/8-16	.3810	.3760	.3685	.3635	.320
	7/16-14	.4445	.4395	.4305	.4255	.375
	1/2-13	.5075	.5025	.4920	.4870	.432
	9/16-12	.5710	.5630	.5540	.5460	.490
	5/8-11	.6340	.6260	.6160	.6080	.545

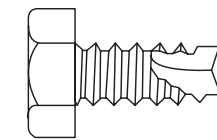
STRENGTHS & TIGHTENING TORQUES

TYPES 1 and 23

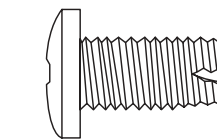
Screw Size	ULTIMATE STRENGTH			MAXIMUM Recommended Tightening Torques (Inch-Pounds)
	Minimum Tension (Pounds)	Torque (Inch-Pounds)		
		Minimum Blind Hole	Minimum Open Hole	
2-56	475	6.0	7.0	6.0
3-48	650	9.0	10.0	9.0
4-40	800	13.5	14.0	13.5
4-48	875	13.5	14.0	13.5
5-40	1050	19.0	21.0	19.0
6-32	1200	26.5	28.0	26.0
6-40	1350	28.0	30.0	28.0
8-32	1950	45.0	55.0	45.0
8-36	1975	50.0	60.0	50.0
10-24	2350	65.0	75.0	65.0
10-32	2700	75.0	90.0	75.0
12-24	3250	100.0	125.0	100.0
12-28	3450	125.0	135.0	125.0
1/4-20	4225	155.0	175.0	155.0
1/4-28	4900	200.0	220.0	200.0
5/16-18	7000	350.0	375.0	350.0
5/16-24	7800	400.0	425.0	400.0
3/8-16	10450	625.0	700.0	625.0
3/8-24	11900	760.0	850.0	760.0



Type 23 Thread-cutting



Type 25 Thread-cutting



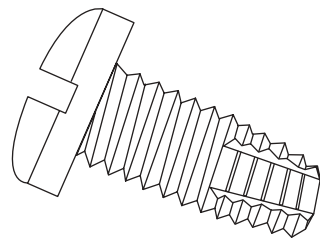
Type 1 Thread-cutting

TYPE 25

Screw Size	ULTIMATE STRENGTH		MAXIMUM Recommended Tightening Torques (Inch-Pounds)
	Minimum Tension (Pounds)	Minimum Blind Hole Torque (Inch-Pounds)	
3-32	425	5.0	4.5
3-28	575	9.0	8.5
4-24	725	14.0	13.0
5-20	975	19.0	18.0
6-20	1125	25.0	25.0
8-18	1775	46.0	45.0
10-16	2100	61.0	60.0
12-14	2900	92.0	90.0
1/4-14	3800	150.0	145.0

TYPE F THREAD-CUTTING

For making fastenings to ferrous and non-ferrous Castings, Bronze or Brass Forgings, heavy gage Sheet Metal, Structural Steel, Plastics.



SHEET METAL and STRUCTURAL STEEL

SCREW DIAM.	SHEET STEEL, STRUCTURAL STEEL, STAINLESS STEEL, MONEL METAL, BRASS, ALUMINUM ALLOY		
	Metal Thickness	Drilled or Clean-Punched Hole	Drill Size No.
	Hole Required		
No. 2-56	.048"	.073"	49
	.060"	.073"	49
	.075"	.076"	48
	.105"	.078"	47
No. 4-40	.048"	.093"	42
	.060"	.096"	41
	.075"	.096"	41
	.105"	.099"	39
No. 6-32	.048"	.111"	34
	.060"	.113"	33
	.075"	.116"	32
	.105"	.120"	31
No. 8-32	.048"	.140"	28
	.060"	.144"	27
	.075"	.144"	27
	.105"	.147"	26
No. 10-24	.060"	.166"	19
	.075"	.169"	18
	.105"	.169"	18
	.125"	.173"	17
No. 10-32	.060"	.166"	19
	.075"	.173"	17
	.105"	.173"	17
	.125"	.177"	16
No. 1/4"-20	.048"	.159"	21
	.060"	.161"	20
	.075"	.166"	19
	.105"	.169"	18
No. 1/4"-20	.060"	.213"	3
	.075"	.221"	2
	.105"	.221"	2
	.125"	.228"	1
No. 1/4"-20	.135"	.228"	1
	.164"	.228"	1
	.187"	.234"	15/64"
	.250"	.238"	Letter B

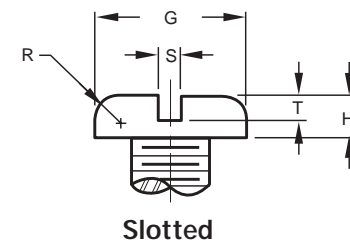
PLASTICS

SCREW DIAM.	Hole Required	Drill Size No.	Depth of Penetration*	
			Min.	Max.
CELLULOSE ACETATE, CELLULOSE NITRATE, ACRYLIC RESINS, STYRENE RESINS				
No. 2-56	NOT RECOMMENDED (See Type X)			
No. 4-40	.093"	42	1/4"	5/16"
No. 6-32	.116"	32	1/4"	5/16"
No. 8-32	.144"	27	5/16"	1/2"
No. 10-32	.166"	19	3/8"	1/2"
No. 10-24	.161"	20	3/8"	1/2"
No. 1/4"-20	.228"	1	3/8"	1"
PHENOL FORMALDEHYDE				
No. 2-56	.073"	49	7/32"	3/8"
No. 4-40	.098"	40	1/4"	5/16"
No. 6-32	.116"	32	1/4"	5/16"
No. 8-32	.144"	27	5/16"	1/2"
No. 10-32	.166"	19	3/8"	1/2"
No. 10-24	.161"	20	3/8"	1/2"
No. 1/4"-20	.228"	1	3/8"	5/8"

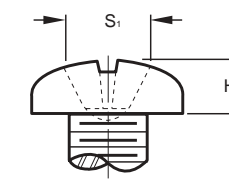
CASTINGS

SCREW DIAM.	Hole Required	Drill Size No.	Depth of Penetration*	
			Min.	Max.
ALUMINUM, MAGNESIUM, ZINC, BRASS, BRONZE, GREY IRON, MALLEABLE IRON, STEEL				
No. 2-56	.078"	47	3/16"	1/4"
No. 4-40	.099"	39	3/16"	1/4"
No. 6-32	.120"	31	3/16"	1/4"
No. 8-32	.147"	26	7/32"	5/16"
No. 10-32	.169"	18	1/4"	3/8"
No. 10-24	.169"	18	1/4"	3/8"
No. 1/4"-20	.228"	1	5/16"	3/8"

Pan Head Specifications



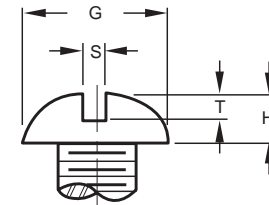
Slotted



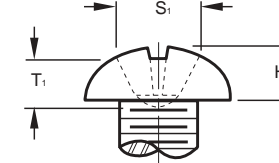
Phillips Recessed

SCREW SIZE		2	3	4	5	6	8	10	12	1/4	5/16	3/8
		G Head Diameter	Max.	.167	.193	.219	.245	.270	.322	.373	.425	.492	.615	.740
	Min.	.155	.180	.205	.231	.256	.306	.357	.407	.473	.594	.716
H Slotted Hd. Height	Max.	.053	.060	.068	.075	.082	.096	.110	.125	.144	.178	.212
	Min.	.045	.051	.058	.065	.072	.085	.099	.112	.130	.162	.195
H1 Phillips Hd. Height	Max.	.062	.071	.080	.089	.097	.115	.133	.151	.175	.218	.244
	Min.	.053	.062	.070	.079	.087	.105	.122	.139	.162	.203	.216
R Radius Basic		.035	.037	.042	.044	.046	.052	.061	.078	.087	.099	.143
S Slot Width	Max.	.031	.035	.039	.043	.048	.054	.060	.067	.075	.084	.094
	Min.	.023	.027	.031	.035	.039	.045	.050	.056	.064	.072	.081
T Slot Depth	Max.	.031	.036	.040	.045	.050	.058	.068	.077	.087	.106	.124
	Min.	.022	.026	.030	.034	.037	.045	.053	.061	.070	.085	.100
S1 Recess Diameter	Max.	.104	.112	.122	.158	.166	.182	.199	.259	.281	.350	.393
	Min.	.091	.099	.109	.145	.153	.169	.186	.246	.268	.337	.380
Penetration Gaging Depth	Max.	.052	.061	.071	.072	.080	.097	.113	.124	.144	.173	.213
	Min.	.034	.043	.053	.046	.055	.071	.089	.098	.118	.149	.190
Driver Size		1	1	1	2	2	2	2	3	3	4	4

Round Head Specifications



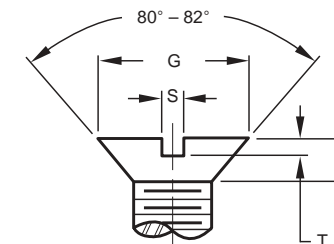
Slotted



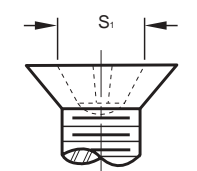
Phillips Recessed

SCREW SIZE		2	3	4	5	6	8	10	12	1/4	5/16	3/8
		G Head Diameter	Max.	.162	.187	.211	.236	.260	.309	.359	.408	.472	.590	.708
	Min.	.146	.169	.193	.217	.240	.287	.334	.382	.443	.557	.670
H Head Height	Max.	.069	.078	.086	.095	.103	.120	.137	.153	.175	.216	.256
	Min.	.059	.067	.075	.083	.091	.107	.123	.139	.160	.198	.237
S Slot Width	Max.	.031	.035	.039	.043	.048	.054	.060	.067	.075	.084	.094
	Min.	.023	.027	.031	.035	.039	.045	.050	.056	.064	.072	.081
T Slot Depth	Max.	.048	.053	.058	.063	.068	.077	.087	.096	.109	.132	.155
	Min.	.037	.040	.044	.047	.051	.058	.065	.072	.082	.099	.117
S1 Recess Diameter	Max.	.100	.109	.118	.154	.162	.178	.195	.249	.268	.308	.387
	Min.	.087	.096	.105	.141	.149	.165	.182	.236	.255	.295	.374
Penetration Gaging Depth	Max.	.046	.055	.065	.063	.073	.090	.108	.108	.130	.170	.208
	Min.	.027	.035	.046	.035	.045	.064	.082	.082	.104	.144	.182
Driver Size		1	1	1	2	2	2	2	3	3	3	4

Flat Head Specifications



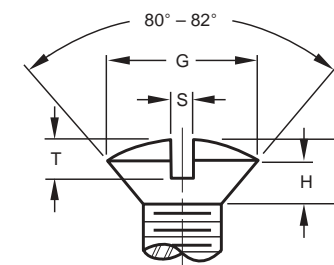
Slotted



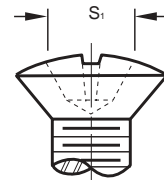
Phillips Recessed

SCREW SIZE		2	3	4	5	6	8	10	12	1/4	5/16	3/8
		G Head Diameter	Max.	.172	.199	.225	.252	.279	.332	.385	.438	.507	.635	.762
	Min.	.147	.171	.195	.220	.244	.292	.340	.389	.452	.568	.685
H Head Height	Max.	.051	.059	.067	.075	.083	.100	.116	.132	.153	.191	.230
	Min.	.040	.048	.055	.062	.069	.084	.098	.112	.131	.165	.200
S Slot Width	Max.	.031	.035	.039	.043	.048	.054	.060	.067	.075	.084	.094
	Min.	.023	.027	.031	.035	.039	.045	.050	.056	.064	.072	.081
T Slot Depth	Max.	.023	.027	.030	.034	.038	.045	.053	.060	.070	.088	.106
	Min.	.015	.017	.020	.022	.024	.029	.034	.039	.046	.058	.070
S1 Recess Diameter	Max.	.102	.107	.128	.154	.174	.189	.204	.268	.283	.365	.393
	Min.	.089	.094	.115	.141	.161	.176	.191	.255	.270	.352	.380
Penetration Gaging Depth	Max.	.056	.061	.082	.075	.095	.110	.125	.139	.154	.196	.225
	Min.	.040	.045	.066	.052	.072	.087	.102	.116	.131	.174	.203
Driver Size		1	1	1	2	2	2	2	3	3	4	4

Oval Head Specifications



Slotted

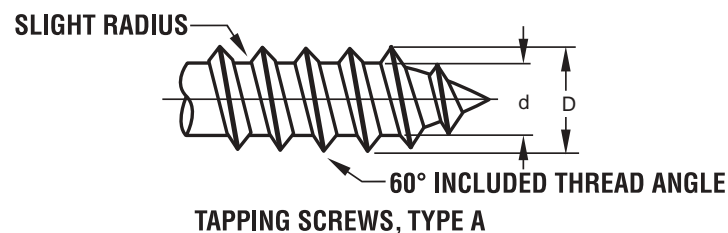


Phillips Recessed

SCREW SIZE		2	3	4	5	6	8	10	12	1/4	5/16	3/8
		G Head Diameter	Max.	.172	.199	.225	.252	.279	.322	.385	.438	.507	.635	.762
	Min.	.147	.171	.195	.220	.244	.292	.340	.389	.452	.568	.685
H Head Height	Max.	.051	.059	.067	.075	.083	.100	.116	.132	.153	.191	.230
	Min.	.040	.048	.055	.062	.069	.084	.098	.112	.131	.165	.200
J Total Head Height	Max.	.080	.092	.104	.116	.128	.152	.176	.200	.232	.290	.347
	Min.	.063	.073	.084	.095	.105	.126	.148	.169	.197	.249	.300
S Slot Width	Max.	.031	.035	.039	.043	.048	.054	.060	.067	.075	.084	.094
	Min.	.023	.027	.031	.035	.039	.045	.050	.056	.064	.072	.081
T Slot Depth	Max.	.045	.052	.059	.067	.074	.088	.103	.117	.136	.171	.206
	Min.	.037	.043	.049	.055	.060	.072	.084	.096	.112	.141	.170
S1 Recess Diameter	Max.	.112	.124	.136	.158	.178	.192	.209	.270	.290	.390	.410
	Min.	.099										

(SHEET METAL SCREWS)

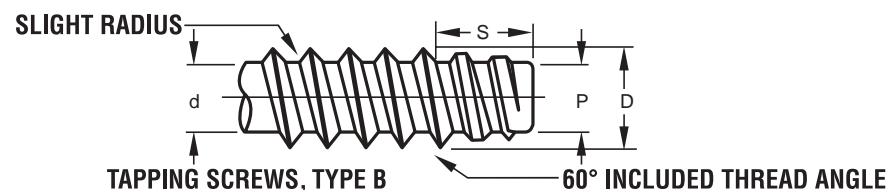
Tapping screw head dimensions are the same as Machine Screws. Except for "Type A" No. 14 diameters - which take the same head dimensions as Wood Screws for Flat, Round, Oval, Pan and Truss heads.



TAPPING SCREWS, TYPE A

Nom. Size	Regular Lengths	Threads per Inch			D		d	
		Short Lengths*			Major Diameter		Minor Diameter	
		Flat & Oval Hd.	All Others (No c's'k)	Threads per Inch	Max.	Min.	Max.	Min.
4	24	1/4	3/16	24	0.114	0.110	0.083	0.078
5	20	1/4	3/16	20	0.130	0.126	0.095	0.090
6	18	5/16	1/4	20	0.141	0.136	0.102	0.096
7	16	3/8	5/16	19	0.158	0.152	0.114	0.108
8	15	7/16	3/8	18	0.168	0.162	0.123	0.116
10	12	1/2	3/8	16	0.194	0.188	0.133	0.126
12	11	9/16	7/16	14	0.221	0.215	0.162	0.155
14	10	5/8	1/2	14	0.254	0.248	0.185	0.178
20	9	13/16	11/16	12	0.333	0.327	0.234	0.226
24	9	1	3/4	12	0.390	0.383	0.291	0.282

*Threads per inch differ on short lengths for most sizes. (Flat and oval heads in these lengths and shorter will be furnished as standard with undercut heads.)

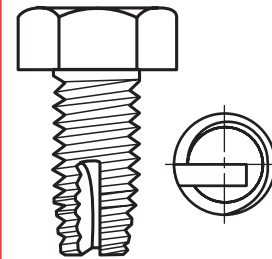


TAPPING SCREWS, TYPE B

Nom. Size	Threads per Inch	D		d		P		S*	
		Major Diameter		Minor Diameter		Point Diameter		Short Lengths	
		Max.	Min.	Max.	Min.	Max.	Min.	Flat & Oval Hd.	All Others (no c's'k)
4	24	0.114	0.110	0.086	0.082	0.079	0.074	1/4	3/16
5	20	0.130	0.126	0.094	0.090	0.087	0.082	1/4	3/16
6	20	0.139	0.135	0.104	0.099	0.095	0.089	5/16	1/4
7	19	0.154	0.149	0.115	0.109	0.105	0.099	3/8	5/16
8	18	0.166	0.161	0.122	0.116	0.112	0.106	7/16	5/16
10	16	0.189	0.183	0.141	0.135	0.130	0.123	1/2	3/8
12	14	0.215	0.209	0.164	0.157	0.152	0.145	9/16	7/16
1/4	14	0.246	0.240	0.192	0.185	0.179	0.171	5/8	1/2
5/16	12	0.315	0.308	0.244	0.236	0.230	0.222	5/8	1/2
3/8	12	0.380	0.371	0.309	0.299	0.293	0.285	5/8	1/2

*Taper length(s) is 2 to 2 1/2 times the pitch of the thread except on lengths shown and shorter the taper length(s) is 1 1/2 to 2 times the pitch of the thread.

THREAD-CUTTING SCREWS FOR METAL

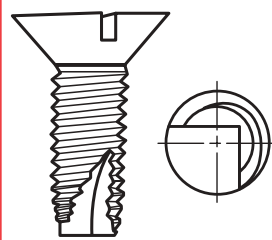


TYPE 1 Hardened steel Type 1 thread-cutting screws are made for use in metals. Use them as general purpose fasteners for almost any fastening purpose in harder metals such as steel, special alloy steels and cast iron. Utilizing a standard machine screw thread, they perform their thread-cutting function in metals of any thickness and may be used over and over.
 Because these screws possess almost twice the strength of ordinary machine screws much smaller screws can be used. When driven into untapped holes (drilled or punched) they stay snug in their self-cut, perfectly mated threads.
 Type 1 thread-cutting screws conform to American National Standard machine screw dimensions and tolerances. Where required, they can be specified in brass, bronze, stainless steel or aluminum on special order.

RECOMMENDED HOLE SIZES IN SHEET METAL

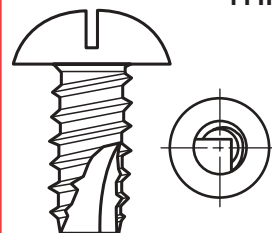
SCREW DIAMETER	STEEL, STAINLESS STEEL, MONEL, BRASS					ALUMINUM ALLOY		
	Metal Thickness	Pierced or Extruded Hole	Drilled or Clean-Punched Hole	Pierced or Extruded Hole	Drilled or Clean-Punched Hole	Pierced or Extruded Hole	Drilled or Clean-Punched Hole	Drill Size No.
No. 2	.015"	—	.063"	52	—	—	—	—
	.018"	—	.063"	52	—	—	—	—
	.024"	—	.067"	51	—	.063"	52	—
	.030"	—	.070"	50	—	.063"	52	—
	.036"	—	.073"	49	—	.063"	52	—
	.048"	—	.073"	49	—	.067"	51	—
No. 4	.060"	—	.076"	48	—	.070"	50	—
	.015"	.086"	.086"	44	—	—	—	—
	.018"	.086"	.086"	44	—	—	—	—
	.024"	.086"	.089"	43	.086"	—	—	—
	.030"	.086"	.093"	42	.086"	.086"	44	—
	.036"	.086"	.093"	42	.086"	.086"	44	—
No. 6	.048"	—	.096"	41	.086"	.086"	44	—
	.060"	—	.099"	39	—	.089"	43	—
	.075"	—	.101"	38	—	.089"	43	—
	.105"	—	—	—	—	.093"	42	—
	.015"	.111"	.104"	37	—	—	—	—
	.018"	.111"	.104"	37	—	—	—	—
No. 7	.024"	.111"	.106"	36	.111"	—	—	—
	.030"	.111"	.106"	36	.111"	.104"	37	—
	.036"	.111"	.110"	35	.111"	.104"	37	—
	.048"	—	.111"	34	.111"	.104"	37	—
	.060"	—	.116"	32	—	.106"	36	—
	.075"	—	.120"	31	—	.110"	35	—
No. 8	.105"	—	.128"	30	—	.111"	34	—
	.128" to .250"	—	—	—	—	.120"	31	—
	.018"	.120"	.116"	32	—	—	—	—
	.024"	.120"	.116"	32	.120"	—	—	—
	.030"	.120"	.116"	32	.120"	.113"	33	—
	.036"	.120"	.116"	32	.120"	.113"	33	—
No. 10	.048"	.120"	.120"	31	.120"	.116"	32	—
	.060"	—	.128"	30	—	.120"	31	—
	.075"	—	.136"	29	—	.128"	30	—
	.105"	—	.140"	28	—	.136"	29	—
	.128" to .250"	—	—	—	—	.136"	29	—
	No. 12	.018"	.136"	—	—	—	—	—
.024"		.136"	.125"	1/8	.136"	—	—	—
.030"		.136"	.125"	1/8	.136"	.116"	32	—
.036"		.136"	.125"	1/8	.136"	.120"	31	—
.048"		.136"	.128"	30	.136"	.128"	30	—
.060"		—	.136"	29	—	.136"	29	—
No. 14 (1/4)	.075"	—	.140"	28	—	.140"	28	—
	.105"	—	.149"	25	—	.147"	26	—
	.125"	—	.149"	25	—	.147"	26	—
	.135"	—	.152"	24	—	.149"	25	—
	.164"	—	—	—	—	.152"	24	—
	.200" to .375"	—	—	—	—	—	—	—
No. 20	.018"	.157"	—	—	—	—	—	—
	.024"	.157"	.144"	27	.157"	—	—	—
	.030"	.157"	.144"	27	.157"	—	—	—
	.036"	.157"	.147"	26	.157"	.144"	27	—
	.048"	.157"	.152"	24	.157"	.144"	27	—
	.060"	—	.152"	24	—	.144"	27	—
No. 24	.075"	—	.157"	22	—	.147"	26	—
	.105"	—	.161"	20	—	.147"	26	—
	.125"	—	.169"	18	—	.154"	23	—
	.135"	—	.169"	18	—	.154"	23	—
	.164"	—	.173"	17	—	.159"	21	—
	.200" to .375"	—	—	—	—	.166"	19	—
No. 30	.024"	.185"	.166"	19	—	—	—	—
	.030"	.185"	.166"	19	—	—	—	—
	.036"	.185"	.166"	19	—	—	—	—
	.048"	.185"	.169"	18	—	.161"	20	—
	.060"	—	.177"	16	—	.161"	19	—
	.075"	—	.182"	14	—	.161"	17	—
No. 36	.105"	—	.185"	13	—	.161"	15	—
	.125"	—	.196"	9	—	.161"	14	—
	.135"	—	.196"	9	—	.161"	14	—
	.164"	—	.201"	7	—	.161"	12	—
	.200" to .375"	—	—	—	—	.161"	9	—
	No. 48	.030"	.209"	.1935"	10	—	—	—
.036"		.209"	.1935"	10	—	—	—	—
.048"		.209"	.1935"	10	—	—	—	—
.060"		—	.199"	8	—	.199"	8	—
.075"		—	.204"	6	—	.201"	7	—
.105"		—	.209"	4	—	.204"	6	—
No. 60	.125"	—	.228"	1	—	.209"	4	—
	.135"	—	.228"	1	—	.209"	4	—
	.164"	—	.234"	15/64"	—	.213"	3	—
	.187"	—	.234"	15/64"	—	.213"	3	—
	.194"	—	.234"	15/64"	—	.221"	2	—
	.200" to .375"	—	—	—	—	.228"	1	—

THREAD-CUTTING SCREWS FOR CASTINGS



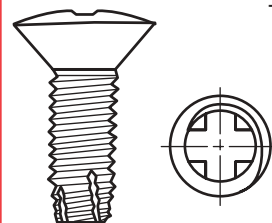
TYPE 23 These specially designed self-threading screws are for use in zinc, aluminum and other soft metal die castings. Employing a wider thread-cutting slot, they allow ample clearance for chips. And, the off-center slot presents an acute angle, with sharp cutting edges for best cutting performance.
 Type 23 screws are often used in plastics where a standard machine screw thread is desired. They can also be used in harder metals where the advantages of a wide cutting slot are important; or use them for assembly of electrical components of copper or bronze.
 Made of heat treated, hardened steel, Type 23 screws are available in other materials such as stainless steel, Monel, brass or aluminum on special order.

THREAD-CUTTING SCREWS FOR PLASTICS



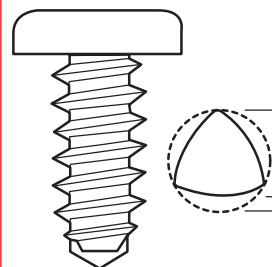
TYPE 25 This hardened steel screw for plastics is characterized by a wider thread-cutting slot, acute cutting edge and wide spaced threads. Chips won't clog; less driving torque is required; and, free cutting action greatly reduces internal stress of plastics as the screw is driven. This reduces the possibility of fracturing brittle plastic substances. And, it often eliminates the need for threaded inserts, cutting production and assembly costs.
 Besides hardened steel, these thread cutting screws are available in brass, bronze, stainless steel and aluminum on special order.

THREAD-CUTTING SCREWS FOR SHEET METAL, CASTINGS, AND PLASTICS



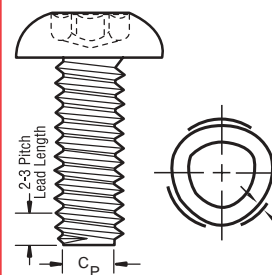
TYPE F This thread-cutting screw may be used for making fastenings to castings (ferrous and non-ferrous metals) forgings from brass or bronze, heavy gauge sheet metals, structural steel, plastics, and resin impregnated plywood. Holes may be drilled, punched or molded, depending on the material.
 Type F screws provide tight, vibrationless fit with high resistance to torque, shear and tension.

PLASTITE® THREAD FORMING SCREWS FOR THERMOPLASTICS



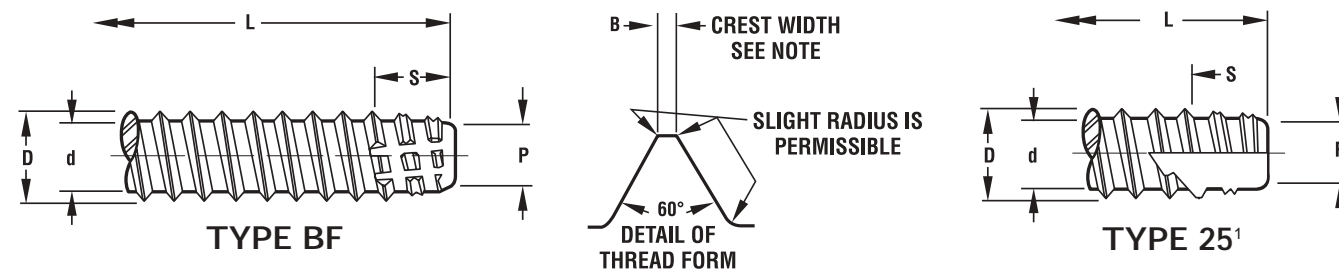
Speed Assembly: The twin helix design and the steep helix angle seat the screw in half as many revolutions, cutting the driving time in half.
Reduce Strip-out and Pull-out: The narrow 48° threads and fewer revolutions required to seat the fastener generate less friction and heat build-up to weaken the plastic material. The steep angle requires a higher torque to shear or strip the mating threads of the plastic. The probability of stripping or pulling out is also reduced because the 48° threads penetrate deeper into the plastic.
Reduce Stress Failure: The Tri-Roundular design and slim thread profile minimize radial stresses and the boss failures that stress can cause.
Increase Holding Power: Plastite's high profile thread design provides greater shear area in the plastic material for increased holding power in the joint.

TAP TITE TECHNOLOGY



Some materials are referred to as "notch sensitive." This means that notches, such as cut threads, almost totally destroy the strength characteristics of the material. In these materials formed threads such as generated by Tap Tite can alleviate this problem. Tap Tite only deform material by cold working and not by removing material by cutting.
 The Tri-roundular shape of Tap Tite is the key to its ability for form threads. The high areas, referred to as the "lobes" do the actual material deforming or thread forming and the flats between the "lobes" provide the needed relief for the material being moved. This relief facilitates material flow by providing more area for displaced material to move than just between the flanks of the thread. The Tri-roundular configuration extends the entire length of the Tap Tite in contrast to most other thread forming screws which have a forming configuration only of the first two or three threads at the point. This is the reason for Tap Tites generally lower driving torque as compared to other thread formers.

THICK-NESS	MATERIAL	Screw Size	10-32		12-24		1/4-20		1/4-28		5/16-18		5/16-24		3/8-16		3/8-24	
			No.	Dia.	No.	Dia.	No.	Dia.	No.	Dia.	No.	Dia.	No.	Dia.	No.	Dia.	No.	Dia.
UP TO .047	Steel		20	.161	15	.180	5	.205	7/32	.2188								
	Stainless Steel*		20	.161	15	.180	4	.209	7/32	.2188								
.063	Aluminum-Sheet		20	.161	16	.177	13/64	.2031	7/32	.2188								
	Steel		19	.166	15	.180	4	.209	7/32	.2188	17/64	.2656	J	.277	P	.323	R	.339
.078	Stainless Steel*		19	.166	13	.185	3	.213	2	.221	I	.272	K	.281	21/64	.3281	11/32	.3438
	Aluminum-Sheet		20	.161	16	.177	6	.204	7/32	.2188								
.094	Steel		19	.166	14	.182	4	.209	2	.221	17/64	.2656	J	.277	P	.323	11/32	.3438
	Stainless Steel*		18	.169	3/16	.1875	3	.213	1	.228	I	.272	9/32	.2812	Q	.332	11/32	.3438
.109	Aluminum-Sheet		20	.161	15	.180	5	.205	7/32	.2188								
	Steel		19	.166	13	.185	2	.213	2	.221	I	.272	9/32	.2812	21/64	.3281	11/32	.3438
.125	Stainless Steel*		18	.169	12	.189	7/32	.2188	1	.228	J	.277	9/32	.2812	Q	.332	S	.348
	Aluminum-Sheet		19	.166	14	.182	4	.209	2	.221								
.141	Steel		18	.169	3/16	.1875	3	.213	1	.228	I	.272	9/32	.2812	Q	.332	11/32	.3438
	Stainless Steel*		11/64	.1719	12	.189	7/32	.2188	1	.228	J	.277	L	.290	R	.339	S	.348
.188	Aluminum-Sheet		19	.166	14	.182	4	.209	2	.221								
	Cast Aluminum & Zinc Die Cast		11/64	.1719	11	.191	2	.221	1	.228	K	.281	L	.290	R	.339	S	.348
.250	Cast Iron		16	.177	8	.199	1	.228	15/64	.2344	L	.290	19/64	.2969	S	.348	23/64	.3594
	Steel		11/64	.1719	11	.191	2	.221	1	.228	K	.281	L	.290	R	.339	S	.348
.313	Stainless Steel*		17	.173	9	.196	1	.228	A	.234	9/32	.2812	L	.290	11/32	.3438	T	.358
	Aluminum-Sheet		18	.169	3/16	.1875	3	.213	1	.228	I	.272	9/32	.2812	Q	.332	11/32	.3438
.375 & UP	Cast Aluminum & Zinc Die Cast		11/64	.1719	11	.191	2	.221	1	.228	K	.281	L	.290	R	.339	S	.348
	Cast Iron		15	.180	7	.201	A	.234	B	.238	M	.295	19/64	.2969	S	.348	23/64	.3594
	Steel		16	.177	8	.199	1	.228	15/64	.2344	L	.290	M	.295	S	.348	T	.358
	Stainless Steel*		15	.180	7	.201	A	.234	B	.238	M	.295	19/64	.2969	S	.348	23/64	.3594
	Aluminum-Sheet		11/64	.1719	11	.191	2	.221	1	.228	K	.281	L	.290	R	.339	S	.348
	Cast Aluminum & Zinc Die Cast		17	.173	10	.193	2	.221	1	.228	9/32	.2812	L	.290	R	.339	S	.348
	Cast Iron		15	.180	13/64	.2031	15/64	.2344	B	.238	M	.295	N	.302	T	.358	23/64	.3594
	Steel		15	.180	13/64	.2031	A	.234	B	.238	M	.295	19/64	.2969	T	.358	23/64	.3594
	Stainless Steel*		14	.182	5	.205	15/64	.2344	C	.242	19/64	.2969	N	.302	T	.358	23/64	.3594
	Aluminum-Sheet		16	.177	8	.199	1	.228	15/64	.2344	L	.290	M	.295	S	.348	T	.358
	Cast Aluminum & Zinc Die Cast		17	.173	9	.196	1	.228	A	.234	9/32	.2812	L	.290	11/32	.3438	T	.358
	Cast Iron		14	.182	5	.205	B	.238	C	.242	19/64	.2969	N	.302	23/64	.3594	23/64	.3594
	Steel		15	.180	13/64	.2031	A	.234	B	.238	M	.295	19/64	.2969	T	.358	23/64	.3594
	Stainless Steel*		14	.182	5	.205	B	.238	C	.242	19/64	.2969	N	.302	T	.358	23/64	.3594
	Aluminum-Sheet		15	.180	13/64	.2031	15/64	.2344	B	.238	19/64	.2969	N	.302	T	.358	23/64	.3594
	Cast Aluminum & Zinc Die Cast		16	.177	9	.196	1	.228	A	.234	L	.290	M	.295	S	.348	T	.358
	Cast Iron		14	.182	5	.205	B	.238	C	.242	19/64	.2969	N	.302	23/64	.3594	23/64	.3594
	Steel				13/64	.2031	A	.234	M	.295	19/64	.2969	N	.302	T	.358	23/64	.3594
	Stainless Steel*				5	.205	B	.238	19/64	.2969	N	.302	T	.358	23/64	.3594		
	Aluminum-Sheet				13/64	.2031	15/64	.2344	19/64	.2969	N	.302	T	.358	23/64	.3594		
	Cast Aluminum & Zinc Die Cast				9	.196	1	.228	L	.290	M	.295	S	.348	T	.358		
	Cast Iron				5	.205	B	.238	19/64	.2969	N	.302	23/64	.3594	23/64	.3594		



Size	Threads per inch	D			d		p**		Special Taper Length for these lengths and under shall be 1/2 to 2 times the pitch of the thread	
		MAJOR DIAMETER			MINOR DIAMETER		POINT DIAMETER		90°	*C'sk
		Basic	Max.	Min.	Max.	Min.	Max.	Min.		
0	48	.060	.060	.057	.036	.033	.031	.027	5/64	1/8
1	42	.073	.075	.072	.049	.046	.044	.040	5/64	5/32
2	32	.086	.088	.084	.064	.060	.058	.054	7/64	3/16
3	28	.099	.101	.097	.075	.071	.068	.063	9/64	7/32
4	24	.112	.114	.110	.086	.082	.079	.074	3/16	1/4
5	20	.125	.130	.126	.094	.090	.087	.082	3/16	1/4
6	20	.138	.139	.135	.104	.099	.095	.089	1/4	5/16
7	19	.151	.154	.149	.115	.109	.105	.099	5/16	3/8
8	18	.164	.166	.161	.122	.116	.112	.106		
10	16	.190	.189	.183	.141	.135	.130	.123	3/8	1/2
12	14	.216	.215	.209	.164	.157	.152	.145	7/16	9/16
1/4	14	.250	.246	.240	.192	.185	.179	.171	1/2	5/8
5/16	12	.3125	.315	.308	.244	.236	.230	.222	1/2	5/8

Maximum crest of thread (B) up to and including size 8 equals 0.004 inch; minimum crest of thread over size 8 equals 0.006 inch.

Tapered threads have unfinished crests.

Taper and Flutes: Screws shall be tapered and fluted as illustrated in cut. Details of taper and flute design shall be optional with manufacturer, provided they meet the performance requirements and the flutes extend through the first full thread.

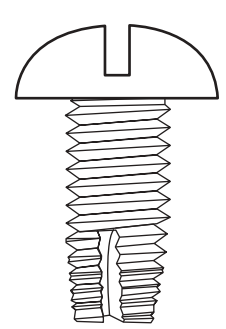
Taper length (S) is 2 to 2 1/2 times the pitch of the thread.

Sizes and pitches in the above table are not necessarily stock sizes.

*Countersunk Heads these lengths and shorter shall be furnished with undercut heads.

**These values are before roll threading.

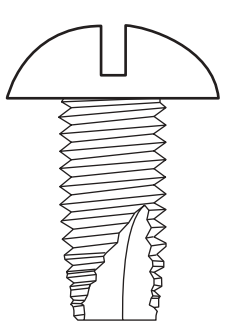
1 Otherwise designated as Type "BT"



TYPE 1

NOTE: Type 1 T. C. screws are recommended for steel parts with thicknesses less than 1/2 of the screw diameter as indicated by light area.
 Type 23 T. C. screws are recommended for all other applications in metal.
 *Values listed are for #410 corrosion resistant screws in high tensile stainless steel.
 T. C. screws are not generally recommended in cast metals having a thickness less than 3 thread pitches or in metal parts with thread engagement greater than 10 thread pitches. You can fasten in thicker material by counterboring to give the proper length of thread engagement.

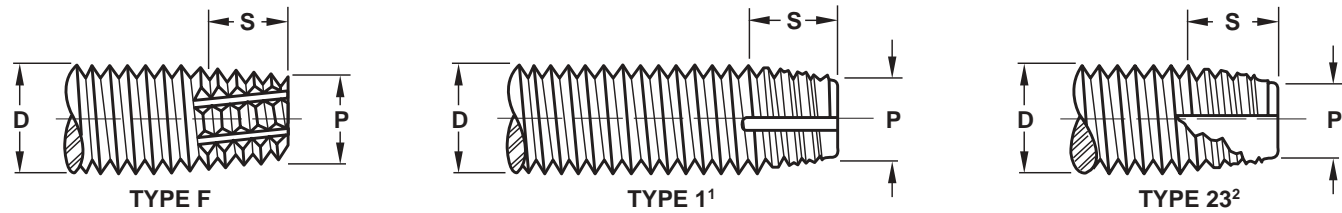
Shaded areas on chart are recommended hole diameters for Type 1 screws
 White areas on chart are recommended hole diameters for Type 23 screws



TYPE 23

MACHINE SCREWS		TAPPING SCREWS	
Diameter	Length Thru	Diameter	Length Thru
No. 2, 3	1/8"	4	1/4"
4, 5, 6	3/16"	6	5/16"
8	1/4"	7	3/8"
10	5/16"	8	7/16"
12	3/8"	10	1/2"
1/4"	7/16"	12	9/16"
5/16"	1/2"	14 & 1/4"	5/8"
3/8"	9/16"	5/16"	5/8"
1/2"	3/4"	20	13/16"

Undercut heads are furnished automatically as standard in short Flat & Oval head screws according to the above chart. Any others furnished to special order.



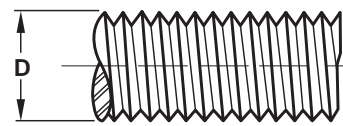
COARSE THREADS

FINE THREADS

Size	Threads Per Inch	D			P		Size	Threads Per Inch	D			P	
		MAJOR DIA.			POINT DIA.				MAJOR DIA.			POINT DIA.	
		Basic	Max.	Min.	Max.	Min.			Basic	Max.	Min.	Max.	Min.
2	56	.0860	.0860	.0820	.067	.061	2	64	.0860	.0860	.0822	.070	.064
3	48	.0990	.0990	.0946	.077	.070	3	56	.0990	.0990	.0950	.080	.074
4	40	.1120	.1120	.1072	.086	.077	4	48	.1120	.1120	.1076	.090	.083
5	40	.1250	.1250	.1202	.099	.090	5	44	.1250	.1250	.1204	.101	.093
6	32	.1380	.1380	.1326	.106	.095	6	40	.1380	.1380	.1332	.112	.103
8	32	.1640	.1640	.1586	.132	.121	8	36	.1640	.1640	.1590	.135	.125
10	24	.1900	.1900	.1834	.147	.133	10	32	.1900	.1900	.1846	.158	.147
12	24	.2160	.2160	.2094	.173	.159	12	28	.2160	.2160	.2098	.179	.167
1/4	20	.2500	.2500	.2428	.198	.181	1/4	28	.2500	.2500	.2438	.213	.201
5/16	18	.3125	.3125	.3043	.255	.236	5/16	24	.3125	.3125	.3059	.269	.255
3/8	16	.3750	.3750	.3660	.310	.289	3/8	24	.3750	.3750	.3684	.332	.318

Taper and Flutes: Screws shall be tapered and fluted as illustrated in cut. Details of taper and flute design shall be optional with manufacturer, provided they meet the performance requirements and the flutes extend through the first full thread. Sizes and pitches listed in the above table are not necessarily stock sizes.

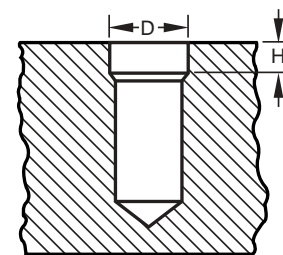
Screws having a thread length of 8 pitches or less will have a taper length (S) of 2½ to 3½ times the pitch distance. Longer lengths will have a taper length (S) of 3½ to 4½ times the pitch distance.
 ¹Otherwise designated as Type "T".
 ²Otherwise designated as Type "D".



UNIFIED AND AMERICAN CLASS 2A THREAD

Size	Threads per Inch	Major Diameter		Pitch Diameter		Minor Diam.	Allowance	Size	Threads per Inch	Major Diameter		Pitch Diameter		Minor Diam.	Allowance
		Max.	Min.	Max.	Min.					Max.	Min.	Max.	Min.		
2(.086)	56	.0854	.0813	.0738	.0717	.0635	.0006	10(.190)	24	.1890	.1818	.1619	.1586	.1379	.0010
3(.099)	48	.0983	.0938	.0848	.0825	.0727	.0007	10(.190)	32	.1891	.1831	.1688	.1658	.1508	.0009
4(.112)	40	.1112	.1061	.0950	.0925	.0805	.0008	12(.216)	24	.2150	.2078	.1879	.1845	.1639	.0010
5(.125)	40	.1242	.1191	.1080	.1054	.0935	.0008	1/4(.250)	20	.2489	.2408	.2164	.2127	.1876	.0011
6(.138)	32	.1372	.1312	.1169	.1141	.0989	.0008	1/4(.250)	28	.2490	.2425	.2258	.2225	.2052	.0010
6(.138)	40	.1372	.1321	.1210	.1184	.1065	.0008	5/16(.3125)	18	.3113	.3026	.2752	.2712	.2431	.0012
8(.164)	32	.1631	.1571	.1428	.1399	.1248	.0009	3/8(.375)	16	.3737	.3643	.3331	.3287	.2970	.0013
8(.164)	36	.1632	.1577	.1452	.1424	.1291	.0008	1/2(.500)	13	.4985	.4876	.4485	.4435	.4041	.0015

THICKNESS	MATERIAL	Screw Size	Drill Size	4-40		4-48		5-40		6-32		6-40		8-32		10-24	
				No.	Dia.	No.	Dia.	No.	Dia.	No.	Dia.	No.	Dia.	No.	Dia.	No.	Dia.
UP	Steel			43	.089	42	.093	37	.104	35	.110	32	.116	29	.136	23	.154
TO	Stainless Steel*			43	.089	42	.093	37	.104	35	.110	32	.116	29	.136	23	.154
.047	Aluminum-Sheet			43	.089	42	.093	38	.101	7/64	.1094	33	.113	29	.136	24	.152
	Steel			43	.089	3/32	.0938	37	.104	34	.111	32	.116	29	.136	23	.154
.063	Stainless Steel*			42	.093	41	.096	36	.106	32	.116	31	.120	28	.140	21	.159
	Aluminum-Sheet			43	.089	42	.093	38	.101	7/64	.1094	32	.116	29	.136	24	.152
	Steel			42	.093	41	.096	37	.104	33	.113	32	.116	28	.140	5/32	.1562
.078	Stainless Steel*			3/32	.0938	40	.098	36	.106	32	.116	31	.120	28	.140	20	.161
	Aluminum-Sheet			43	.089	3/32	.0938	37	.104	34	.111	32	.116	29	.136	23	.154
	Steel			42	.093	41	.096	36	.106	32	.106	31	.120	28	.140	27	.159
.094	Stainless Steel*			41	.096	40	.098	7/64	.1094	32	.116	31	.120	27	.144	20	.161
	Aluminum-Sheet			43	.089	3/32	.0938	37	.104	33	.113	32	.116	29	.136	5/32	.1562
	Steel			42	.093	40	.098	36	.106	32	.116	31	.120	27	.144	20	.161
.109	Stainless Steel*			41	.096	39	.099	7/64	.1094	31	.120	1/8	.125	27	.144	19	.166
	Aluminum-Sheet			42	.093	41	.096	37	.104	33	.113	32	.116	28	.140	22	.157
	Steel			41	.096	39	.099	7/64	.1094	31	.120	31	.120	27	.144	19	.166
.125	Stainless Steel*			40	.098	39	.099	34	.111	31	.120	1/8	.125	26	.147	19	.166
	Aluminum-Sheet			42	.093	41	.096	36	.106	32	.116	31	.120	28	.140	21	.159
	Cast Aluminum & Zinc Die Cast			40	.098	39	.099	35	.110	31	.120	1/8	.125	26	.147	19	.166
	Cast Iron			38	.101	37	.104	32	.116	1/8	.125	30	.128	24	.152	17	.173
	Steel			40	.098	39	.099	35	.110	31	.120	1/8	.125	26	.147	19	.166
.141	Stainless Steel*			39	.099	38	.101	33	.113	1/8	.125	1/8	.125	26	.147	18	.169
	Aluminum-Sheet			3/32	.0938	40	.098	36	.105	32	.116	31	.120	28	.140	20	.161
	Cast Aluminum & Zinc Die Cast			40	.098	39	.099	35	.110	31	.120	1/8	.125	26	.147	19	.166
	Cast Iron			37	.104	37	.104	32	.116	30	.128	30	.128	24	.152	16	.177
	Steel			38	.101	37	.104	32	.116	1/8	.125	30	.128	24	.152	17	.173
.188	Stainless Steel*			37	.104	37	.104	32	.116	30	.128	30	.128	23	.154	16	.177
	Aluminum-Sheet			40	.098	39	.099	35	.110	31	.120	1/8	.125	26	.147	19	.166
	Cast Aluminum & Zinc Die Cast			40	.098	38	.101	34	.111	31	.120	1/8	.125	26	.147	19	.166
	Cast Iron			37	.104	36	.106	32	.116	30	.128	30	.128	23	.154	16	.177
	Steel			37	.104			32	.116	30	.128	30	.128	23	.154	16	.177
.250	Stainless Steel*			37	.104			31	.120	30	.128	30	.128	5/32	.1562	15	.180
	Aluminum-Sheet			38	.101			33	.113	1/8	.125	30	.128	25	.149	11/64	.1719
	Cast Aluminum & Zinc Die Cast			39	.099			33	.113	1/8	.125	1/8	.125	25	.149	18	.169
	Cast Iron			36	.106			31	.120	30	.128	30	.128	22	.157	15	.180
	Steel							30	.128					23	.154	16	.177
.313	Stainless Steel*							30	.128					5/32	.1562	15	.180
	Aluminum-Sheet							30	.128					23	.154	16	.177
	Cast Aluminum & Zinc Die Cast									1/8	.125			25	.149	11/64	.1719
	Cast Iron									30	.128			22	.157	15	.180
	Steel															16	.177
.375 & UP	Stainless Steel*															15	.180
	Aluminum-Sheet															16	.177
	Cast Aluminum & Zinc Die Cast															11/64	.1719
	Cast Iron															15	.180



FOR USE IN PLASTICS with recommended hole sizes

TYPE 23

TYPE 25

Screw Size	Cellulose Compounds		Phenolics, Polystyrene, Urea-Formaldehyde Compounds		Recommended Counterbore			Screw Size	Cellulose Compounds		Phenolics, Polystyrene, Urea-Formaldehyde Compounds	
	Drill No.	Drill Dia.	Drill No.	Dia.	No.	D			Drill No.	Dia.	Drill No.	Dia.
						Dia.	Depth					
2-56	48	.0760	5/64	.0781	43	.0890	1/32	2-32	48	.0760	5/64	.0781
3-48	44	.0860	43	.0890	38	.1090	1/32	3-28	43	.0890	43	.0890
4-40	40	.0980	39	.0995	32	.1160	1/16	4-24	39	.0995	37	.1040
5-40	35	.1100	33	.1130	29	.1360	1/16	5-20	33	.1130	32	.1160
6-32	31	.1200	1/8	.1250	28	.1400	1/16	6-20	31	.1200	1/8	.1250
8-32	27	.1440	26	.1470	19	.1660	1/16	8-18	27	.1440	26	.1470
10-24	19	.1660	18	.1695	12	.1890	1/16	10-16	19	.1660	18	.1695
12-24	12	.1890	10	.1935	7/32	.2187	3/32	12-14	12	.1890	10	.1935
1/4-20	2	.2210	1	.2280	E	.2500	3/32	1/4-14	2	.2210	1	.2280
5/16-18	J	.2770	9/32	.2812	O	.3160	1/8	5/16-12	J	.2770	L	.2900
3/8-16	R	.3390	11/32	.3438	W	.3860	1/8	3/8-12	11/32	.3438	S	.3480