Errata
to
ASME B18.29.1-1993

The Errata corrections listed below apply to ASME B18.29.1-1993, Helical Coil Screw Thread Inserts – Free Running and Screw Locking (Inch Series). This Errata to the 1993 edition is being issued in the form of replacement pages. Corrections are incorporated directly into the effective pages. Replace or insert the pages listed. It is also advisable that this cover page be retained for reference. The pages show the corrections given below. The pages not listed are the reverse sides of the listed pages and contain no changes.

Page	Location	Change
3	Table 1	(1) Under Nominal Thread Size $^1/_4$(0.2500)-20, correct Pitch Diameter, 2B Max., to read 0.2864 (instead of 0.2964) (2) Under Nominal Thread Size $^3/_4$(0.7500)-10, correct Minor Diameter, Max., to read 0.7838 (instead of 0.7638) (3) Under Nominal Thread Size $1^1/_8$(1.1250)-7, correct Pitch Diameter, 2B Max., to read 1.2262 (instead of 1.2252)
13	Para. 4.4.3.2	Correct the spelling of "Breakway" to read "Breakaway" in two places

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TABLE 1 STI THREADED HOLE DATA

Nominal Thread Size	"G" Minimum Drilling Depth For Each Insert Length										Countersink "M" Diameter (120° = 5° Included angle)		Minor Diameter		Pitch Diameter			Major Dia. Min.	"T" Minimum Tapping Depth				
	Plug Taps					Bottoming Taps													Insert Length				
	1D	1½D	2D	2½D	3D	1D	1½D	2D	2½D	3D	Min.	Max.	Min.	Max.	Min.	3B Max.	2B Max.	2B 3B	1D	1½D	2D	2½D	3D
UNIFIED COARSE (UNC)																							
1(0.073)-64	0.203	0.240	0.276	0.313	0.349	0.136	0.172	0.209	0.245	0.282	0.08	0.10	0.0764	0.0823	0.0832	0.0843	0.0850	0.0933	0.090	0.125	0.160	0.200	0.235
2(0.086)-56	0.236	0.279	0.322	0.365	0.408	0.157	0.200	0.243	0.286	0.329	0.09	0.11	0.0899	0.0961	0.0976	0.0989	0.0996	0.1092	0.100	0.150	0.190	0.230	0.280
3(0.099)-48	0.273	0.323	0.372	0.422	0.471	0.182	0.232	0.281	0.331	0.380	0.11	0.14	0.1036	0.1104	0.1126	0.1140	0.1148	0.1261	0.120	0.170	0.220	0.270	0.320
4(0.112)-40	0.318	0.374	0.430	0.486	0.542	0.212	0.268	0.324	0.380	0.436	0.14	0.17	0.1175	0.1252	0.1283	0.1299	0.1308	0.1445	0.140	0.190	0.250	0.310	0.360
5(0.125)-40	0.338	0.400	0.462	0.525	0.588	0.225	0.288	0.350	0.412	0.475	0.16	0.19	0.1305	0.1373	0.1413	0.1430	0.1438	0.1575	0.150	0.210	0.280	0.340	0.400
6(0.138)-32	0.394	0.464	0.532	0.602	0.670	0.263	0.332	0.401	0.470	0.539	0.18	0.21	0.1448	0.1527	0.1583	0.1601	0.1611	0.1786	0.170	0.240	0.310	0.380	0.450
8(0.164)-32	0.434	0.516	0.598	0.680	0.762	0.289	0.371	0.453	0.535	0.617	0.20	0.23	0.1708	0.1781	0.1843	0.1862	0.1872	0.2046	0.200	0.280	0.360	0.440	0.520
10(0.190)-24	0.535	0.630	0.725	0.820	0.915	0.357	0.452	0.547	0.642	0.737	0.24	0.27	0.1990	0.2080	0.2170	0.2192	0.2203	0.2441	0.230	0.330	0.420	0.520	0.610
12(0.216)-24	0.574	0.682	0.790	0.898	1.006	0.383	0.491	0.599	0.707	0.815	0.26	0.29	0.2250	0.2340	0.2430	0.2453	0.2464	0.2701	0.260	0.370	0.470	0.580	0.690
1/4(0.2500)-20	0.675	0.800	0.925	1.050	1.175	0.450	0.575	0.700	0.825	0.950	0.31	0.34	0.2608	0.2704	0.2825	0.2851	0.2864	0.3150	0.300	0.430	0.550	0.680	0.800
5/16(0.3125)-18	0.801	0.957	1.113	1.269	1.425	0.534	0.690	0.846	1.002	1.158	0.38	0.41	0.3245	0.3342	0.3486	0.3515	0.3529	0.3847	0.370	0.530	0.680	0.840	0.990
3/8(0.3750)-16	0.750	0.938	1.125	1.312	1.500	0.625	0.812	1.000	1.188	1.375	0.45	0.48	0.3885	0.3987	0.4156	0.4189	0.4203	0.4562	0.440	0.630	0.810	1.000	1.190
7/16(0.4375)-14	0.867	1.086	1.305	1.524	1.743	0.724	0.943	1.162	1.381	1.600	0.52	0.55	0.4530	0.4639	0.4839	0.4875	0.4890	0.5303	0.510	0.730	0.950	1.170	1.380
1/2(0.5000)-13	0.962	1.212	1.462	1.712	1.962	0.808	1.058	1.308	1.558	1.808	0.59	0.62	0.5166	0.5273	0.5499	0.5537	0.5554	0.5999	0.580	0.830	1.080	1.330	1.580
9/16(0.5625)-12	1.062	1.343	1.624	1.905	2.186	0.895	1.176	1.457	1.738	2.019	0.66	0.69	0.5806	0.5918	0.6167	0.6208	0.6225	0.6708	0.650	0.930	1.210	1.490	1.770
5/8(0.6250)-11	1.170	1.483	1.795	2.108	2.420	0.989	1.301	1.614	1.926	2.239	0.73	0.76	0.6447	0.6564	0.6841	0.6885	0.6903	0.7431	0.720	1.030	1.340	1.650	1.970
3/4(0.7500)-10	1.350	1.725	2.100	2.475	2.850	1.150	1.525	1.900	2.275	2.650	0.87	0.90	0.7716	0.7838	0.8149	0.8196	0.8216	0.8799	0.850	1.230	1.600	1.980	2.350
7/8(0.8750)-9	1.542	1.979	2.417	2.854	3.292	1.319	1.757	2.194	2.632	3.069	1.00	1.03	0.8990	0.9119	0.9471	0.9522	0.9543	1.0193	0.990	1.420	1.860	2.300	2.740
1(1.0000)-8	1.750	2.250	2.750	3.250	3.750	1.500	2.000	2.500	3.000	3.500	1.14	1.17	1.0271	1.0421	1.0812	1.0868	1.0890	1.1624	1.130	1.630	2.130	2.630	3.130
1 1/8(1.1250)-7	1.982	2.545	3.107	3.670	4.232	1.696	2.259	2.821	3.384	3.946	1.29	1.32	1.1559	1.1730	1.2178	1.2239	1.2262	1.3106	1.270	1.830	2.390	2.960	3.520
1 1/4(1.2500)-7	2.107	2.732	3.357	3.982	4.607	1.821	2.446	3.071	3.696	4.321	1.41	1.44	1.2809	1.2980	1.3428	1.3490	1.3514	1.4356	1.390	2.020	2.640	3.270	3.890
1 3/8(1.3750)-6	2.375	3.062	3.750	4.437	5.125	2.042	2.729	3.417	4.104	4.792	1.56	1.59	1.4110	1.4310	1.4832	1.4900	1.4926	1.5915	1.540	2.230	2.920	3.600	4.290
1 1/2(1.5000)-6	2.500	3.250	4.000	4.750	5.500	2.167	2.917	3.667	4.417	5.167	1.69	1.72	1.5360	1.5560	1.6082	1.6151	1.6177	1.7165	1.670	2.420	3.170	3.920	4.670
UNIFIED FINE (UNF)																							
2(0.086)-64	0.223	0.266	0.309	0.352	0.395	0.149	0.192	0.235	0.278	0.321	0.09	0.11	0.0894	0.0947	0.0962	0.0974	0.0981	0.1063	0.100	0.145	0.190	0.230	0.275
3(0.099)-56	0.256	0.305	0.355	0.404	0.454	0.170	0.220	0.269	0.319	0.368	0.11	0.14	0.1029	0.1086	0.1106	0.1119	0.1126	0.1222	0.120	0.170	0.220	0.270	0.310
4(0.112)-48	0.293	0.349	0.405	0.461	0.517	0.195	0.251	0.307	0.363	0.419	0.14	0.17	0.1166	0.1229	0.1256	0.1271	0.1279	0.1391	0.130	0.190	0.240	0.300	0.360
6(0.138)-40	0.357	0.426	0.495	0.564	0.633	0.238	0.307	0.376	0.445	0.514	0.17	0.20	0.1435	0.1503	0.1543	0.1560	0.1569	0.1705	0.160	0.230	0.300	0.370	0.440
8(0.164)-36	0.413	0.495	0.577	0.659	0.741	0.275	0.357	0.439	0.521	0.603	0.20	0.23	0.1701	0.1771	0.1821	0.1840	0.1849	0.2001	0.190	0.270	0.360	0.440	0.520
10(0.190)-32	0.472	0.568	0.662	0.758	0.852	0.315	0.410	0.505	0.600	0.695	0.23	0.26	0.1968	0.2041	0.2103	0.2123	0.2133	0.2306	0.220	0.320	0.410	0.510	0.600
1/4(0.2500)-28	0.589	0.714	0.839	0.964	1.089	0.393	0.518	0.648	0.768	0.893	0.29	0.32	0.2577	0.2646	0.2732	0.2754	0.2765	0.2964	0.290	0.410	0.540	0.660	0.790
5/16(0.3125)-24	0.718	0.874	1.030	1.186	1.342	0.479	0.635	0.791	0.947	1.103	0.36	0.39	0.3215	0.3288	0.3395	0.3421	0.3433	0.3666	0.350	0.510	0.670	0.820	0.980
3/8(0.3750)-24	0.625	0.812	1.000	1.187	1.375	0.542	0.729	0.917	1.104	1.292	0.42	0.45	0.3840	0.3910	0.4020	0.4047	0.4059	0.4291	0.420	0.600	0.790	0.980	1.170
7/16(0.4375)-20	0.738	0.957	1.176	1.395	1.614	0.638	0.857	1.076	1.295	1.514	0.50	0.53	0.4483	0.4561	0.4700	0.4731	0.4744	0.5025	0.490	0.710	0.930	1.140	1.360
1/2(0.5000)-20	0.800	1.050	1.300	1.550	1.800	0.700	0.950	1.200	1.450	1.700	0.56	0.59	0.5108	0.5186	0.5325	0.5357	0.5371	0.5650	0.550	0.800	1.050	1.300	1.550
9/16(0.5625)-18	0.895	1.176	1.457	1.738	2.019	0.784	1.065	1.346	1.627	1.908	0.63	0.66	0.5745	0.5826	0.5986	0.6020	0.6035	0.6347	0.620	0.900	1.180	1.460	1.740
5/8(0.6250)-18	0.958	1.271	1.583	1.896	2.208	0.847	1.160	1.472	1.785	2.097	0.69	0.72	0.6370	0.6451	0.6611	0.6646	0.6661	0.6972	0.680	0.990	1.310	1.620	1.930
3/4(0.7500)-16	1.125	1.500	1.875	2.250	2.625	1.000	1.375	1.750	2.125	2.500	0.82	0.85	0.7635	0.7720	0.7906	0.7945	0.7961	0.8312	0.810	1.190	1.560	1.940	2.310
7/8(0.8750)-14	1.304	1.741	2.179	2.616	3.054	1.161	1.598	2.036	2.473	2.911	0.96	0.99	0.8905	0.8994	0.9214	0.9257	0.9274	0.9678	0.950	1.380	1.820	2.260	2.700

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TABLE 1 CONTINUED

Nominal Thread Size	"G" Minimum Drilling Depth For Each Insert Length										Countersink "M" Diameter (120° = 5° Included angle)		Minor Diameter		Pitch Diameter			Major Dia. Min.	"T" Minimum Tapping Depth Insert Length				
	Plug Taps					Bottoming Taps																	
	1D	1½D	2D	2½D	3D	1D	1½D	2D	2½D	3D	Min.	Max.	Min.	Max.	Min.	3B Max.	2B Max.	2B 3B	1D	1½D	2D	2½D	3D
1(1.0000)-12	1.500	2.000	2.500	3.000	3.500	1.333	1.833	2.333	2.833	3.333	1.10	1.13	1.0181	1.0281	1.0542	1.0589	1.0608	1.1083	1.080	1.580	2.080	2.580	3.080
1⅛(1.1250)-12	1.625	2.187	2.750	3.312	3.875	1.453	2.021	2.583	3.146	3.708	1.22	1.25	1.1431	1.1531	1.1792	1.1841	1.1860	1.2333	1.210	1.770	2.330	2.900	3.460
1¼(1.2500)-12	1.750	2.375	3.000	3.625	4.250	1.583	2.208	2.833	3.458	4.083	1.35	1.38	1.2681	1.2781	1.3042	1.3092	1.3112	1.3583	1.330	1.960	2.580	3.210	3.830
1⅜(1.3750)-12	1.875	2.562	3.250	3.937	4.625	1.708	2.396	3.083	3.771	4.458	1.47	1.50	1.3931	1.4031	1.4292	1.4343	1.4364	1.4833	1.460	2.150	2.830	3.520	4.210
1½(1.5000)-12	2.000	2.750	3.500	4.250	5.000	1.833	2.583	3.333	4.083	4.833	1.60	1.63	1.5181	1.5281	1.5542	1.5595	1.5615	1.6083	1.580	2.330	3.080	3.830	4.580
UNIFIED SPECIAL (UNS)																							
1(1.0000)-14	1.429	1.929	2.429	2.929	3.429	1.286	1.786	2.286	2.786	3.286	1.08	1.11	1.0155	1.0243	1.0464	1.0508	1.0527	1.0928	1.070	1.570	2.070	2.570	3.070

(*See Notes (1) and (2).*)

NOTES:

(1) The minimum drilling depths allow for:
  (a) countersinking the drilled hole to prevent a feather edge at the start of the tapped hole.
  (b) ¾ to 1½ pitch of insert "set-down" to allow for maximum production tolerance.
  (c) dimensions are shown for both plug and bottoming taps. Plug taps 5/16 in. and smaller have a male center and the drilled hole depth dimensions allow for this length (one half of the diameter of the bolt). Calculation of dimension *G* is as follows:

  For plug taps 5/16 in. and smaller:
  G = insert nominal length + .5 × bolt nominal diameter + 4 pitch (tap chamfer) + 1 pitch (tap end clearance) + 1 pitch (allowance for countersink and maximum insert set-down).

  For plug taps ⅜ in. and larger:
  G = insert nominal length + 4 pitch (tap chamfer) + 1 pitch (tap end clearance) + 1 pitch (allowance for countersink and maximum insert set-down).

  For bottoming taps:
  G = insert nominal length + 2 pitch (tap chamfer) + 1 pitch (tap end clearance) + 1 pitch (allowance for countersink and maximum insert set-down).

(2) The minimum tapping depth (dimension *T*) is the minimum for countersunk holes with insert set-down of 1½ pitch maximum (see Fig. 1). The calculation for dimension *T* is:
  T = insert nominal length + 1 pitch

(3) Thread diameters are calculated as follows:
  Pitch Dia., Min. = Pitch Dia., Min., of Nominal Thread + 2 × H Max.
  Pitch Dia., Max. = Pitch Dia., Max. of Nominal Thread + 2 × H Min.
  where H min. and H max. are from Table 1.

  Major Dia., Min. = Pitch Dia., Min. + 0.649519 pitch
  Minor Dia., Min. = Pitch Dia., Min. – 0.433013 pitch
  Minor Dia., Max. = Minor Dia., Min. + tolerance
  where tolerance is selected from the appropriate table in ASME B1.1 for UNS threads with basic major diameter equal to the minimum major diameter of the STI thread.

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bolts selected for this test shall be of sufficient length so the thread runout does not enter the insert and that a minimum of 3 full threads extend past the locking coils. Acceptability of bolt threads shall be determined based on System 22 of ANSI/ASME B1.3M.

4.4.2 Torque Test Block. The insert to be tested shall be installed in a Class 3B threaded hole conforming to Table 1 in a test block made from 2024-T4 aluminum alloy. After installation the tang shall be removed.

4.4.3 Torque Test Method. The torque test shall consist of a 15-cycle, room temperature test. A new bolt and a new tapped hole shall be used for each complete 15-cycle test. Bolts must assemble freely, with the fingers, up to the locking coil or coils. The bolt shall be engaged and disengaged from the assembled insert for 15 full installation and removal cycles. The test shall be run at a rate slow enough to yield a dependable measure of torque and avoid heating of the bolt. A bolt shall be considered fully installed when three threads extend past the end of the locking coils of the insert. The removal cycle shall be considered complete when the locking coils are disengaged.

4.4.3.1 Maximum Locking Torque. Maximum locking torque shall be the highest torque value encountered on any installation or removal cycle and shall not exceed the values specified in Table 6. Maximum locking torque readings shall be taken on the first and seventh installation cycles and on the fifteenth removal cycle.

4.4.3.2 Minimum Breakaway Torque. Minimum breakaway torque shall be the torque required to start removal of the screw or bolt from the installed position and shall be recorded at the start of the fifteenth removal cycle. The torque value for any cycle shall be not less than the applicable value shown on Table 6.

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Helical Coil Screw Thread Inserts — Free Running and Screw Locking (Inch Series)

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FOREWORD

(This Foreword is not part of ASME B18.29.1-1993.)

Although this is the first ASME Standard covering helical coil screw thread inserts, they have been in use for many years. The helical coil insert was invented in the 1930s and found initial acceptance in aircraft engines during World War II.

Since that time applications for helical coil inserts have come into broad usage in aerospace, automotive, and industrial original equipment design, production salvage (repair), and in service repair.

Subcommittee 29, Threaded Inserts, met initially in May 1989 after authorization by the ASME B18 Committee to proceed with development of standards covering screw thread inserts.

Following approval by the B18 Committee, the proposal was submitted to the American National Standards Institute for approval. ANSI approval was received on February 4, 1993.

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HELICAL COIL SCREW THREAD INSERTS— FREE RUNNING AND SCREW LOCKING (INCH SERIES)

1 INTRODUCTORY NOTES

1.1 Scope

1.1.1 This Standard is intended to delineate the dimensional data for the inch series helical coil screw thread insert and the threaded hole into which it is installed. Appendices that describe insert selection, STI (Screw Thread Insert) taps, gages and gaging, insert installation, and removal tooling are also included.

1.1.2 The inclusion of dimensional data in this Standard is not intended to imply that all products described are stock sizes. Consumers should consult with manufacturers concerning availability.

1.2 References

The latest editions of the following documents form a part of this Standard to the extent specified herein.

American National Standards

ASME B1.1, Unified Inch Screw Threads (UN and UNR Thread Form)

ANSI/ASME B1.2, Gages and Gaging for Unified Inch Screw Threads

ANSI/ASME B1.3M, Screw Thread Gaging Systems for Dimensional Accepatbility—Inch and Metric Screw Threads (UN, UNR, UNJ, M, and MJ)

ANSI/ASME B46.1, Surface Texture (Surface Roughness, Waviness, and Lay)

ASME/ANSI B47.1, Gage Blanks

ASME/ANSI B94.9, Taps—Cut and Ground Threads

ANSI Y14.5M, Dimensioning and Tolerancing

ANSI Y14.36, Surface Texture Symbols

SAE J417, Hardness Tests and Hardness Number Conversions

Federal Standard

FED-STD-H28/4, Screw Thread Standards for Federal Services, Section 4, Controlled Radius Root Screw Threads, UNJ Symbol

Military Specifications

MIL-S-8879, Screw Threads, Controlled Radius Root with Increased Minor Diameter, General Specification for

MIL-L-46010, Lubricant, Solid Film, Heat Cured, Corrosion Inhibiting

1.3 Description

Helical coil inserts are screw thread bushings coiled from wire of diamond shape cross-section. They are screwed into STI (Screw Thread Insert) tapped holes to form nominal size internal threads. Inserts are installed by torquing through a diametral tang. This tang is notched for removal after installation.

In the free state, they are larger in diameter than the tapped hole into which they are installed. In the assembly operation, the torque applied to the tang reduces the diameter of the leading coil and permits it to enter the tapped thread. The remaining coils are reduced in diameter as they, in turn, are screwed into the tapped hole. When the torque or rotation is stopped, the coils expand with a spring-like action anchoring the insert in place against the tapped hole.

1.4 Class of Fit

Since helical coil inserts are flexible, the class of fit of the final assembly is a function of the size of the tapped hole. Helical coil STI taps are available for both Class 2B and 3B tapped holes. Class 2B tapped holes provide maximum production tolerances, but result in lower locking torques when screw locking inserts are used. The higher and more consistent torques given in Table 6 are met by the screw locking inserts when assembled and tested in Class 3B tapped holes in accordance with para 4.4.

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1.5 Compatibility

Assembled helical coil inserts will mate properly with items having UN external threads in accordance with ASME B1.1. In addition, due to the radius on the crest of the insert at the minor diameter, the assembled insert will mate with UNJ external threaded parts with controlled radius root threads per FED-STD-H28/4 (MIL-S-8879).

1.6 Types of Inserts

1.6.1 Free Running. The free running insert provides a smooth, hard, and free running thread.

1.6.2 Screw-Locking. The screw-locking insert provides a resilient locking thread produced by a series of chords on one or more of the insert coils.

2 STI TAPPED HOLE

The tapped hole into which the insert is installed shall be in accordance with ASME B1.1, except that diameters are larger to accommodate the wire cross-section of the insert. Dimensions of the STI Tapped Hole are shown in Table 1 and are calculated per Note 3 to Table 1.

2.1 Screw Thread Designation

2.1.1 Designation for Tapped Hole. The drawing note for the STI threaded hole per Table 1 to accept the helical coil insert shall be in accordance with the following example:

1/4-20 UNC-2B STI (or 0.250-20 UNC-2B STI)
Thread .430 min depth, per ASME B18.29.1

2.1.2 Designation for a Helical Coil Insert. Designation of the helical coil insert on parts lists, spares lists, purchase orders, etc., shall be in accordance with the following examples:

1/4-20 UNC 0.375 long (or 0.250-20 UNC 0.375 long) Helical Coil free running Insert, per ASME B18.29.1

#10-32 UNF 0.380 long (or 0.190-32 UNF 0.380 long) Helical coil screw locking insert, per ASME B18.29.1

2.1.3 Designation for STI Threaded Hole Including Installed Helical Coil Insert. The drawing note for the STI threaded hole per Table 1 having a helical coil insert installed shall be in accordance with the following example:

1/4-20 UNC-2B STI (or 0.250-20 UNC-2B STI)
Thread 0.430 min deep
Install 1/4-20 UNC 0.375 long helical coil free running insert, per ASME B18.29.1.

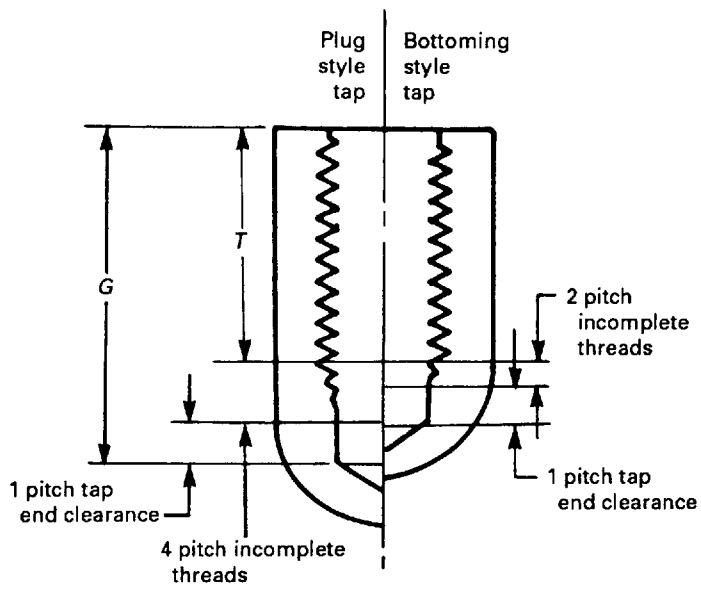


FIG. 1 TAPPING DEPTHS

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TABLE 1 STI THREADED HOLE DATA

Nominal Thread Size	"G" Minimum Drilling Depth For Each Insert Length										Countersink "M" Diameter (120° = 5° Included angle)		Minor Diameter		Pitch Diameter			Major Dia. Min.	"T" Minimum Tapping Depth Insert Length				
	Plug Taps					Bottoming Taps																	
	1D	1½D	2D	2½D	3D	1D	1½D	2D	2½D	3D	Min.	Max.	Min.	Max.	Min.	3B Max.	2B Max.	2B 3B	1D	1½D	2D	2½D	3D
UNIFIED COARSE (UNC)																							
1(0.073)-64	0.203	0.240	0.276	0.313	0.349	0.136	0.172	0.209	0.245	0.282	0.08	0.10	0.0764	0.0823	0.0832	0.0843	0.0850	0.0933	0.090	0.125	0.160	0.200	0.235
2(0.086)-56	0.236	0.279	0.322	0.365	0.408	0.157	0.200	0.243	0.286	0.329	0.09	0.11	0.0899	0.0961	0.0976	0.0989	0.0996	0.1092	0.100	0.150	0.190	0.230	0.280
3(0.099)-48	0.273	0.323	0.372	0.422	0.471	0.182	0.232	0.281	0.331	0.380	0.11	0.14	0.1036	0.1104	0.1126	0.1140	0.1148	0.1261	0.120	0.170	0.220	0.270	0.320
4(0.112)-40	0.318	0.374	0.430	0.486	0.542	0.212	0.268	0.324	0.380	0.436	0.14	0.17	0.1175	0.1252	0.1283	0.1299	0.1308	0.1445	0.140	0.190	0.250	0.310	0.360
5(0.125)-40	0.338	0.400	0.462	0.525	0.588	0.225	0.288	0.350	0.412	0.475	0.16	0.19	0.1305	0.1373	0.1413	0.1430	0.1438	0.1575	0.150	0.210	0.280	0.340	0.400
6(0.138)-32	0.394	0.464	0.532	0.602	0.670	0.263	0.332	0.401	0.470	0.539	0.18	0.21	0.1448	0.1527	0.1583	0.1601	0.1611	0.1786	0.170	0.240	0.310	0.380	0.450
8(0.164)-32	0.434	0.516	0.598	0.680	0.762	0.289	0.371	0.453	0.535	0.617	0.20	0.23	0.1708	0.1781	0.1843	0.1862	0.1872	0.2046	0.200	0.280	0.360	0.440	0.520
10(0.190)-24	0.535	0.630	0.725	0.820	0.915	0.357	0.452	0.547	0.642	0.737	0.24	0.27	0.1990	0.2080	0.2170	0.2192	0.2203	0.2441	0.230	0.330	0.420	0.520	0.610
12(0.216)-24	0.574	0.682	0.790	0.898	1.006	0.383	0.491	0.599	0.707	0.815	0.26	0.29	0.2250	0.2340	0.2430	0.2453	0.2464	0.2701	0.260	0.370	0.470	0.580	0.690
1/4(0.2500)-20	0.675	0.800	0.925	1.050	1.175	0.450	0.575	0.700	0.825	0.950	0.31	0.34	0.2608	0.2704	0.2825	0.2851	0.2964	0.3150	0.300	0.430	0.550	0.680	0.800
5/16(0.3125)-18	0.801	0.957	1.113	1.269	1.425	0.534	0.690	0.846	1.002	1.158	0.38	0.41	0.3245	0.3342	0.3486	0.3515	0.3529	0.3847	0.370	0.530	0.680	0.840	0.990
3/8(0.3750)-16	0.750	0.938	1.125	1.312	1.500	0.625	0.812	1.000	1.188	1.375	0.45	0.48	0.3885	0.3987	0.4156	0.4189	0.4203	0.4562	0.440	0.630	0.810	1.000	1.190
7/16(0.4375)-14	0.867	1.086	1.305	1.524	1.743	0.724	0.943	1.162	1.381	1.600	0.52	0.55	0.4530	0.4639	0.4839	0.4875	0.4890	0.5303	0.510	0.730	0.950	1.170	1.380
1/2(0.5000)-13	0.962	1.212	1.462	1.712	1.962	0.808	1.058	1.308	1.558	1.808	0.59	0.62	0.5166	0.5273	0.5499	0.5537	0.5554	0.5999	0.580	0.830	1.080	1.330	1.580
9/16(0.5625)-12	1.062	1.343	1.624	1.905	2.186	0.895	1.176	1.457	1.738	2.019	0.66	0.69	0.5806	0.5918	0.6167	0.6208	0.6225	0.6708	0.650	0.930	1.210	1.490	1.770
5/8(0.6250)-11	1.170	1.483	1.795	2.108	2.420	0.989	1.301	1.614	1.926	2.239	0.73	0.76	0.6447	0.6564	0.6841	0.6885	0.6903	0.7431	0.720	1.030	1.340	1.650	1.970
3/4(0.7500)-10	1.350	1.725	2.100	2.475	2.850	1.150	1.525	1.900	2.275	2.650	0.87	0.90	0.7716	0.7638	0.8149	0.8196	0.8216	0.8799	0.850	1.230	1.600	1.980	2.350
7/8(0.8750)-9	1.542	1.979	2.417	2.854	3.292	1.319	1.757	2.194	2.632	3.069	1.00	1.03	0.8990	0.9119	0.9471	0.9522	0.9543	1.0193	0.990	1.420	1.860	2.300	2.740
1(1.0000)-8	1.750	2.250	2.750	3.250	3.750	1.500	2.000	2.500	3.000	3.500	1.14	1.17	1.0271	1.0421	1.0812	1.0868	1.0890	1.1624	1.130	1.630	2.130	2.630	3.130
1 1/8(1.1250)-7	1.982	2.545	3.107	3.670	4.232	1.696	2.259	2.821	3.384	3.946	1.29	1.32	1.1559	1.1730	1.2178	1.2239	1.2252	1.3106	1.270	1.830	2.390	2.960	3.520
1 1/4(1.2500)-7	2.107	2.732	3.357	3.982	4.607	1.821	2.446	3.071	3.696	4.321	1.41	1.44	1.2809	1.2980	1.3428	1.3490	1.3514	1.4356	1.390	2.020	2.640	3.270	3.890
1 3/8(1.3750)-6	2.375	3.062	3.750	4.437	5.125	2.042	2.729	3.417	4.104	4.792	1.56	1.59	1.4110	1.4310	1.4832	1.4900	1.4926	1.5915	1.540	2.230	2.920	3.600	4.290
1 1/2(1.5000)-6	2.500	3.250	4.000	4.750	5.500	2.167	2.917	3.667	4.417	5.167	1.69	1.72	1.5360	1.5560	1.6082	1.6151	1.6177	1.7165	1.670	2.420	3.170	3.920	4.670
UNIFIED FINE (UNF)																							
2(0.086)-64	0.223	0.266	0.309	0.352	0.395	0.149	0.192	0.235	0.278	0.321	0.09	0.11	0.0894	0.0947	0.0962	0.0974	0.0981	0.1063	0.100	0.145	0.190	0.230	0.275
3(0.099)-56	0.256	0.305	0.355	0.404	0.454	0.170	0.220	0.269	0.319	0.368	0.11	0.14	0.1029	0.1086	0.1106	0.1119	0.1126	0.1222	0.120	0.170	0.220	0.270	0.310
4(0.112)-48	0.293	0.349	0.405	0.461	0.517	0.195	0.251	0.307	0.363	0.419	0.14	0.17	0.1166	0.1229	0.1256	0.1271	0.1279	0.1391	0.130	0.190	0.240	0.300	0.360
6(0.138)-40	0.357	0.426	0.495	0.564	0.633	0.238	0.307	0.376	0.445	0.514	0.17	0.20	0.1435	0.1503	0.1543	0.1560	0.1569	0.1705	0.160	0.230	0.300	0.370	0.440
8(0.164)-36	0.413	0.495	0.577	0.659	0.741	0.275	0.357	0.439	0.521	0.603	0.20	0.23	0.1701	0.1771	0.1821	0.1840	0.1849	0.2001	0.190	0.270	0.360	0.440	0.520
10(0.190)-32	0.472	0.568	0.662	0.758	0.852	0.315	0.410	0.505	0.600	0.695	0.23	0.26	0.1968	0.2041	0.2103	0.2123	0.2133	0.2306	0.220	0.320	0.410	0.510	0.600
1/4(0.2500)-28	0.589	0.714	0.839	0.964	1.089	0.393	0.518	0.648	0.768	0.893	0.29	0.32	0.2577	0.2646	0.2732	0.2754	0.2765	0.2964	0.290	0.410	0.540	0.660	0.790
5/16(0.3125)-24	0.718	0.874	1.030	1.186	1.342	0.479	0.635	0.791	0.947	1.103	0.36	0.39	0.3215	0.3288	0.3395	0.3421	0.3433	0.3666	0.350	0.510	0.670	0.820	0.980
3/8(0.3750)-24	0.625	0.812	1.000	1.187	1.375	0.542	0.729	0.917	1.104	1.292	0.42	0.45	0.3840	0.3910	0.4020	0.4047	0.4059	0.4291	0.420	0.600	0.790	0.980	1.170
7/16(0.4375)-20	0.738	0.957	1.176	1.395	1.614	0.638	0.857	1.076	1.295	1.514	0.50	0.53	0.4483	0.4561	0.4700	0.4731	0.4744	0.5025	0.490	0.710	0.930	1.140	1.360
1/2(0.5000)-20	0.800	1.050	1.300	1.550	1.800	0.700	0.950	1.200	1.450	1.700	0.56	0.59	0.5108	0.5186	0.5325	0.5357	0.5371	0.5650	0.550	0.800	1.050	1.300	1.550
9/16(0.5625)-18	0.895	1.176	1.457	1.738	2.019	0.784	1.065	1.346	1.627	1.908	0.63	0.66	0.5745	0.5826	0.5986	0.6020	0.6035	0.6347	0.620	0.900	1.180	1.460	1.740
5/8(0.6250)-18	0.958	1.271	1.583	1.896	2.208	0.847	1.160	1.472	1.785	2.097	0.69	0.72	0.6370	0.6451	0.6611	0.6646	0.6661	0.6972	0.680	0.990	1.310	1.620	1.930
3/4(0.7500)-16	1.125	1.500	1.875	2.250	2.625	1.000	1.375	1.750	2.125	2.500	0.82	0.85	0.7635	0.7720	0.7906	0.7945	0.7961	0.8312	0.810	1.190	1.560	1.940	2.310
7/8(0.8750)-14	1.304	1.741	2.179	2.616	3.054	1.161	1.598	2.036	2.473	2.911	0.96	0.99	0.8905	0.8994	0.9214	0.9257	0.9274	0.9678	0.950	1.380	1.820	2.260	2.700

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TABLE 1 CONTINUED

Nominal Thread Size	"G" Minimum Drilling Depth For Each Insert Length										Countersink "M" Diameter (120° = 5° Included angle)		Minor Diameter		Pitch Diameter			Major Dia. Min.	"T" Minimum Tapping Depth				
	Plug Taps					Bottoming Taps													Insert Length				
	1D	1½D	2D	2½D	3D	1D	1½D	2D	2½D	3D	Min.	Max.	Min.	Max.	Min.	3B Max.	2B Max.	2B 3B	1D	1½D	2D	2½D	3D
1(1.0000)-12	1.500	2.000	2.500	3.000	3.500	1.333	1.833	2.333	2.833	3.333	1.10	1.13	1.0181	1.0281	1.0542	1.0589	1.0608	1.1083	1.080	1.580	2.080	2.580	3.080
1⅛(1.1250)-12	1.625	2.187	2.750	3.312	3.875	1.453	2.021	2.583	3.146	3.708	1.22	1.25	1.1431	1.1531	1.1792	1.1841	1.1860	1.2333	1.210	1.770	2.330	2.900	3.460
1¼(1.2500)-12	1.750	2.375	3.000	3.625	4.250	1.583	2.208	2.833	3.458	4.083	1.35	1.38	1.2681	1.2781	1.3042	1.3092	1.3112	1.3583	1.330	1.960	2.580	3.210	3.830
1⅜(1.3750)-12	1.875	2.562	3.250	3.937	4.625	1.708	2.396	3.083	3.771	4.458	1.47	1.50	1.3931	1.4031	1.4292	1.4343	1.4364	1.4833	1.460	2.150	2.830	3.520	4.210
1½(1.5000)-12	2.000	2.750	3.500	4.250	5.000	1.833	2.583	3.333	4.083	4.833	1.60	1.63	1.5181	1.5281	1.5542	1.5595	1.5615	1.6083	1.580	2.330	3.080	3.830	4.580
UNIFIED SPECIAL (UNS)																							
1(1.0000)-14	1.429	1.929	2.429	2.929	3.429	1.286	1.786	2.286	2.786	3.286	1.08	1.11	1.0155	1.0243	1.0464	1.0508	1.0527	1.0928	1.070	1.570	2.070	2.570	3.070

(*See Notes (1) and (2).*)

NOTES:

(1) The minimum drilling depths allow for:
  (a) countersinking the drilled hole to prevent a feather edge at the start of the tapped hole.
  (b) ¾ to 1½ pitch of insert "set-down" to allow for maximum production tolerance.
  (c) dimensions are shown for both plug and bottoming taps. Plug taps 5/16 in. and smaller have a male center and the drilled hole depth dimensions allow for this length (one half of the diameter of the bolt). Calculation of dimension *G* is as follows:

  For plug taps 5/16 in. and smaller:
  G = insert nominal length + .5 × bolt nominal diameter + 4 pitch (tap chamfer) + 1 pitch (tap end clearance) + 1 pitch (allowance for countersink and maximum insert set-down).

  For plug taps ⅜ in. and larger:
  G = insert nominal length + 4 pitch (tap chamfer) + 1 pitch (tap end clearance) + 1 pitch (allowance for countersink and maximum insert set-down).

  For bottoming taps:
  G = insert nominal length + 2 pitch (tap chamfer) + 1 pitch (tap end clearance) + 1 pitch (allowance for countersink and maximum insert set-down).

(2) The minimum tapping depth (dimension *T*) is the minimum for countersunk holes with insert set-down of 1½ pitch maximum (see Fig. 1). The calculation for dimension *T* is:
  T = insert nominal length + 1 pitch

(3) Thread diameters are calculated as follows:
  Pitch Dia., Min. = Pitch Dia., Min., of Nominal Thread + 2 × H Max.
  Pitch Dia., Max. = Pitch Dia., Max. of Nominal Thread + 2 × H Min.
  where H min. and H max. are from Table 1.

  Major Dia., Min. = Pitch Dia., Min. + 0.649519 pitch
  Minor Dia., Min. = Pitch Dia., Min. − 0.433013 pitch
  Minor Dia., Max. = Minor Dia., Min. + tolerance
  where tolerance is selected from the appropriate table in ASME B1.1 for UNS threads with basic major diameter equal to the minimum major diameter of the STI thread.

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TABLE 2 CHEMICAL COMPOSITION

Element	Analysis, %	Check Analysis	
		Under, Min	Over, Max
Carbon	0.15 max.	...	0.01
Manganese	2.00 max.	...	0.04
Silicon	1.00 max.	...	0.05
Phosphorous	0.045 max.	...	0.01
Sulphur	0.035 max.	...	0.005
Chromium	17.00 to 20.00	0.20	0.20
Nickel	8.00 to 10.50	0.15	0.15
Molybdenum	0.75 max.	...	0.05
Copper	0.75 max.	...	0.05

2.2 Gages and Gaging

Acceptance of the threaded hole is determined by gaging with STI GO, NOT GO (HI), and plain cylindrical gages designed and applied in accordance with System 21 of ANSI/ASME B1.3M, (see Appendix C).

3 HELICAL COIL INSERT

3.1 Material

Chemical composition of the inserts is austenitic corrosion resistant (stainless) steel within the limits of Table 2.

3.2 Properties

3.2.1 Tensile Strength. Wire, before coiling into inserts, shall have tensile strength not lower than 150,000 psi, determined in accordance with ASTM A370.

3.2.2 Bending. Wire shall withstand, without cracking, bending in accordance with ASTM E290 at room temperature through an angle of 180 deg. around a diameter equal to twice the cross-sectional dimension of the wire in the plane of the bend.

3.2.3 Spacing. Inserts shall stretch with approximately equal spacing between turns when extended axially beyond their elastic limit.

3.2.4 Workmanship. The formed wire shall be of uniform quality and temper; smooth, clean, free from kinks, waviness, splits, cracks, laps, seams, scale, segregation, and other defects which may impair the serviceability of the insert.

3.3 Coatings

3.3.1 Red Dye Indentification. Screw-locking inserts are dyed red for identification, except when they are cadmium plated (para. 3.3.2) or dry film lubricant coated (para. 3.3.3). The red dye may completely or only partially cover the insert. However, it must be sufficient to identify the insert when it is installed in its threaded hole, (see Table 3).

3.3.2 Cadmium Plating (Optional). Cadmium plating when applied to helical coil inserts shall meet with the following requirements.

3.3.2.1 Thickness. Maximum plating thickness shall be 0.0001 in.. Minimum plating thickness shall be complete coverage.

3.3.2.2 Supplementary Chromate Treatment. Free running inserts shall receive a supplementary chromate treatment resulting in a distinctly iridescent bronze to yellow color, (see Table 3).

Screw locking inserts shall receive a supplementary chromate treatment resulting in dark olive drab color, (see Table 3).

3.3.3 Dry Film Lubricant Coating (Optional). Dry Film Lubricant Coating when applied to helical coil inserts shall meet the requirements of para. 3.3.3.1 and para. 3.3.3.2, (see also Table 3).

3.3.3.1 Material. The lubricant shall meet the requirements of military standard MIL-L-46010, Type I, Lubricant, Solid Film Heat Cured, Corrosion Inhibiting.

3.3.3.2 Thickness. The coating shall be uniformly deposited on the insert with the minimum thickness being complete coverage. The maximum thickness shall be the avoidance of "bridging" between coils. Slight fill-in between closely wound coils, which immediately separates as the coils are axially

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TABLE 3 COLOR IDENTIFICATION

Plating or Lubricant	Free Running Insert	Screw Locking Insert
None	Bare	Red Dye
Cadmium Plating	Iridescent Bronze to Yellow	Dark Olive Drab
Dry Film Lubricant	Dark Gray to Black	Dark Gray to Black

pulled apart by hand, shall not be considered "bridging."

3.4 Configuration and Dimensions

The insert configuration shall be in accordance with Fig. 2, and its dimensions shall be in accordance with Tables 4 and 5.

3.4.1 Nominal Length. Each nominal insert size is standardized in five lengths which are multiples of the insert's nominal diameter. These are 1, 1½, 2, 2½, and 3 times nominal diameter.

Each nominal length is the minimum through-hole length (material thickness), without countersink, into which that insert can be installed. It is a reference value and cannot be measured.

3.4.2 Assembled Length. Actual assembled length of the insert equals nominal length minus ½ pitch to minus ¾ pitch, with insert installed in a basic STI threaded hole. It cannot be measured in the insert's free state.

4 INSERT QUALITY REQUIREMENTS

4.1 Examination of the Product

Inserts shall be visually examined for conformance with drawing and workmanship requirements using conventional inspection methods and instruments.

4.2 Threads

The inserts, when assembled in STI threaded holes conforming to Table 1, shall form threads conforming to ASME B1.1, except for the locking feature of screw-locking inserts. The assembled insert, both types, shall accept and function with parts having external UNJ threads per FED-STD-H28/4 (MIL-S-8879).

NOTE: Accuracy of the finished thread, when the insert is installed is dependent upon the accuracy of the tapped hole. If the finished tapped hole gages satisfactorily, the installed insert will be within the thread tolerance when the insert meets the requirements of the standard. It is, therefore, not necessary to gage the installed insert. After the insert is installed, the GO thread plug gage may not enter freely because the insert may not have been fully seated in the tapped hole. However, the insert should become seated after a bolt or screw is installed and tightened.

4.3 Tang Removal Notch

4.3.1 Notched Inserts. Inserts that are notched for tang removal are the standard configuration.

The tang removal notch shall be located as shown in Fig. 2 and shall be of such depth that the part may be installed without failure of the tang, and that the tang may be removed, after assembly, without affecting the function of the installed insert.

4.3.2 Unnotched Inserts. Inserts without notches are available from most manufacturers on special order.

They must meet all requirements of this Standard, except those relating to the notch.

4.4 Self-Locking Torque

The screw-locking insert, when assembled in threaded holes conforming to Table 1 and tested in accordance with para. 4.4.3 shall provide a frictional lock to retain the bolt threads within the torque limits specified in Table 6.

4.4.1 Torque Test Bolts. Assembled screw-locking inserts shall be torque-tested with bolts having Class 3A threads in accordance with ASME B1.1, cadmium plated, and a hardness of 36-44 HRC. The

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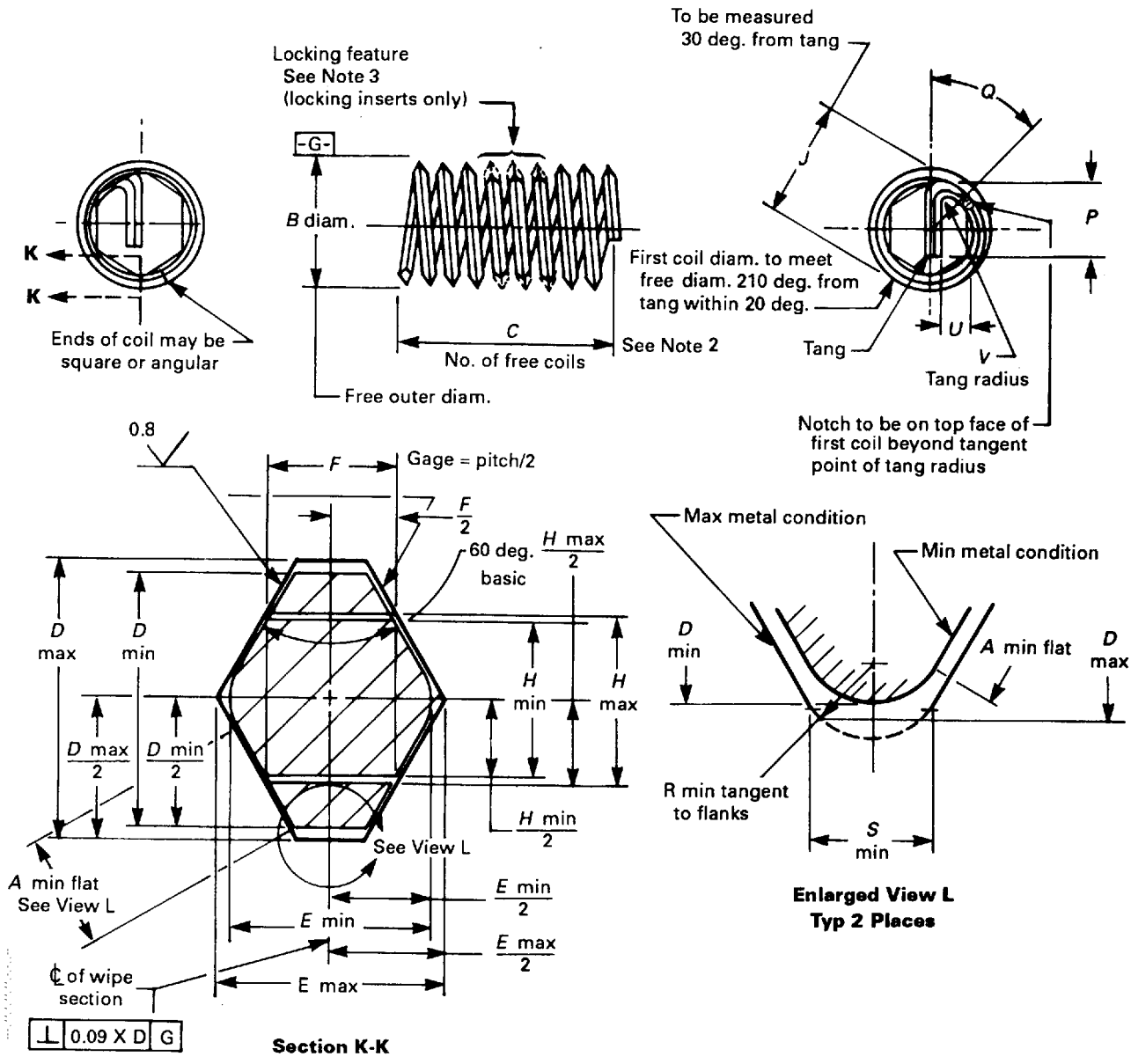


FIG. 2 INSERT CONFIGURATION

NOTES:
(1) Assembled length of insert to be measured 90 deg. from tang.
(2) Number of free coils to be counted 90 deg. from tang.
(3) Number of locking coils, spacing of locking coils, number of locking deformations, shape and orientation optional. Locking feature for 1, 1.5 and 2 dia. length inserts symmetrically positioned about the center of insert, and for 2.5 and 3 dia. length inserts at 1 dia. from tang end of insert.
(4) Dimensions apply before supplementary coating, (see Table 4 and 5).
(5) Surface texture; symbols per ANSI Y14.36, requirements per ANSI/ASME B46.1.
(6) Dimensions and tolerancing; ANSI Y14.5M.

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TABLE 4 INSERT LENGTH DATA

Nominal Thread Size	1 × DIA				1½ × DIA				2 × DIA				2½ × DIA				3 × DIA			
	Nominal	Assembled		C Ref	Nominal	Assembled		C Ref	Nominal	Assembled		C Ref	Nominal	Assembled		C Ref	Nominal	Assembled		C Ref
		Max	Min			Max	Min			Max	Min			Max	Min			Max	Min	
UNIFIED COARSE (UNC)																				
1(0.073)-64	0.073	0.065	0.061	2 3/4	0.110	0.102	0.098	4 7/8	0.146	0.138	0.134	6 7/8	0.182	0.174	0.170	8 7/8	0.219	0.211	0.207	10 7/8
2(0.086)-56	0.086	0.077	0.073	3	0.129	0.120	0.116	5 1/4	0.172	0.163	0.159	7 3/8	0.215	0.206	0.202	9 5/8	0.258	0.249	0.245	11 7/8
3(0.099)-48	0.099	0.089	0.083	2 7/8	0.148	0.138	0.133	5	0.198	0.188	0.182	7 1/4	0.248	0.238	0.232	9 3/8	0.297	0.287	0.281	11 1/2
4(0.112)-40	0.112	0.100	0.093	2 3/4	0.168	0.156	0.149	4 3/4	0.224	0.212	0.205	6 3/4	0.280	0.268	0.261	8 7/8	0.336	0.324	0.317	10 7/8
5(0.125)-40	0.125	0.113	0.106	3 1/4	0.188	0.175	0.169	5 1/2	0.250	0.238	0.231	7 3/4	0.312	0.300	0.293	10	0.375	0.363	0.356	12 1/4
6(0.138)-32	0.138	0.122	0.115	2 3/4	0.207	0.191	0.184	4 3/4	0.276	0.260	0.253	6 7/8	0.345	0.329	0.322	8 7/8	0.414	0.398	0.391	10 7/8
8(0.164)-32	0.164	0.148	0.141	3 1/2	0.246	0.230	0.223	6	0.328	0.312	0.305	8 3/8	0.410	0.394	0.387	10 3/4	0.492	0.476	0.469	13 1/4
10(0.190)-24	0.190	0.169	0.159	2 7/8	0.285	0.264	0.254	5	0.380	0.359	0.349	7 1/8	0.475	0.454	0.444	9 1/4	0.570	0.549	0.539	11 3/8
12(0.216)-24	0.216	0.195	0.185	3 1/2	0.324	0.303	0.293	6	0.432	0.411	0.401	8 3/8	0.540	0.519	0.509	10 5/8	0.648	0.627	0.617	13 1/8
1/4(0.2500)-20	0.250	0.225	0.212	3 3/8	0.375	0.350	0.338	5 3/4	0.500	0.475	0.462	8	0.625	0.600	0.588	10 3/8	0.750	0.725	0.712	12 3/4
5/16(0.3125)-18	0.312	0.284	0.271	4	0.469	0.440	0.427	6 5/8	0.625	0.597	0.583	9 1/4	0.781	0.753	0.740	11 7/8	0.938	0.909	0.896	14 5/8
3/8(0.3750)-16	0.375	0.344	0.328	4 3/8	0.562	0.531	0.516	7 1/4	0.750	0.718	0.703	10	0.938	0.906	0.891	12 7/8	1.125	1.093	1.078	15 3/4
7/16(0.4375)-14	0.438	0.402	0.384	4 1/2	0.656	0.621	0.603	7 3/8	0.875	0.839	0.821	10 1/4	1.094	1.058	1.040	13 1/8	1.312	1.277	1.259	16 1/8
1/2(0.5000)-13	0.500	0.462	0.442	4 7/8	0.750	0.712	0.692	7 7/8	1.000	0.962	0.942	11	1.250	1.212	1.192	14 1/8	1.500	1.462	1.442	17 1/8
9/16(0.5625)-12	0.562	0.521	0.500	5 1/8	0.844	0.802	0.781	8 1/4	1.125	1.083	1.062	11 1/2	1.406	1.364	1.344	14 3/4	1.688	1.646	1.625	17 7/8
5/8(0.6250)-11	0.625	0.580	0.557	5 1/4	0.938	0.892	0.869	8 1/2	1.250	1.205	1.182	11 3/4	1.562	1.517	1.494	15	1.875	1.830	1.807	18 3/8
3/4(0.7500)-10	0.750	0.700	0.675	5 7/8	1.125	1.075	1.050	9 3/8	1.500	1.450	1.425	13	1.875	1.825	1.800	16 1/2	2.250	2.200	2.175	20 1/8
7/8(0.8750)-9	0.875	0.819	0.792	6 1/4	1.312	1.257	1.229	10	1.750	1.694	1.667	13 3/4	2.188	2.132	2.104	17 1/2	2.625	2.569	2.542	21 1/4
1(1.0000)-8	1.000	0.938	0.906	6 3/8	1.500	1.438	1.406	10 1/8	2.000	1.938	1.906	14	2.500	2.438	2.406	17 3/4	3.000	2.938	2.906	21 5/8
1 1/8(1.1250)-7	1.125	1.054	1.018	6 1/8	1.688	1.616	1.580	9 7/8	2.250	2.179	2.143	13 5/8	2.812	2.741	2.705	17 1/2	3.375	3.304	3.268	21 1/4
1 1/4(1.2500)-7	1.250	1.179	1.143	7	1.875	1.804	1.768	11 1/4	2.500	2.249	2.393	15 3/8	3.125	3.054	3.018	19 1/2	3.750	3.697	3.643	23 3/4
1 3/8(1.3750)-6	1.375	1.292	1.250	6 1/2	2.062	1.979	1.938	10 1/2	2.750	2.667	2.625	14 3/8	3.438	3.354	3.312	18 3/8	4.125	4.042	4.000	22 1/4
1 1/2(1.5000)-6	1.500	1.417	1.375	7 1/4	2.250	2.167	2.125	11 1/2	3.000	2.917	2.875	15 7/8	3.750	3.667	3.625	20 1/8	4.500	4.417	4.375	24 1/2
UNIFIED FINE (UNF)																				
2(0.086)-64	0.086	0.078	0.074	3 1/2	0.129	0.121	0.117	5 7/8	0.172	0.164	0.160	8 3/8	0.215	0.207	0.203	10 3/4	0.258	0.250	0.246	13 1/8
3(0.099)-56	0.099	0.090	0.086	3 3/8	0.143	0.139	0.135	5 5/8	0.198	0.189	0.185	8	0.248	0.239	0.234	10 3/8	0.297	0.288	0.284	12 5/8
4(0.112)-48	0.112	0.102	0.096	3 3/8	0.168	0.158	0.152	5 5/8	0.224	0.214	0.208	7 7/8	0.280	0.270	0.264	10 1/4	0.336	0.326	0.320	12 1/2
6(0.138)-40	0.138	0.126	0.119	3 1/2	0.207	0.195	0.188	6	0.276	0.264	0.257	8 3/8	0.345	0.333	0.326	10 3/4	0.414	0.402	0.393	13 1/4
8(0.164)-36	0.164	0.150	0.143	3 7/8	0.246	0.232	0.225	6 1/2	0.328	0.314	0.307	9 1/8	0.410	0.396	0.389	11 5/8	0.492	0.554	0.171	14 1/4
10(0.190)-32	0.190	0.174	0.167	4 1/8	0.285	0.269	0.262	6 7/8	0.380	0.364	0.357	9 1/2	0.475	0.459	0.452	12 1/4	0.570	0.402	0.547	14 7/8
1/4(0.2500)-28	0.250	0.232	0.223	5	0.375	0.357	0.348	8 1/4	0.500	0.482	0.473	11 3/8	0.625	0.607	0.598	14 1/2	0.750	0.732	0.723	17 5/8
5/16(0.3125)-24	0.312	0.291	0.281	5 1/2	0.469	0.447	0.438	8 7/8	0.625	0.604	0.594	12 1/4	0.781	0.760	0.750	15 5/8	0.938	0.916	0.906	19
3/8(0.3750)-24	0.375	0.354	0.344	6 7/8	0.562	0.541	0.531	11	0.750	0.729	0.719	15	0.938	0.917	0.906	19 1/8	1.125	1.104	1.094	23 1/8
7/16(0.4375)-20	0.438	0.412	0.400	6 5/8	0.656	0.631	0.619	10 5/8	0.875	0.850	0.838	14 5/8	1.094	1.068	1.056	18 1/2	1.312	1.287	1.275	22 1/2
1/2(0.5000)-20	0.500	0.475	0.462	7 1/8	0.750	0.725	0.712	12 3/8	1.000	0.975	0.962	16 7/8	1.250	1.225	1.212	21 3/8	1.500	1.475	1.462	25 7/8
9/16(0.5625)-18	0.562	0.534	0.521	8	0.844	0.815	0.802	12 1/2	1.125	1.097	1.083	17 1/8	1.406	1.378	1.365	21 3/4	1.688	1.659	1.646	26 1/4
5/8(0.6250)-18	0.625	0.597	0.583	9	0.938	0.909	0.896	14 1/8	1.250	1.222	1.208	19 1/4	1.562	1.534	1.521	24 1/4	1.875	1.847	1.833	29 3/8
3/4(0.7500)-16	0.750	0.719	0.703	9 3/4	1.125	1.094	1.078	15 1/8	1.500	1.469	1.453	20 5/8	1.875	1.844	1.828	26	2.250	2.218	2.203	31 1/2
7/8(0.8750)-14	0.875	0.839	0.821	9 7/8	1.312	1.276	1.259	15 1/2	1.750	1.714	1.696	21 1/8	2.188	2.151	2.134	26 5/8	2.625	2.589	2.571	32 1/4
1(1.0000)-12	1.000	0.958	0.938	9 5/8	1.500	1.458	1.438	15	2.000	1.958	1.938	20 1/2	2.500	2.458	2.438	26	3.000	2.958	2.938	31 1/2

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TABLE 4 CONTINUED

Nominal Thread Size	1 × DIA				1½ × DIA				2 × DIA				2½ × DIA				3 × DIA			
	Nom-inal	Assembled		C Ref	Nom-inal	Assembled		C Ref	Nom-inal	Assembled		C Ref	Nom-inal	Assembled		C Ref	Nom-inal	Assembled		C Ref
		Max	Min			Max	Min			Max	Min			Max	Min			Max	Min	
1 1/8(1.1250)–12	1.125	1.083	1.062	11 1/8	1.688	1.645	1.625	17 1/4	2.250	2.208	2.188	23 3/8	2.812	2.770	2.750	29 1/2	3.375	3.333	3.312	35 3/4
1 1/4(1.2500)–12	1.250	1.208	1.188	12 1/2	1.875	1.833	1.812	19 3/8	2.500	2.458	2.438	26 1/4	3.125	3.083	3.062	33	3.750	3.708	3.688	39 7/8
1 3/8(1.3750)–12	1.375	1.333	1.312	13 3/4	2.062	2.020	2.000	21 3/8	2.750	2.708	2.688	28 7/8	3.438	3.395	3.375	36 1/2	4.125	4.083	4.062	44
1 1/2(1.5000)–12	1.500	1.458	1.438	15 1/4	2.250	2.208	2.188	23 1/2	3.000	2.958	2.938	31 5/8	3.750	3.708	3.688	39 7/8	4.500	4.458	4.438	48 1/8
UNIFIED SPECIAL (UNS)																				
1(1.0000)–14	1.000	0.964	0.946	11 1/2	1.500	1.464	1.446	17 7/8	2.000	1.964	1.946	24 1/4	2.500	2.464	2.446	30 5/8	3.000	2.964	2.946	37

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TABLE 5 INSERT DIMENSIONS

Nominal Thread Size	A	B		D		E		F	H		J		P		Q	R	S	U		V
	Min	Min	Max	Min	Max	Min	Max	Gage	Min	Max	Min	Max	Min	Max		Min	Min	Max	Min	Max
UNIFIED COARSE (UNC)																				
1(0.073)-64	0.0028	0.095	0.103	0.0139	0.0169	0.0107	0.0137	0.00781	0.00975	0.01015	0.092	0.103	0.055	0.075	75°-150°	0.0028	0.0049	0.060	0.017	0.010
2(0.086)-56	0.0033	0.110	0.119	0.0163	0.0193	0.0126	0.0156	0.00893	0.01120	0.01160	0.103	0.111	0.062	0.085	75°-150°	0.0032	0.0056	0.071	0.025	0.011
3(0.099)-48	0.0043	0.128	0.139	0.0196	0.0226	0.0152	0.0182	0.01042	0.01313	0.01353	0.120	0.139	0.070	0.090	75°-150°	0.0038	0.0065	0.085	0.026	0.013
4(0.112)-40	0.0068	0.144	0.159	0.0241	0.0271	0.0189	0.0219	0.01250	0.01584	0.01624	0.144	0.159	0.070	1.105	25°-100°	0.0045	0.0078	0.043	0.027	0.013
5(0.125)-40	0.0068	0.158	0.173	0.0241	0.0271	0.0189	0.0219	0.01250	0.01584	0.01624	0.158	0.173	0.078	0.108	25°-100°	0.0045	0.0078	0.049	0.029	0.013
6(0.138)-32	0.0076	0.178	0.193	0.0295	0.0338	0.0233	0.0273	0.01563	0.01985	0.02030	0.178	0.193	0.091	0.135	25°-100°	0.0056	0.0098	0.055	0.031	0.017
8(0.164)-32	0.0076	0.205	0.220	0 0295	0.0338	0.0233	0.0273	0.01563	0.01985	0.02030	0.205	0.220	0.117	0.153	20°-100°	0.0056	0.0098	0.068	0.040	0.019
10(0.190)-24	0.0120	0.244	0.259	0.0410	0.0449	0.0305	0.0365	0.02083	0.02656	0.02706	0.244	0.259	0.138	0.183	15°-90°	0.0075	0.0130	0.071	0.040	0.022
12(0.216)-24	0.0120	0.270	0.285	0.0410	0.0449	0.0305	0.0365	0.02033	0.02656	0.02706	0.270	0.285	0.154	0.189	20°-80°	0.0075	0.0130	0.084	0.051	0.026
1/4(0.2500)-20	0.0164	0.310	0.330	0.0500	0.0540	0.0378	0.0438	0.02500	0.03198	0.03248	0.310	0.330	0.182	0.238	20°-80°	0.0090	0.0156	0.094	0.057	0.031
5/16(0.3125)-18	0.0176	0.380	0.400	0.0560	0.0600	0.0416	0.0486	0.02778	0.03558	0.03608	0.375	0.400	0.214	0.291	20°-80°	0.0100	0.0174	0.122	0.080	0.032
3/8(0.3750)-16	0.0215	0.452	0.472	0.0636	0.0677	0.0477	0.0547	0.03125	0.04009	0.04059	0.445	0.472	0.269	0.354	20°-80°	0.0113	0.0195	0.149	0.100	0.032
7/16(0.4375)-14	0.0267	0.526	0.551	0.0730	0.0770	0.0545	0.0625	0.03571	0.04589	0.04639	0.518	0.551	0.313	0.416	20°-80°	0.0129	0.0223	0.179	0.115	0.012
1/2(0.5000)-13	0.0273	0.597	0.622	0.0758	0.0829	0.0593	0.0673	0.03846	0.04946	0.04996	0.586	0.622	0.348	0.463	20°-80°	0.0139	0.0240	0.212	0.140	0.056
9/16(0.5625)-12	0.0334	0.669	0.694	0.0861	0.0900	0.0649	0.0729	0.04167	0.05363	0.05413	0.656	0.676	0.390	0.521	20°-80°	0.0150	0.0260	0.234	0.160	0.056
5/8(0.6250)-11	0.0351	0.742	0.767	0.0909	0.0980	0.0715	0.0795	0.04545	0.05855	0.05905	0.727	0.747	0.421	0.572	20°-80°	0.0164	0.0284	0.267	0.179	0.072
3/4(0.7500)-10	0.0402	0.881	0.906	0.1007	0.1079	0.0795	0.0875	0.05000	0.06445	0.06495	0.840	0.885	0.453	0.640	60°-120°	0.0180	0.0312	0.331	0.219	0.072
7/8(0.8750)-9	0.0465	1.022	1.052	0.1124	0.1199	0.0892	0.0972	0.05556	0.07167	0.07217	0.991	1.026	0.500	0.734	60°-120°	0.0200	0.0347	0.385	0.267	0.102
1(1.0000)-8	0.0544	1.166	1.196	0.1264	0.1350	0.1004	0.1094	0.06250	0.08069	0.08119	1.135	1.170	0.526	0.781	60°-120°	0.0226	0.0391	0.438	0.310	0.106
1 1/8(1.1250)-7	0.0645	1.315	1.355	0.1451	0.1546	0.1160	0.1250	0.07143	0.09229	0.09279	1.260	1.315	0.557	0.843	60°-120°	0.0258	0.0446	0.480	0.355	0.103
1 1/4(1.2500)-7	0.0645	1.443	1.483	0.1451	0.1546	0.1160	0.1250	0.07143	0.09229	0.09279	1.366	1.416	0.679	0.937	60°-120°	0.0258	0.0446	0.536	0.424	0.110
1 3/8(1.3750)-6	0.0775	1.598	1.643	0.1695	0.1799	0.1368	0.1458	0.08333	0.10775	0.10825	1.545	1.598	0.689	1.093	60°-120°	0.0301	0.0521	0.573	0.423	0.112
1 1/2(1.5000)-6	0.0775	1.727	1.772	0.1695	0.1799	0.1368	0.1458	0.08333	0.10775	0.10825	1.676	1.727	0.811	1.187	60°-120°	0.0301	0.0521	0.661	0.500	0.114
UNIFIED FINE (UNF)																				
2(0.086)-64	0.0028	0.110	0.119	0.0139	0.0169	0.0107	0.0137	0.00781	0.00975	0.01015	0.103	0.111	0.062	0.080	75°-150°	0.0028	0.0049	0.069	0.024	0.011
3(0.099)-56	0.0033	0.131	0.146	0.0163	0.0193	0.0126	0.0156	0.00893	0.01120	0.01160	0.124	0.146	0.072	0.090	75°-150°	0.0032	0.0056	0.083	0.031	0.012
4(0.112)-48	0.0043	0.147	0.162	0.0196	0.0226	0.0152	0.0182	0.01042	0.01313	0.01353	0.134	0.162	0.060	0.095	75°-150°	0.0038	0.0065	0.093	0.034	0.013
6(0.138)-40	0.0068	0.173	0.193	0.0241	0.0271	0.0189	0.0219	0.01250	0.01584	0.01624	0.173	0.193	0.100	0.130	25°-100°	0.0045	0.0078	0.057	0.033	0.018
8(0.164)-36	0.0059	0.204	0.224	0.0261	0.0301	0.0203	0.0243	0.01389	0.01764	0.01804	0.204	0.224	0.117	0.147	20°-100°	0.0050	0.0087	0.069	0.043	0.019
10(0.190)-32	0.0076	0.236	0.256	0.0295	0.0338	0.0233	0.0273	0.01563	0.01985	0.02030	0.236	0.256	0.130	0.182	15°-90°	0.0056	0.0093	0.084	0.058	0.025
1/4(0.2500)-28	0.0085	0.306	0.326	0.0347	0.0387	0.0253	0.0313	0.01786	0.02270	0.02320	0.306	0.326	0.173	0.244	15°-70°	0.0064	0.0112	0.111	0.071	0.032
5/16(0.3125)-24	0.0120	0.380	0.400	0.0410	0.0449	0.0305	0.0365	0.02083	0.02656	0.02706	0.359	0.400	0.203	0.291	15°-55°	0.0075	0.0130	0.138	0.094	0.036
3/8(0.3750)-24	0.0120	0.448	0.468	0.0410	0.0449	0.0305	0.0365	0.02083	0.02656	0.02706	0.422	0.468	0.235	0.353	15°-75°	0.0075	0.0130	0.169	0.125	0.032
7/16(0.4375)-20	0.0164	0.524	0.549	0.0500	0.0540	0.0378	0.0438	0.02500	0.03198	0.03248	0.494	0.549	0.281	0.416	15°-75°	0.0090	0.0156	0.198	0.141	0.042
1/2(0.5000)-20	0.0164	0.592	0.617	0.0500	0.0540	0.0378	0.0438	0.02500	0.03198	0.03248	0.556	0.617	0.313	0.479	15°-75°	0.0090	0.0156	0.229	0.172	0.042
9/16(0.5625)-18	0.0176	0.666	0.691	0.0560	0.0600	0.0416	0.0486	0.02778	0.03558	0.03608	0.625	0.691	0.344	0.541	15°-75°	0.0100	0.0174	0.256	0.196	0.056
5/8(0.6250)-18	0.0176	0.733	0.758	0.0560	0.0600	0.0416	0.0486	0.02778	0.03558	0.03608	0.688	0.758	0.375	0.588	15°-75°	0.0100	0.0174	0.287	0.227	0.072
3/4(0.7500)-16	0.0215	0.876	0.901	0.0636	0.0677	0.0477	0.0547	0.03125	0.04009	0.04059	0.820	0.901	0.453	0.562	15°-75°	0.0113	0.0195	0.345	0.280	0.072
7/8(0.8750)-14	0.0267	1.021	1.051	0.0730	0.0770	0.0545	0.0625	0.03571	0.04589	0.04639	0.955	1.051	0.495	0.640	15°-75°	0.0129	0.0223	0.402	0.330	0.104
1(1.0000)-12	0.0334	1.169	1.199	0.0861	0.0900	0.0649	0.0729	0.04167	0.05363	0.05413	1.094	1.119	0.526	0.728	15°-75°	0.0150	0.0260	0.450	0.380	0.106

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TABLE 5 CONTINUED

Nominal Thread Size	A	B		D		E		F	H		J		P		Q	R	S	U		V
	Min	Min	Max	Min	Max	Min	Max	Gage	Min	Max	Min	Max	Min	Max		Min	Min	Max	Min	Max
1⅛(1.1250)-12	0.0334	1.304	1.334	0.0861	0.0900	0.0649	0.0729	0.04167	0.05363	0.05413	1.219	1.334	0.557	0.819	10°-70°	0.0150	0.0260	0.523	0.432	0.108
1¼(1.2500)-12	0.0334	1.439	1.469	0.0861	0.0900	0.0649	0.0729	0.04167	0.05363	0.05413	1.344	1.374	0.679	0.941	10°-70°	0.0150	0.0260	0.589	0.491	0.110
1⅜(1.3750)-12	0.0334	1.575	1.610	0.0861	0.0900	0.0649	0.0729	0.04167	0.05363	0.05413	1.469	1.504	0.689	1.001	10°-70°	0.0150	0.0260	0.652	0.553	0.112
1½(1.5000)-12	0.0334	1.710	1.745	0.0861	0.0900	0.0649	0.0729	0.04167	0.05363	0.05413	1.594	1.629	0.811	1.123	10°-70°	0.0150	0.0260	0.718	0.612	0.114
UNIFIED SPECIAL (UNS)																				
1(1.0000)-14	0.0267	1.156	1.186	0.0730	0.0770	0.0545	0.0625	0.03571	0.04589	0.04639	1.080	1.186	0.525	0.750	15°-75°	0.0129	0.0223	0.464	0.392	0.166

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TABLE 6 SELF-LOCKING TORQUE

Nominal Thread Size	Maximum Locking Torque, Installation, or Removal	Minimum Breakway Torque
UNIFIED COARSE (UNC)		
1(0.073)-64	15.0 ozf-in.	2.0 ozf-in.
2(0.086)-56	20.0 ozf-in.	3.0 ozf-in.
3(0.099)-48	32.0 ozf-in.	7.0 ozf-in.
4(0.112)-40	48.0 ozf-in.	10.0 ozf-in.
5(0.125)-40	75.2 ozf-in.	13.0 ozf-in.
6(0.138)-32	6.0 lbf-in.	1.0 lbf-in.
8(0.164)-32	9.0 lbf-in.	1.5 lbf-in.
10(0.190)-24	13.0 lbf-in.	2.0 lbf-in.
12(0.216)-24	24.0 lbf-in.	3.0 lbf-in.
1/4(0.2500)-20	30.0 lbf-in.	4.5 lbf-in.
5/16(0.3125)-18	60.0 lbf-in.	7.5 lbf-in.
3/8(0.3750)-16	80.0 lbf-in.	12.0 lbf-in.
7/16(0.4375)-14	100.0 lbf-in.	16.5 lbf-in.
1/2(0.5000)-13	150.0 lbf-in.	24.0 lbf-in.
9/16(0.5625)-12	200.0 lbf-in.	30.0 lbf-in.
5/8(0.6250)-11	300.0 lbf-in.	40.0 lbf-in.
3/4(0.7500)-10	400.0 lbf-in.	60.0 lbf-in.
7/8(0.8750)- 9	600.0 lbf-in.	82.0 lbf-in.
1(1.0000)-8	800.0 lbf-in.	110.0 lbf-in.
1 1/8(1.1250)- 7	900.0 lbf-in.	137.0 lbf-in.
1 1/4(1.2500)- 7	1,000.0 lbf-in.	165.0 lbf-in.
1 3/8(1.3750)- 6	1,150.0 lbf-in.	185.0 lbf-in.
1 1/2(1.5000)- 6	1,350.0 lbf-in.	210.0 lbf-in.
UNIFIED FINE (UNF)		
2(0.086)-64	20.0 ozf-in.	3.0 ozf-in.
3(0.099)-56	32.0 ozf-in.	7.0 ozf-in.
4(0.112)-48	48.0 ozf-in.	10.0 ozf-in.
6(0.138)-40	6.0 lbf-in.	1.0 lbf-in.
8(0.164)-36	9.0 lbf-in.	1.5 lbf-in.
10(0.190)-32	13.0 lbf-in.	2.0 lbf-in.
1/4(0.2500)-28	30.0 lbf-in.	3.0 lbf-in.
5/16(0.3125)-24	60.0 lbf-in.	6.5 lbf-in.
3/8(0.3750)-24	80.0 lbf-in.	9.5 lbf-in.
7/16(0.4375)-20	100.0 lbf-in.	14.0 lbf-in.
1/2(0.5000)-20	150.0 lbf-in.	18.0 lbf-in.
9/16(0.5625)-18	200.0 lbf-in.	24.0 lbf-in.
5/8(0.6250)-18	300.0 lbf-in.	32.0 lbf-in.
3/4(0.7500)-16	400.0 lbf-in.	50.0 lbf-in.
7/8(0.8750)-14	600.0 lbf-in.	70.0 lbf-in.
(1.0000)-12	800.0 lbf-in.	90.0 lbf-in.
1 1/8(1.1250)-12	900.0 lbf-in.	117.0 lbf-in.
1 1/4(1.2500)-12	1,000.0 lbf-in.	143.0 lbf-in.
1 3/8(1.3750)-12	1,150.0 lbf-in.	165.0 lbf-in.
1 1/2(1.5000)-12	1,350.0 lbf-in.	190.0 lbf-in.
UNIFIED SPECIAL (UNS)		
1(1.0000) – 14	800.0 lbf-in.	90.0 lbf-in.

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bolts selected for this test shall be of sufficient length so the thread runout does not enter the insert and that a minimum of 3 full threads extend past the locking coils. Acceptability of bolt threads shall be determined based on System 22 of ANSI/ASME B1.3M.

4.4.2 Torque Test Block. The insert to be tested shall be installed in a Class 3B threaded hole conforming to Table 1 in a test block made from 2024-T4 aluminum alloy. After installation the tang shall be removed.

4.4.3 Torque Test Method. The torque test shall consist of a 15-cycle, room temperature test. A new bolt and a new tapped hole shall be used for each complete 15-cycle test. Bolts must assemble freely, with the fingers, up to the locking coil or coils. The bolt shall be engaged and disengaged from the assembled insert for 15 full installation and removal cycles. The test shall be run at a rate slow enough to yield a dependable measure of torque and avoid heating of the bolt. A bolt shall be considered fully installed when three threads extend past the end of the locking coils of the insert. The removal cycle shall be considered complete when the locking coils are disengaged.

4.4.3.1 Maximum Locking Torque. Maximum locking torque shall be the highest torque value encountered on any installation or removal cycle and shall not exceed the values specified in Table 6. Maximum locking torque readings shall be taken on the first and seventh installation cycles and on the fifteenth removal cycle.

4.4.3.2 Minimum Breakway Torque. Minimum breakway torque shall be the torque required to start removal of the screw or bolt from the installed position and shall be recorded at the start of the fifteenth removal cycle. The torque value for any cycle shall be not less than the applicable value shown on Table 6.

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APPENDIX A
INSERT LENGTH SELECTION

(This Appendix is not part of ASME B18.29.1-1993, and is included for information purposes only.)

A1 ENGAGED LENGTH OF BOLT

Normally, the engaged length of bolt in an insert is determined by strength considerations.

A2 MATERIAL STRENGTHS

The standard engineering practice of balancing the tensile strength of the bolt material against the shear strength of the parent or boss material also applies to helical coil inserts. Tables A1 and A2 will aid in developing the full load value of the bolt rather than stripping the parent or tapped material.

In using this table, these factors must be considered:

A2.1 The parent material shear strengths are for room temperature. Elevated temperatures call for significant shear value reductions; compensation should be made when required. Shear values are appropriate because the parent material is subject to shearing stress at the major diameter of the tapped threads.

A2.2 When parent material shear strength falls between two tabulated values, use the lower of the two.

A2.3 Bolt thread length, overall length, insert length, and full tapped thread depth must be adequate to insure full thread engagement when assembled in order to comply with its design function.

TABLE A1 INSERT LENGTH SELECTION

Parent Material Shear Strength, psi	Bolt Designation				
	SAE Grade 2	SAE Grade 5 1 in. and Smaller	SAE Grade 5 Over 1 in.	SAE Grade 8	Socket Head Cap Screw
	Insert Length in Terms of Diameters				
15,000	2½	3	3	-	-
20,000	2	2½	2½	3	-
25,000	1½	2	2	2½	3
30,000	1½	2	1½	2	2½
40,000	1	1½	1½	1½	2
50,000	1	1	1	1½	1½

TABLE A2 HARDNESS NUMBER CONVERSIONS

Bolt	Rockwell Hardness, Max	Tensile Strength, Max
SAE Grade 2	B100	117,000
SAE Grade 5 1 in. and Smaller	C34	153,000
SAE Grade 5 Over 1 in.	C30	138,000
SAE Grade 8	C39	176,000
Socket Head Cap Screw	C45	215,000

GENERAL NOTE: Bolt strengths upon which insert length recommendations are based are developed by taking the maximum hardness allowed in the standard and taking the equivalent tensile strength from SAE J417 Hardness Tests and Hardness Number Conversions. These are shown in Table A2.

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APPENDIX B
SCREW THREAD INSERT TAPS

(This Appendix is not part of ASME B18.29.1-1993, and is included for information purposes only.)

B1 SCOPE

This appendix covers design and dimensions for taps for producing STI threaded holes required for the installation of helical coil screw thread inserts. Threaded hole dimensions are shown in Table 1 of this Standard.

B2 NOMENCLATURE

Helical coil screw thread insert taps are identified by the designation STI.

B3 DESIGNS

B3.1 Types of Taps. Various types and styles of STI taps are available. General dimensions and tolerances follow ASME/ANSI B94.9. Nominal diameter used for determining these values is the "Major Dia. Min." from Table 1. See Table B1 and Figs. B1, B2, and B3 for general dimensions of some common STI taps.

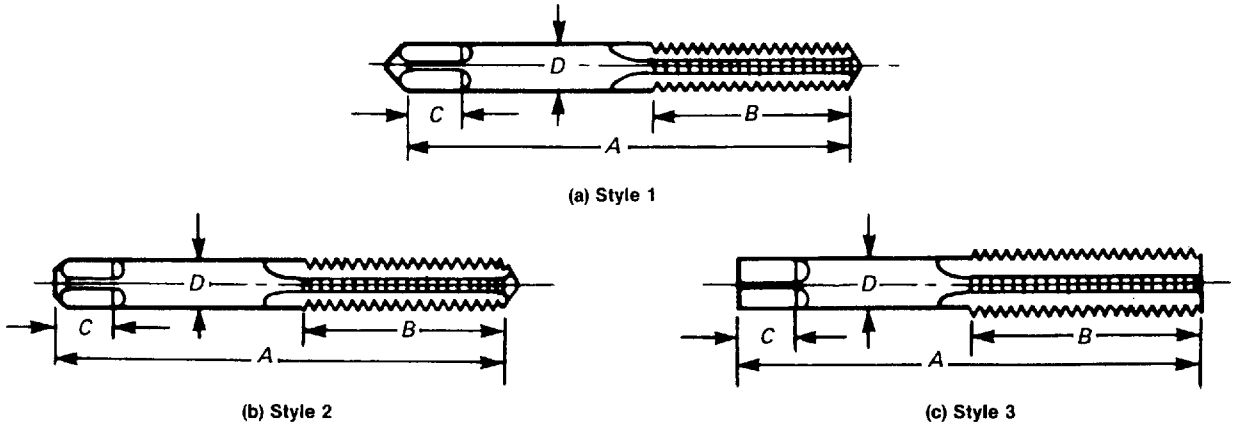
B3.2 Tap Thread Limits. Ground thread taps are recommended for screw thread inserts. Tap thread limits follow ASME/ANSI B94.9. Basic pitch diameter used for determining values is the "Pitch Diameter, min." from Table 1. See Table B2 for major and pitch diameter limits corresponding to common H limit numbers for standard size STI taps.

B4 MARKING

Taps are marked in accordance with ASME/ANSI B94.9 except that the designator "STI" is added to the thread size.

EXAMPLE: 1/4-28 STI NF HS G H2

Other information may be added at the discretion of the manufacturer.



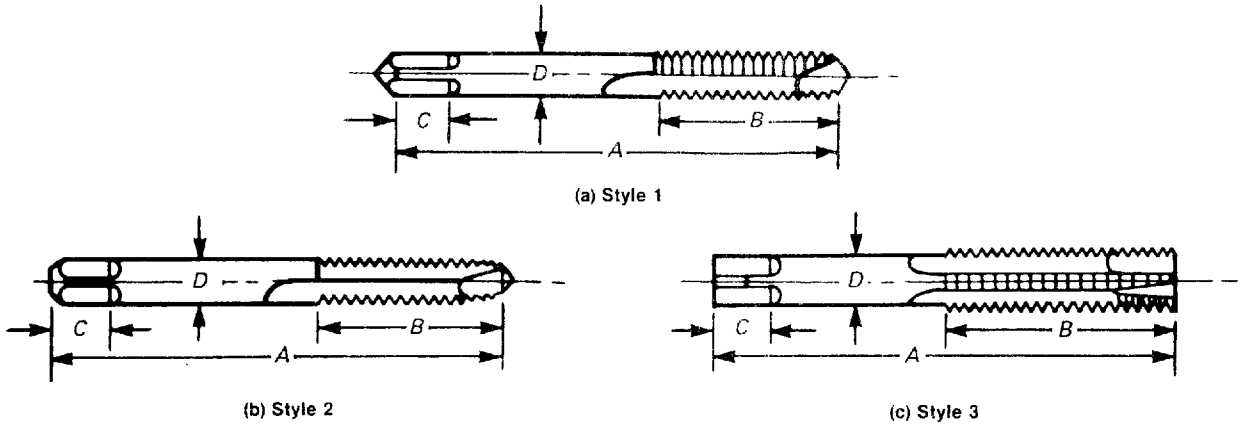
(a) Style 1

(b) Style 2

(c) Style 3

FIG. B1 STRAIGHT FLUTED TAPS
High-Speed Steel—Ground Thread

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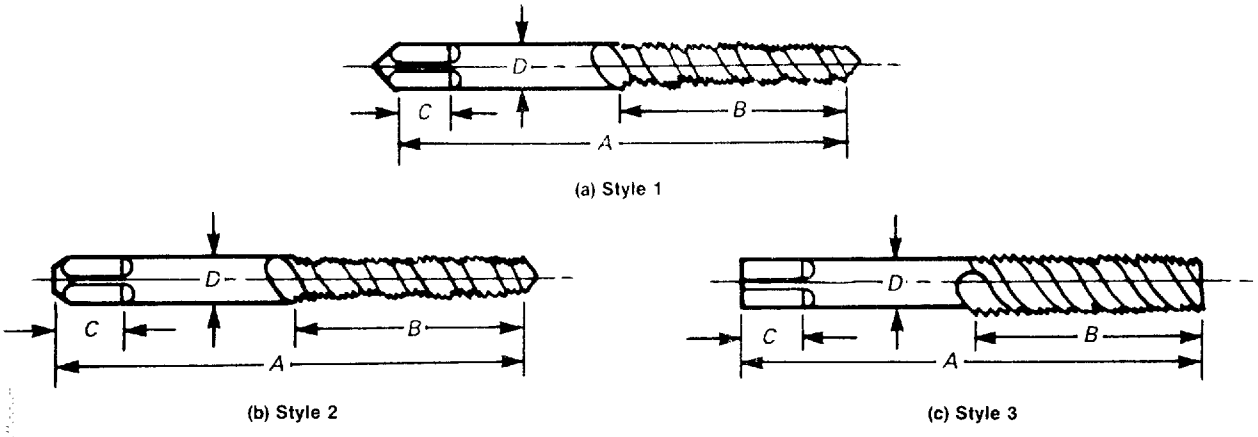


(a) Style 1

(b) Style 2

(c) Style 3

FIG. B2 SPIRAL POINTED TAPS
High-Speed Steel—Ground Thread



(a) Style 1

(b) Style 2

(c) Style 3

FIG. B3 FAST SPIRAL FLUTED TAPS
High-Speed Steel—Ground Thread

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TABLE B1 TAP GENERAL DIMENSIONS

Nominal Thread Size	Length Over All A	TAP DIMENSIONS				NUMBER OF FLUTES			
		Length Of Thread B	Length Of Square C	Max. Dia. Of Shank D	Max. Size of Square	Straight Flute NOTE 1	Spiral Point Plug NOTE 2	Spiral Flute Bott. NOTE 3	STYLE Figures B1–B3
UNIFIED COARSE (UNC)									
1(0.073)–64	1 13/16	1/2	3/16	0.141	0.110	3	2	2	1
2(0.086)–56	1 7/8	9/16	3/16	0.141	0.110	3	2	2	1
3(0.099)–48	1 15/16	5/8	3/16	0.141	0.110	3	2	2	1
4(0.112)–40	2	11/16	3/16	0.141	0.110	3	2	2	1
5(0.125)–40	2 1/8	3/4	1/4	0.168	0.131	3	2	3	1
6(0.138)–32	2 3/8	7/8	1/4	0.194	0.152	3	2	3	1
8(0.164)–32	2 3/8	15/16	9/32	0.220	0.165	3	2	3	1
10(0.190)–24	2 1/2	1	5/16	0.255	0.191	3	2	3	2
12(0.216)–24	2 23/32	1 1/8	3/8	0.318	0.238	3	2	3	2
1/4(0.2500)–20	2 23/32	1 1/8	3/8	0.318	0.238	3	2	3	2
5/16(0.3125)–18	2 15/16	1 1/4	7/16	0.381	0.286	4	3	3	2
3/8(0.3750)–16	3 3/8	1 21/32	7/16	0.367	0.275	4	3	3	3
7/16(0.4375)–14	3 19/32	1 21/32	1/2	0.429	0.322	4	3	4	3
1/2(0.5000)–13	3 13/16	1 13/16	9/16	0.480	0.360	4	3	4	3
9/16(0.5625)–12	4 1/32	1 13/16	5/8	0.542	0.406	4	—	—	3
5/8(0.6250)–11	4 1/4	2	11/16	0.590	0.442	4	—	—	3
3/4(0.7500)–10	4 11/16	2 7/32	3/4	0.697	0.523	4	—	—	3
7/8(0.8750)–9	5 1/8	2 1/2	13/16	0.800	0.600	4	—	—	3
1(1.0000)–8	5 3/4	2 9/16	1	1.021	0.766	4	—	—	3
1 1/8(1.1250)–7	6 1/16	3	1 1/16	1.108	0.831	4	—	—	3
1 1/4(1.2500)–7	6 3/8	3	1 1/8	1.233	0.925	4	—	—	3
1 3/8(1.3750)–6	6 11/16	3 3/16	1 1/8	1.305	0.979	6	—	—	3
1 1/2(1.5000)–6	7	3 3/16	1 1/4	1.430	1.072	6	—	—	3
UNIFIED FINE (UNF)									
2(0.086)–64	1 7/8	9/16	3/16	0.141	0.110	3	2	2	1
3(0.099)–56	1 15/16	5/8	3/16	0.141	0.110	3	2	2	1
4(0.112)–48	2	11/16	3/16	0.141	0.110	3	2	2	1
6(0.138)–40	2 1/8	3/4	1/4	0.168	0.131	3	2	3	1
8(0.164)–36	2 3/8	15/16	9/32	0.220	0.165	3	2	3	1
10(0.190)–32	2 1/2	1	5/16	0.255	0.191	3	2	3	2
1/4(0.2500)–28	2 23/32	1 1/8	3/8	0.318	0.238	3	2	3	2
5/16(0.3125)–24	2 15/16	1 1/4	7/16	0.381	0.286	4	3	3	2
3/8(0.3750)–24	3 5/32	1 7/16	13/32	0.323	0.242	4	3	3	3
7/16(0.4375)–20	3 3/8	1 21/32	7/16	0.367	0.275	4	3	3	3
1/2(0.5000)–20	3 19/32	1 21/32	1/2	0.429	0.322	4	3	4	3
9/16(0.5625)–18	3 13/16	1 13/16	9/16	0.480	0.360	4	—	—	3
5/8(0.6250)–18	4 1/32	1 13/16	5/8	0.542	0.406	4	—	—	3
3/4(0.7500)–16	4 15/32	2	11/16	0.652	0.489	4	—	—	3
7/8(0.8750)–14	5 1/8	2 1/2	13/16	0.800	0.600	4	—	—	3
1(1.0000)–12	5 7/16	2 9/16	7/8	0.896	0.672	4	—	—	3
1 1/8(1.1250)–12	5 3/4	2 9/16	1	1.021	0.766	6	—	—	3
1 1/4(1.2500)–12	6 1/16	3	1 1/16	1.108	0.831	6	—	—	3
1 3/8(1.3750)–12	6 3/8	3	1 1/8	1.233	0.925	6	—	—	3
1 1/2(1.5000)–12	6 11/16	3 3/16	1 1/8	1.305	0.979	6	—	—	3
UNIFIED SPECIAL (UNS)									
1(1.0000)–14	5 7/16	2 9/16	7/8	0.896	0.672	4	—	—	3

NOTES:
(1) Straight Flute Taps are available with either plug chamfer (3 to 4 pitches) or bottoming chamfer (1 1/2 to 2 pitches).
(2) Spiral Point Taps are available only with plug chamfer (3 to 4 pitches).
(3) Spiral Flute Taps are high spiral and are available only with bottoming chamfer (1 1/2 to 2 pitches).
(4) Tolerances are in accordance with ASME/ANSI B94.9.
(5) For Tap Thread Limits and Tolerances, see Table B2.

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TABLE B2 TAP THREAD LIMITS

Nominal Size	Major Dia.		Class 3B			Class 2B		
				Pitch Dia.			Pitch Dia.	
	Max.	Min.	Limits	Max.	Min.	Limits	Max.	Min.
UNIFIED COURSE (UNC)								
1(0.073)-64	0.0958	0.0948	H1	0.0837	0.0832	H2	0.0842	0.0837
2(0.086)-56	0.1117	0.1107	H1	0.0981	0.0976	H2	0.0986	0.0981
3(0.099)-48	0.1289	0.1279	H1	0.1131	0.1126	H2	0.1136	0.1131
4(0.112)-40	0.1473	0.1463	H1	0.1288	0.1283	H2	0.1293	0.1288
5(0.125)-40	0.1603	0.1593	H1	0.1418	0.1413	H2	0.1423	0.1418
6(0.138)-32	0.1817	0.1807	H2	0.1593	0.1588	H3	0.1598	0.1593
8(0.164)-32	0.2077	0.2067	H2	0.1853	0.1848	H3	0.1858	0.1853
10(0.190)-24	0.2475	0.2465	H2	0.2180	0.2175	H3	0.2185	0.2180
12(0.216)-24	0.2735	0.2725	H2	0.2440	0.2435	H3	0.2445	0.2440
1/4(0.2500)-20	0.3187	0.3177	H2	0.2835	0.2830	H3	0.2840	0.2835
5/16(0.3125)-18	0.3884	0.3874	H3	0.3501	0.3496	H4	0.3506	0.3501
3/8(0.3750)-16	0.4602	0.4592	H3	0.4171	0.4166	H4	0.4176	0.4171
7/16(0.4375)-14	0.5343	0.5333	H3	0.4854	0.4849	H4	0.4859	0.4854
1/2(0.5000)-13	0.6042	0.6032	H3	0.5514	0.5509	H4	0.5519	0.5514
9/16(0.5625)-12	0.6751	0.6741	H3	0.6182	0.6177	H4	0.6187	0.6182
5/8(0.6250)-11	0.7477	0.7467	H3	0.6856	0.6851	H4	0.6861	0.6856
3/4(0.7500)-10	0.8850	0.8835	H3	0.8164	0.8159	H5	0.8174	0.8169
7/8(0.8750)-9	1.0247	1.0232	H3	0.9486	0.9481	H5	0.9496	0.9491
1(1.0000)-8	1.1681	1.1666	H4	1.0832	1.0822	H6	1.0842	1.0832
1 1/8(1.1250)-7	1.3171	1.3151	H4	1.2198	1.2188	H6	1.2208	1.2198
1 1/4(1.2500)-7	1.4421	1.4401	H4	1.3448	1.3438	H6	1.3458	1.3446
1 3/8(1.3750)-6	1.5982	1.5962	H6	1.4862	1.4852	H8	1.4872	1.4862
1 1/2(1.5000)-6	1.7232	1.7212	H6	1.6112	1.6102	H8	1.6122	1.6112
UNIFIED FINE (UNF)								
2(0.086)-64	0.1088	0.1078	H1	0.0967	0.0962	H2	0.0972	0.0967
3(0.099)-56	0.1247	0.1237	H1	0.1111	0.1106	H2	0.1116	0.1111
4(0.112)-48	0.1419	0.1409	H1	0.1261	0.1256	H2	0.1266	0.1261
6(0.138)-40	0.1733	0.1723	H1	0.1548	0.1543	H2	0.1553	0.1548
8(0.164)-36	0.2032	0.2022	H1	0.1826	0.1821	H2	0.1831	0.1826
10(0.190)-32	0.2337	0.2327	H2	0.2113	0.2108	H3	0.2118	0.2113
1/4(0.2500)-28	0.2995	0.2985	H2	0.2742	0.2737	H3	0.2747	0.2742
5/16(0.3125)-24	0.3700	0.3690	H2	0.3405	0.3400	H3	0.3410	0.3405
3/8(0.3750)-24	0.4325	0.4315	H2	0.4030	0.4025	H3	0.4035	0.4030
7/16(0.4375)-20	0.5062	0.5052	H3	0.4715	0.4710	H4	0.4720	0.4715
1/2(0.5000)-20	0.5687	0.5677	H3	0.5340	0.5335	H4	0.5345	0.5340
9/16(0.5625)-18	0.6384	0.6374	H3	0.6001	0.5996	H4	0.6006	0.6001
5/8(0.6250)-18	0.7009	0.6999	H3	0.6626	0.6621	H4	0.6631	0.6626
3/4(0.7500)-16	0.8352	0.8342	H3	0.7921	0.7916	H4	0.7926	0.7921
7/8(0.8750)-14	0.9718	0.9708	H3	0.9229	0.9224	H4	0.9234	0.9229
1(1.0000)-12	1.1126	1.1116	H4	1.0562	1.0552	H6	1.0572	1.0562
1 1/8(1.1250)-12	1.2376	1.2366	H4	1.1812	1.1802	H6	1.1822	1.1812
1 1/4(1.2500)-12	1.3626	1.3616	H4	1.3062	1.3052	H6	1.3072	1.3062
1 3/8(1.3750)-12	1.4876	1.4866	H4	1.4312	1.4302	H6	1.4322	1.4312
1 1/2(1.5000)-12	1.6126	1.6116	H4	1.5562	1.5552	H6	1.5572	1.5562
UNIFIED SPECIAL (UNS)								
1(1.0000)-14	1.0968	1.0958	H4	1.0484	1.0474	H6	1.0494	1.0484

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APPENDIX C
STI THREAD PLUG GAGES

(This Appendix is not part of ASME B18.29.1-1993, and is included for information purposes only.)

C1 BLANKS

STI gage blanks are in accordance with ASME/ANSI B47.1, Gage Blanks.

C2 GAGE DESIGN

STI gages are designed in accordance with ANSI/ASME B1.2, Gages and Gaging for Unified Inch Screw Threads.

C3 GAGE TOLERANCES

Tolerances on gaging elements are in accordance with ANSI/ASME B1.2 per Table C1.

TABLE C1 THREAD PLUG GAGE TOLERANCES

Go Gage	Gage Tolerance	Hi (Not Go)	Gage Tolerance
UNC-2B		UNC-2B	
3/8-16 & smaller	W	10-24 & smaller	W
7/16-14 & larger	X	12-24 & larger	X
UNC-3B		UNC-3B	
3/8-16 & smaller	W	3/8-16 & smaller	W
7/16-14 & larger	X	7/16-14 & larger	X
UNF-2B		UNF-2B	
3/4-16 & smaller	W	1/4-28 & smaller	W
7/8-14 & larger	X	5/16-24 & larger	X
UNF-3B		UNF-3B	
3/4-16 & smaller	W	9/16-18 & smaller	W
7/8-14 & larger	X	5/8-18 & larger	X

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APPENDIX D
INSTALLATION

(This Appendix is not part of ASME B18.29.1-1993, and is included for information purposes only.)

D1 INSERT INSTALLATION

Helical coil inserts are greater in diameter than the STI tapped holes into which they are installed. The installation process applies torque to the tang to reduce the diameter of the leading coil and permit it to enter the tapped hole. The remaining coils are reduced in diameter as they, in turn, are screwed into the tapped hole. When the torque or rotation is stopped, the insert coil expands with a spring-like action to anchor the insert permanently in place against the threads of the tapped hole.

Finer pitch inserts are proportionately larger (before installation) than coarse pitch inserts and thus have to be "prewound" to a smaller diameter for installation. Large, coarse pitch inserts (and 2-56 and 3-48 inserts) need only a threaded mandrel tool for installation.

D2 STRIP FEED

Helical coil inserts are normally furnished in bulk containers. However, they are also normally available in feeding belts known as strip feed.

Strip feed consists of a belt or strip of pliable plastic such as polyethylene through which holes have been punched, and into which the helical coil inserts are positioned, the ends of the inserts protruding from each side of the strip. The strip is coiled on a reel or spool.

The purpose for, and advantage of strip feed is to ease handling of the insert and to increase installation rates.

Inserting tools are available for handling strip feed, wherein the strip passes through a slot in the prewinder thus locating each insert for engagement with the mandrel. After each insert has been driven through the tool and installed into the work, the strip indexes the next insert into position.

Helical coil inserts are normally available in Strip Feed in sizes up through 3/8 (.375) nominal diameter.

D3 INSERTING TOOLS

D3.1 Hand Inserting Tools. Various types of hand inserting tools are available. Examples are shown in Table D1.

These hand inserting tools will install helical coil inserts up to 3 diameters long for thread sizes up through $^{7}/_{8}$ inch UNC and UNF. Tools for sizes 1 inch and larger UNC and UNF will install inserts up to 2 diameters long.

D3.2 Power Inserting Tools—Air Driven. For installing large quantities of helical coil inserts, power inserting tools are available. A typical tool is comprised of three basic assemblies: a reversible air motor, an adapter and a front end assembly. The air motor provides the driving torque. The Adapter couples the Motor to the Front End Assembly. The Front End Assembly holds the insert and, in operation, reduces the diameter of the insert (prewinds), then drives it into its tapped hole. A foot activated air valve may be used as an alternative to the hand activated lever.

Two sizes of adapters are available: one for the smaller range of thread sizes and one for the larger sizes. Front End Assemblies are standard in sizes No. 2 through $^{1}/_{2}$ inch Coarse and Fine, for both bulk and strip feed inserts. These tools will install 1, $1^{1}/_{2}$, and 2 diameter length inserts. Front end assemblies are also available for longer length inserts or larger sizes.

Examples of air driven power inserting tools are shown in Table D2.

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D3.3 Power Inserting Tools—Electric. Electric power tools are available for use where electric power is preferred over air. The slender configuration of the mandrels allow them to reach into constricted areas. Electric power meets the requirements of clean room operations. Some operators prefer electric power because it is quieter and the tool is lighter.

Examples of electric power inserting tools are shown in Table D3.

D4 TANG BREAK-OFF TOOLS

If the bolt is to engage the full length of the insert, the driving tang must be removed to eliminate interference with the end of the assembled bolt.

Tang break-off tools are of several types.

D4.1 Spring Actuated Manual Tang Break-Off Tool. Spring actuated tang break-off tools are available for use with inserts through 1/2 in. nominal diameter. Their operation is automatic, having a spring loaded, easily triggered punch that strikes a sharp, uniform blow against the tang of the installed insert.

Examples are shown in Table D4.

D4.2 Rod Type Tang Break-Off Tool. Rod Type tools are available for use with inserts through 1/2 in. nominal diameter. They are actuated by the tap of a hammer.

Examples are shown in Table D5.

D4.3 Long Nose Pliers. For insert nominal sizes larger than 1/2 in., use long nose pliers, bending the tang up and down to snap it off at the notch.

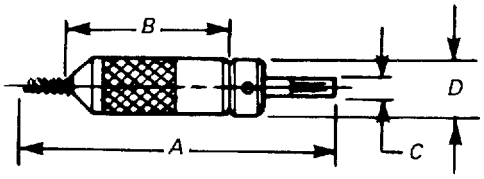
D5 EXTRACTING TOOLS

Examples of tools to remove helical coil inserts are shown in Table D6. These operate by applying the tool to the insert, striking the head of the tool a light blow and turning counterclockwise while maintaining steady downward pressure.

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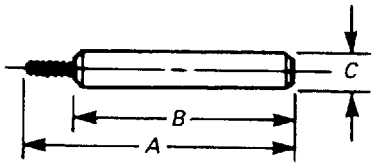
TABLE D1 HAND INSERTING TOOLS

TYPE I UNC & UNF



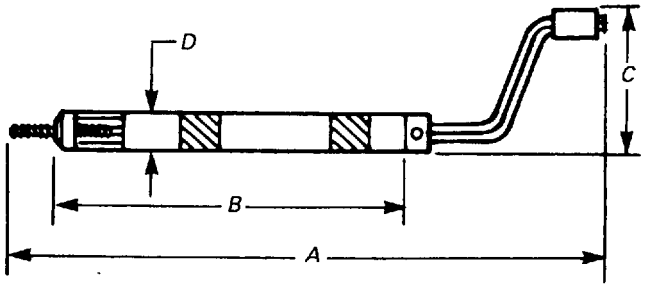
SIZE	A	B	C	D
#1-64	2 5/8	3/4	3/16	7/16
#2-64	2 5/8	3/4	3/16	7/16

TYPE II UNC



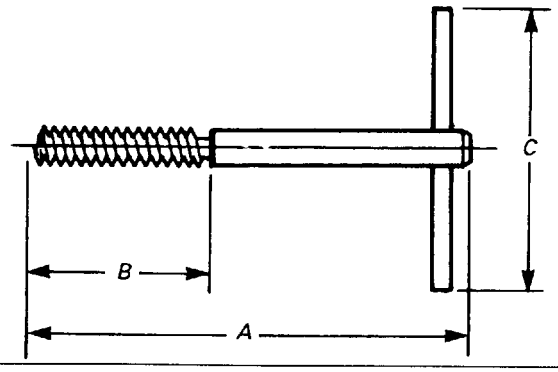
SIZE	A	B	C
#2-56	2 7/16	2	5/16
#3-48	2 7/16	2	5/16

TYPE III UNC & UNF



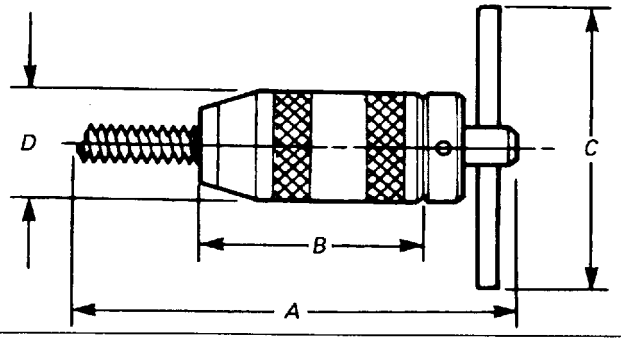
SIZE	A	B	C	D
#3-56	7 15/32	4 5/8	2 9/32	3/8
#4	7 15/32	4 5/8	2 9/32	3/8
#5	7 15/32	4 5/8	2 9/32	3/8
#6	7 15/32	4 5/8	2 9/32	3/8
#8	7 15/32	4 5/8	2 9/32	3/8
#10	7 15/32	4 5/8	2 9/32	15/32
#12	7 31/32	4 5/8	2 17/32	33/64
1/4-	7 31/32	4 5/8	2 17/32	33/64
5/16-	7 11/32	4 5/8	3 23/32	5/8
3/8-	7 31/32	5	3 23/32	45/64
7/16-	8 15/32	5 1/4	3 23/32	25/32
1/2-	8 27/32	5 1/2	3 25/32	7/8

TYPE IV UNC



SIZE	A	B	C
9/16-	4 7/8	1 13/16	4
5/8-	4 7/8	2	4
3/4-	4 7/8	2 3/8	4
7/8-	4 7/8	2 3/4	4 1/2
1″	4 7/8	2 1/8	4 1/2
1 1/8-	6 3/4	2 1/2	6
1 1/4-	6 3/4	2 3/4	6
1 3/8-	6 3/4	3	6
1 1/2-	6 3/4	3 1/4	6

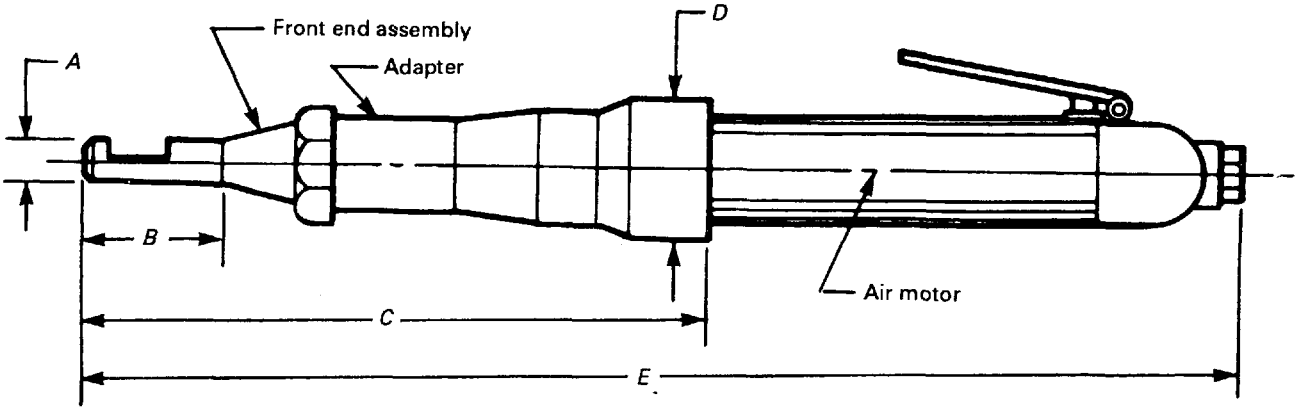
TYPE V UNF & UNS



SIZE	A	B	C	D
9/16-	5 3/8	2 7/8	4	1 1/8
5/8-	5 3/8	2 7/8	4	1 1/8
3/4-	6	2 7/8	4	1 1/2
7/8-	6 3/8	2 7/8	4 1/2	1 1/2
1″	5 7/8	2 7/8	4 1/2	1 5/8
1-1/8-	6 5/16	3 1/16	4 1/2	2
1-1/4-	6 13/16	3 5/16	6	2
1-3/8-	7 5/16	3 9/16	6	2 1/4
1-1/2-	7 13/16	3 13/16	6	2 1/4

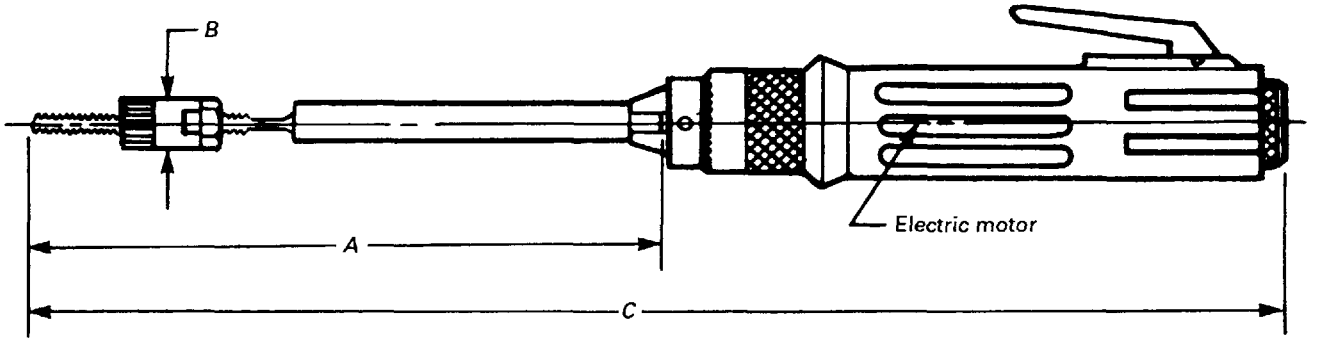
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TABLE D2 AIR POWER INSERTING TOOLS



SIZE UNC & UNF	FOR BULK INSERTS		FOR STRIP FEED INSERTS		C	D	E
	A	B	A	B			
#2	—	—	5/16	7/16	4 7/16	1 1/4	9 13/16
#4	1/4	9/16	3/8	15/16	4 7/16	1 1/4	9 13/16
#5	9/32	9/16	3/8	15/16	4 7/16	1 1/4	9 13/16
#6	5/16	9/16	1/2	15/16	4 7/16	1 1/4	9 13/16
#8	11/32	9/16	1/2	15/16	4 7/16	1 1/4	9 13/16
#10	3/8	29/32	1/2	15/16	4 7/16	1 1/4	9 13/16
1/4″	27/64	29/32	5/8	1 3/8	4 7/16	1 1/4	9 13/16
5/16″	9/16	1 1/8	11/16	1 1/8	5 3/4	1 1/4	11 1/8
3/8″	11/16	1 11/32	—	—	6 1/32	1 1/4	11 13/32
7/16″	3/4	1 17/32	—	—	6 13/32	1 1/4	11 25/32
1/2″	13/16	1 25/32	—	—	6 11/16	1 1/4	12 1/16

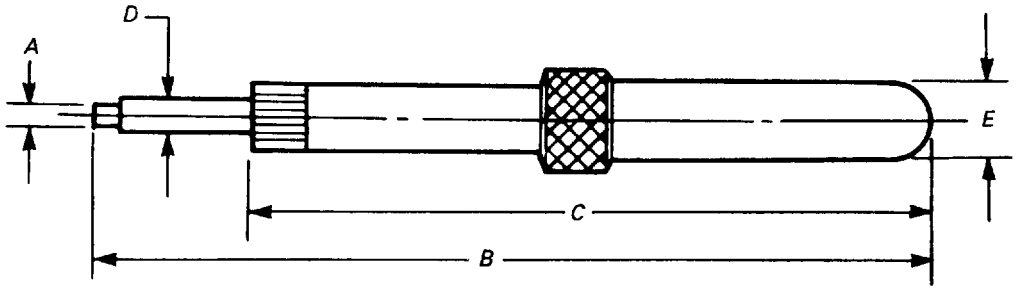
TABLE D3 ELECTRIC POWER INSERTING TOOLS



SIZE	A	B	C
#2-56UNC	4″	5/16	12 3/4
#4-40UNC	4″	5/16	12 3/4
#6-32UNC	4″	5/16	12 3/4
#8-32UNC	4″	5/16	12 3/4

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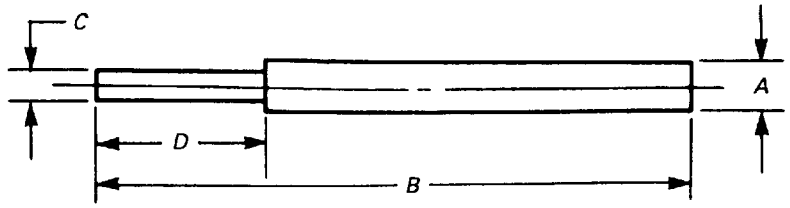
TABLE D4 MANUAL TANG BREAK-OFF TOOLS—SPRING ACTUATED



SIZE	A	B	C	D	E
#1(0.073)	0.052	5 1/4	5	—	1/2
#2(0.086)&#3(0.099)	0.058	5 7/16	5	—	1/2
#4(0.112)&#5(0.125)	0.076	5 1/2	5	—	1/2
#6(0.138)	0.089	5 9/16	5	—	1/2
#8(0.164)	0.112	5 5/8	5	—	1/2
#10(0.190)&#12(0.216)	0.125	5 3/4	5	—	1/2
1/4(0.250)	0.154	5 13/16	5	—	1/2
5/16(0.3125)–18	0.120	5 13/16	4 29/32	0.223	5/8
3/8(0.375)–16	0.187	5 15/16	4 29/32	0.283	5/8
7/16(0.4375)–14	0.229	7 7/32	6 3/32	0.334	3/4
1/2(0.500)–13	0.292	7 11/32	6 3/32	0.392	3/4
5/16(0.3125)–24	0.120	5 13/16	4 29/32	0.251	5/8
3/8(0.375)–24	0.187	5 15/16	4 29/32	0.303	5/8
7/16(0.4375)–20	0.229	7 7/32	6 3/32	0.360	3/4
1/2(0.500)–20	0.292	7 11/32	6 3/32	0.414	3/4

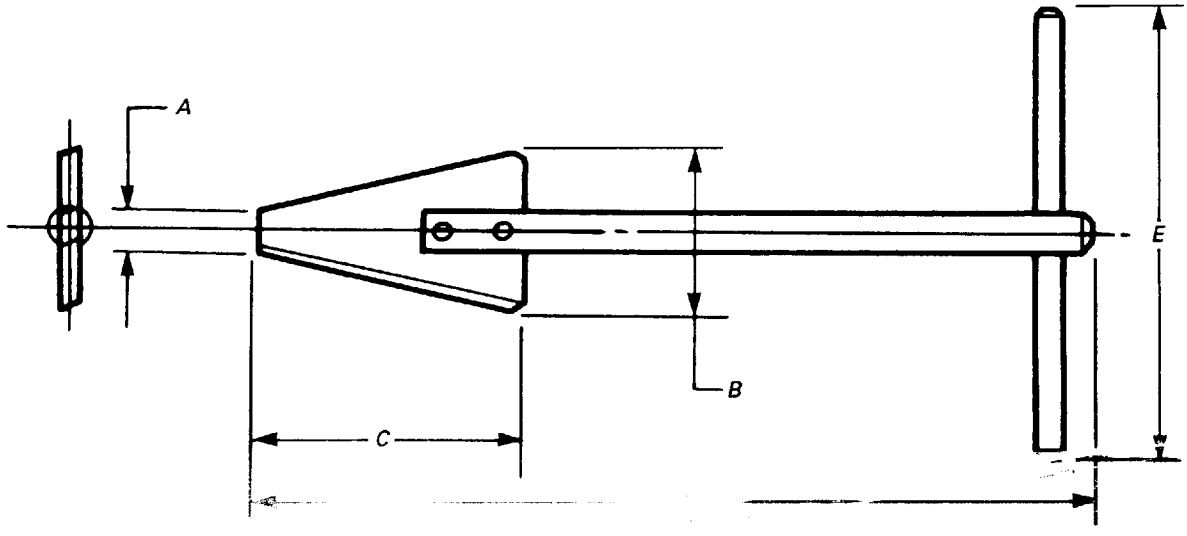
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TABLE D5 ROD TYPE TANG BREAK-OFF TOOLS



SIZE	A	B	C	D
#2(0.086)	1/4	4″	0.058	3/8
#3(0.099)	1/4	4″	0.058	3/8
#4(0.112)	1/4	4″	0.076	1/2
#5(0.125)	1/4	4″	0.086	9/16
#6(0.138)	1/4	4″	0.089	5/8
#8(0.164)	1/4	4″	0.112	11/16
#10(0.190)	1/4	4″	0.125	3/4
#12(0.216)	1/4	4″	0.150	15/16
1/4(0.2500)	1/4	4″	0.176	1″
5/16(0.3125)	1/4	4″	0.230	1 1/8
3/8(0.3750)	9/32	4″	NONE	NONE
7/16(0.4375)	11/32	4″	NONE	NONE
1/2(0.5000)	25/64	4″	NONE	NONE

TABLE D6 EXTRACTING TOOLS



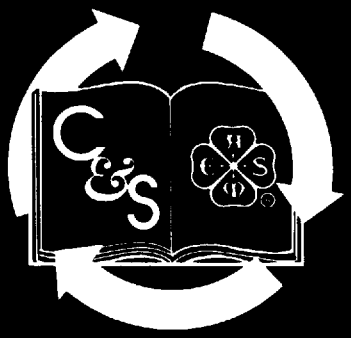
RANGE	A	B	C	D	E
#2(0.086)	0.078	—	5/8	4 1/4	3
#3(0.099) THRU #8(0.164)	0.078	0.375	5/8	4 1/4	3
#10(0.190) THRU 3/8(0.3750)	0.145	0.375	9/16	4 1/4	3
7/16(0.4375) THRU 1″(1.0000)	0.360	1.000	1 5/8	5 1/16	4
1 1/8(1.1250) THRU 1 1/2(1.5000)	0.970	1.500	1 5/16	6 1/8	4

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AMERICAN NATIONAL STANDARDS FOR BOLTS, NUTS, RIVETS, SCREWS, WASHERS, AND SIMILAR FASTENERS

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Large Rivets ..... B18.1.2-1972(R1989)
Metric Small Solid Rivets ..... B18.1.3M-1983(R1989)
Square and Hex Bolts and Screws – Inch Series ..... B18.2.1-1981(R1992)
Square and Hex Nuts (Inch Series) B18.2.2-1987
Metric Hex Cap Screws ..... B18.2.3.1M-1979(R1989)
Metric Formed Hex Screws ..... B18.2.3.2M-1979(R1989)
Metric Heavy Hex Screws ..... B18.2.3.3M-1979(R1989)
Metric Hex Flange Screws B18.2.3.4M-1984
Metric Hex Bolts ..... B18.2.3.5M-1979(R1989)
Metric Heavy Hex Bolts ..... B18.2.3.6M-1979(R1989)
Metric Heavy Hex Structural Bolts ..... B18.2.3.7M-1979(R1989)
Metric Hex Lag Screws ..... B18.2.3.8M-1981(R1991)
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Metric Hex Nuts, Style 1 ..... B18.2.4.1M-1979(R1989)
Metric Hex Nuts, Style 2 ..... B18.2.4.2M-1979(R1989)
Metric Slotted Hex Nuts ..... B18.2.4.3M-1979(R1989)
Metric Hex Flange Nuts B18.2.4.4M-1982
Metric Hex Jam Nuts ..... B18.2.4.5M-1979(R1990)
Metric Heavy Hex Nuts ..... B18.2.4.6M-1979(R1990)
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Metric Series Hexagon Keys and Bits ..... B18.3.2M-1979(R1990)
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Hexagon Socket Flat Countersunk Head Cap Screws (Metric Series) B18.3.5M-1986
Metric Series Socket Set Screws B18.3.6M-1986
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Metric Round Head Short Square Neck Bolts B18.5.2.1M-1981
Metric Round Head Square Neck Bolts B18.5.2.2M-1982
Round Head Square Neck Bolts With Large Head (Metric Series) B18.5.2.3M-1990
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Slotted Head Cap Screws, Square Head Set Screws, and Slotted Headless Set Screws ..... B18.6.2-1972(R1983)
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Metric Thread Forming and Thread Cutting Tapping Screws B18.6.5M-1986
Metric Machine Screws B18.6.7M-1985
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Metric General Purpose Semi-Tubular Rivets ..... B18.7.1M-1984(R1992)
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