

MIL-T-21309B  
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**MILITARY SPECIFICATION**  
**TOOLS FOR INSERTING AND EXTRACTING**  
**HELICAL COIL WIRE SCREW THREAD INSERTS**

This specification is approved for use by all Departments and Agencies of the Department of Defense.

**1. SCOPE**

1.1 This specification covers taps, thread plug gages, inserting tools, expanding tools, offset and staking tools, and extracting tools for inserting and extracting helical coil wire screw thread inserts. Exclusive of taps and gages, illustrations are for reference only and will not preclude the acceptance of tools which will satisfactorily perform the use intended.

1.1.1 All dimensions herein are given in inches except where otherwise specified in millimetres (mm).

1.2 Classification. Tools for inserting and extracting helical coil screw thread inserts shall be of the following types, classes, and styles:

**Type I - Tap, thread cutting.**

Class 1 - Finishing, plug style.  
Class 2 - Roughing, plug style.  
Class 3 - Finishing, bottoming style.  
Class 4 - Spark Plug

**Type II - Gage, plug, thread.**

**Type III - Inserting tool, screw thread inserts.**

Class 1 - Previnder tools.

Style A - 1/2(.500) and smaller Unified Coarse and Fine Threads and Metric Spark Plug Threads.

Style B - 9/16(.5625) through 1-1/2(1.500) Unified Fine Threads.

Class 2 - Mandrel Tools.

Style A - 2(.086) and 3(.099) Unified Coarse Threads

Style B - 9/16(.5625) through 1-1/2(1.500) Unified Coarse Threads.

Class 3 - Expander Tools (14-1.25 and 18-1.5mm Spark Plug Threads only).

Class 4 - Offset Tools (14-1.25 and 18-1.5mm Spark Plug Threads only for use with Class 5)

Class 5 - Staking Tools (14-1.25 and 18-1.5mm Spark Plug Threads only).

**Type IV - Tang break-off tools.**

Class 1 - Style A - 1/4(.250) and smaller, Unified Coarse and Fine Threads.

Style B - 5/16(.3125) through 1/2(.500) Unified Coarse and Fine Threads.

Class 3 - 1/2(.500) and smaller Unified Coarse and Fine Threads, plain punch.

**Type V - Extracting Tools.**

**2. APPLICABLE DOCUMENTS**

2.1 The following documents, of the issue in effect on date of invitation for bids or request for proposal, form a part of the specification to the extent specified herein.

**SPECIFICATIONS**

**FEDERAL**

OGG-D-751 - Drills, Twist (Taper-Square, Straight, and Taper Round, Shanks).  
OGG-T-70 - Taps, Thread Cutting, Standard, American National Form and Metric Spark Plug Thread (High Speed Steel, Ground Thread, Hand).  
OGG-T-558/9 - Tool Box, Portable, Helical Thread Repair.  
PPP-P-80 - Packaging and Packing of Hand Tools

**STANDARDS**

**Military**

MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.  
MS21209 - Insert, Screw-Thread, Coarse and Fine, Screw Locking, Helical Coil, CRES.  
MS33537 - Insert - Standard Dimensions for Coarse and Fine Thread Helical Coil Assembly.  
MS122076 - Insert - CRES Helical Coil Coarse Thread.  
Series  
MS124651 - Insert - CRES Helical Coil Fine Thread.  
Series

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(Copies of specifications, standards, drawings and publication required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

**NATIONAL BUREAU OF STANDARDS**

Handbook H28 - Screw-Thread Standards for Federal Services.

**U.S. DEPARTMENT OF COMMERCE**

Commercial Standard CS8-Gage Blanks.

(Application for copies should be addressed to the Superintendent of Documents, Government Printing Office, Washington, D. C. 20402.)

**3. REQUIREMENTS**

3.1 **Material.** The materials shall be as specified hereinafter. Materials not definitely specified shall be of a quality best suited for the purpose intended.

3.2 **Type 1, taps.** All taps shall be marked either "Screw Thread Insert" or "STI" in addition to the tap size and threads per inch or pitch in millimetres.

3.2.1 **Class 1, finishing, plug style taps.** The class 1 finishing taps for screw thread inserts (STI) shall conform to GGG-T-70, except that they shall conform to the dimensions specified in table I and the additional marking requirements specified herein.

3.2.2 **Class 2, roughing plug style taps.** When specified (see 6.2), roughing taps for 1/2(.500) or larger screw thread inserts shall be furnished. The roughing taps shall conform to 3.2.1, except, that the dimensions of the major diameter shall be smaller than the major diameter of the finishing tap by approximately 1/3 of the thread pitch. The pitch diameter maximum shall be smaller than the minimum tapped hole pitch diameter by approximately 1/3 of the thread pitch. The tolerance on both diameters shall be .002 inch.

# 3.2.3 **Class 3, finishing, bottom style taps.** The class 3 finishing, bottom taps for screw thread inserts (STI) shall conform to GGG-T-70, except that they shall conform to the dimensions specified in table I and the additional marking requirements specified herein.

Table I - Taps, Dimensions For Screw Thread Inserts (STI)

Nominal Thread Size	Suggested 1/ tap drill sizes	No. of flutes	Shank		Square			
			Diam- eter max.	Tolerances (no plus tolerances allowed)	Size	Tolerances (no plus tolerances allowed)	Square length	Tolerances plus or minus
Unified Coarse Series (UNC-3B)								
2(.086)-56	3/32 (.0938)	3	.141	-.0015	.110	.004	3/16	1/32
3(.099)-48	#36 .1065	3	.141	-.0015	.110	.004	3/16	1/32
4(.112)-40	#31 .1200	3	.141	-.0015	.110	.004	3/16	1/32
5(.125)-40	3.4mm .1339	3	.168	-.0015	.131	.004	1/4	1/32
6(.138)-32	#26 .1470	3	.194	-.0015	.152	.004	1/4	1/32
8(.164)-32	#17 .1730	3	.220	-.0015	.165	.004	9/32	1/32
10(.190)-24	13/64 .2031	3	.255	-.0015	.191	.004	5/16	1/32
12(.216)-24	#1 .2280	3	.318	-.0015	.238	.004	3/8	1/32
1/4(.250)-20	R .2660	3	.318	-.0015	.238	.004	3/8	1/32
5/16(.3125)-18	Q .3320	4	.381	-.0015	.286	.004	7/16	1/32
3/8(.375)-16	X .3970	4	.367	-.0015	.275	.004	7/16	1/32
7/16(.4375)-14	29/64 .4531	4	.429	-.0015	.322	.005	1/2	1/32
1/2(.500)-13	33/64 .5156	4	.480	-.0015	.360	.006	9/16	1/32
9/16(.5625)-12	37/64 .5781	4	.542	-.002	.406	.006	5/8	1/32
5/8(.625)-11	21/32 .6562	4	.590	-.002	.442	.006	11/16	1/32
3/4(.750)-10	25/32 .7812	4	.697	-.002	.523	.006	3/4	1/32
7/8(.875)-9	29/32 .9062	4	.800	-.002	.600	.006	13/16	1/32
1(1.000)-8	1-1/32 1.0312	4	1.021	-.002	.766	.005	1	1/16
1-1/8(1.125)-7	1-11/64 1.1719	4	1.108	-.002	.831	.006	1-1/16	1/16
1-1/4(1.250)-7	1-19/64 1.2969	4	1.233	-.002	.925	.008	1-1/8	1/16
1-3/8(1.375)-6	1-27/64 1.4219	6	1.305	-.002	.979	.008	1-1/8	1/16
1-1/2(1.500)-6	1-35/64 1.5469	6	1.430	-.003	1.072	.008	1-1/4	1/16
Unified Fine Series (UNF-3B)								
3(.099)-56	#37 (.1040)	3	.141	-.0015	.110	.004	3/16	1/32
4(.112)-48	3mm .1181	3	.141	-.0015	.110	.004	3/16	1/32
6(.138)-40	#26 .1470	3	.168	-.0015	.131	.004	1/4	1/32
8(.164)-36	#17 .1730	3	.220	-.0015	.165	.004	9/32	1/32
10(.190)-32	#7 .2010	3	.255	-.0015	.191	.004	5/16	1/32
1/4(.250)-28	0 .2610	3	.318	-.0015	.238	.004	3/8	1/32
5/16(.3125)-24	21/64 .3281	4	.381	-.0015	.286	.004	7/16	1/32
3/8(.375)-24	25/64 .3906	4	.323	-.0015	.242	.004	13/32	1/32
7/16(.4375)-20	29/64 .4531	4	.367	-.0015	.275	.006	7/16	1/32
1/2(.500)-20	33/64 .5156	4	.429	-.0015	.322	.006	1/2	1/32
9/16(.5625)-18	37/64 .5781	4	.480	-.002	.360	.006	9/16	1/32
5/8(.625)-18	41/64 .6406	4	.542	-.002	.406	.006	5/8	1/32
3/4(.750)-16	49/64 .7656	4	.652	-.002	.489	.006	11/16	1/32
7/8(.875)-14	57/64 .8906	4	.800	-.002	.600	.006	13/16	1/32
1(1.000)-14	1-1/64 1.0156	4	.896	-.002	.672	.006	7/8	1/16
1(1.000)-12	1-1/64 1.0156	4	.896	-.002	.672	.005	7/8	1/16
1-1/8(1.125)-12	1-9/64 1.1406	6	1.021	-.002	.766	.008	1	1/16
1-1/4(1.250)-12	1-17/64 1.2656	6	1.108	-.002	.831	.008	1-1/16	1/16
1-3/8(1.375)-12	1-25/64 1.3906	6	1.233	-.002	.925	.008	1-1/8	1/16
1-1/2(1.500)-12	1-33/64 1.5156	6	1.305	-.003	.979	.008	1-1/8	1/16

See footnotes at end of table.

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Table I - Taps, Dimensions For Screw Thread Inserts (STI) (Continued).

Nominal Thread Size	Thread Length		Overall Length		Major Diameter 2/ Minimum	4/ Pitch Diameter		H 4/ Limit
	Length	Tolerances (Plus or Minus)	Length	Tolerances (Plus or Minus)		Min.	Max.	
Unified Coarse Series								
2(.086)-56	9/16	3/64	1-7/8	1/32	.1107	.0976	.0981	H1
3(.099)-48	5/8	3/64	1-15/16	1/32	.1279	.1126	.1131	H1
4(.112)-40	11/16	3/64	2	1/32	.1463	.1283	.1288	H1
5(.125)-40	3/4	3/64	2-1/8	1/32	.1593	.1413	.1418	H1
6(.138)-32	7/8	3/64	2-3/8	1/32	.1807	.1588	.1593	H2
8(.164)-32	15/16	3/64	2-3/8	1/32	.2067	.1848	.1853	H2
10(.190)-24	1	1/16	2-1/2	1/32	.2465	.2175	.2180	H2
12(.216)-24	1-1/8	1/16	2-23/32	1/32	.2725	.2435	.2440	H2
14(.250)-20	1-1/8	1/16	2-23/32	1/32	.3177	.2830	.2835	H2
5/16(.3125)-18	1-1/4	1/16	2-15/16	1/32	.3874	.3496	.3501	H3
3/8(.375)-16	1-21/32	1/16	3-3/8	1/32	.4592	.4166	.4171	H3
7/16(.4375)-14	1-21/32	1/16	3-19/32	1/32	.5333	.4849	.4854	H3
1/2(.500)-13	1-13/16	3/32	3-13/16	1/32	.6032	.5509	.5514	H3
9/16(.5625)-12	1-13/16	3/32	4-1/32	1/32	.6741	.6177	.6182	H3
5/8(.625)-11	2	3/32	4-1/4	1/32	.7467	.6851	.6856	H3
3/4(.750)-10	2-7/32	3/32	4-11/16	1/32	.8835	.8159	.8164	H3
7/8(.875)-9	2-1/2	3/32	5-1/8	1/32	1.0232	.9481	.9486	H3
1(1.000)-8	2-9/16	3/32	5-3/4	1/16	1.1666	1.0822	1.0832	H4
1-1/8(1.125)-7	3	3/32	6-1/16	1/16	1.3151	1.2188	1.2198	H4
1-1/4(1.250)-7	3	3/32	6-3/8	1/16	1.4401	1.3438	1.3448	H4
1-3/8(1.375)-6	3-3/16	3/32	6-11/16	1/16	1.5962	1.4852	1.4862	H6
1-1/2(1.500)-6	3-3/16	3/32	7	1/16	1.7212	1.6102	1.6112	H6
Unified Fine Series								
3(.099)-56	5/8	3/64	1-15/16	1/32	.1237	.1106	.1111	H1
4(.112)-48	11/16	3/64	2	1/32	.1409	.1256	.1261	H1
6(.138)-40	3/4	3/64	2-1/8	1/32	.1723	.1543	.1548	H1
8(.164)-36	15/16	3/64	2-3/8	1/32	.2022	.1821	.1826	H1
10(.190)-32	1	1/16	2-1/2	1/32	.2327	.2108	.2113	H2
14(.250)-28	1-1/8	1/16	2-23/32	1/32	.2985	.2737	.2742	H2
5/16(.3125)-24	1-1/4	1/16	2-15/16	1/32	.3690	.3400	.3405	H2
3/8(.375)-24	1-7/16	1/16	3-5/32	1/32	.4315	.4025	.4030	H2
7/16(.4375)-20	1-21/32	1/16	3-3/8	1/32	.5052	.4710	.4715	H3
1/2(.500)-20	1-21/32	3/32	3-19/32	1/32	.5677	.5335	.5340	H3
9/16(.5625)-18	1-13/16	3/32	3-13/16	1/32	.6374	.5996	.6001	H3
5/8(.625)-18	1-13/16	3/32	4-1/32	1/32	.6999	.6621	.6626	H3
3/4(.750)-16	2	3/32	4-15/32	1/32	.8342	.7916	.7921	H3
7/8(.875)-14	2-1/2	3/32	5-1/8	1/32	.9708	.9224	.9229	H3
1(1.000)-14	2-9/16	3/32	5-7/16	1/16	1.0958	1.0474	1.0484	H4
1(1.000)-12	2-9/16	3/32	5-7/16	1/16	1.1116	1.0552	1.0562	H4
1-1/8(1.125)-12	2-9/16	3/32	5-3/4	1/16	1.2366	1.1802	1.1812	H4
1-1/4(1.250)-12	3	3/32	6-1/16	1/16	1.3616	1.3052	1.3062	H4
1-3/8(1.375)-12	3	3/32	6-3/8	1/16	1.4866	1.4302	1.4312	H4
1-1/2(1.500)-12	3-3/16	3/32	6-11/16	1/16	1.6116	1.5552	1.5562	H4

1/ Drills shall conform to QQQ-D-751.

2/ Maximum shall be minimum +.0010 for taps 56 to 11 TPI.  
+.0015 for taps 10 to 8 TPI.  
+.0020 for taps 7 to 6 TPI.

3/ Standard size drills are suggested though in some sizes they vary slightly from minor diameter specifications as shown in MS33537.

4/ These tap pitch diameters are recommended for producing class 3B holes in accordance with MS33537 in aluminum.

3.2.4 Class 4, spark plug taps. Class 4 taps shall be furnished with or without pilots and reamers as specified (see 6.2). When piloted taps are furnished, a hole having a diameter of 1/4 inch shall be drilled through the driving square. Class 4 taps shall conform to Table II (see note to table II).

Table II - Taps, Spark Plug, Dimensions for Screw Thread Inserts (STI).

	14-1.25mm	18-1.5mm	Tolerance
Length of Threaded Pilot <sup>1/</sup>	5/16	3/8	±.010
Length of Reamer Section <sup>1/</sup>	.125	.156	+.000 -.015
Overall Thread Length (Includes Pilot and Reamer on Piloted Taps)	1-1/4	1-5/8	±3/32
Tap Overall Length	6	6	±1/32
Number of Flutes	4	4	
Shank Diameter	.625	.625	±.005
Square Size	.465	.465	±.005
Square Length	11/16	11/16	±1/32
Major Diameter	.6195/.6205	.7984/.7994	
Pitch Diameter	.5902/.5907	.7528/.7533	
Pilot Diameter Major <sup>1/</sup>	.548	.706	±.002

<sup>1/</sup> Not applicable when taps without pilots are specified.

3.3 Type II, gages, thread plug. Type II thread plug gages for tapped threads for screw thread inserts shall be made of tool steel, hardened and tempered to a hardness of 60 to 65 on the Rockwell "C" scale. The gages shall be ground and lapped and conform to Handbook H28, except the pitch and major diameter. The pitch and major diameters shall conform to table III for the 3B class of thread fit and table IV for the 2B class of thread fit. The gages shall be "GO" or "HI" as specified (see 6.2), and shall be similar to figure 1a or 1b as applicable and fit the handle specified in table III or IV. The gages shall be furnished in Unified Coarse, or Fine thread series for either a class 2B or 3B thread fit as specified (see 6.2). In addition to size and thread series, each gage shall be marked either "Screw Thread Insert" or "STI".

\* 3.3.1 Gage handles. The gage handles shall conform to Commercial Standard CS8 for the handle number specified in table III and table IV.

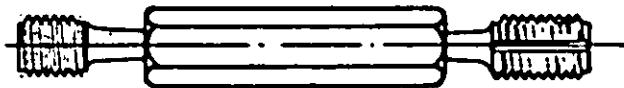


Figure 1a. - Thread plug gage, Type II

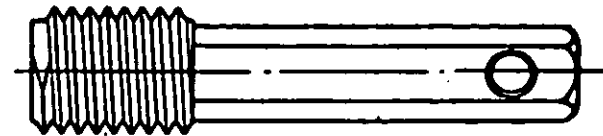


Figure 1b. - Thread plug gage, Type II

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Table III - Pitch and major diameters for class 3B gages

Nominal Thread Size	Thread Series	Handle No.	"00" NIB Thread plug gage				"HI" NIB Thread plug gage			
			Pitch dia.		Major dia.		Pitch dia.		Major dia.	
			Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
Unified Coarse Series										
2(.086)-56	UNC-3B	00	.0977	.0976	.1095	.1092	.0989	.0988	.1033	.1030
3(.099)-48	UNC-3B	00	.1127	.1126	.1264	.1261	.1140	.1139	.1200	.1197
4(.112)-40	UNC-3B	00	.1284	.1283	.1448	.1445	.1299	.1298	.1352	.1349
5(.125)-40	UNC-3B	0	.1414	.1413	.1578	.1575	.1430	.1429	.1482	.1479
6(.138)-32	UNC-3B	0	.1584	.1583	.1789	.1786	.1601	.1600	.1667	.1664
8(.164)-32	UNC-3B	0	.1844	.1843	.2049	.2046	.1862	.1861	.1928	.1925
10(.190)-24	UNC-3B	0	.2171	.2170	.2446	.2441	.2192	.2191	.2281	.2278
12(.216)-24	UNC-3B	1	.2431	.2430	.2706	.2701	.2453	.2452	.2541	.2536
1/4(.250)-20	UNC-3B	1	.2826	.2825	.3155	.3150	.2851	.2850	.2957	.2952
5/16(.3125)-18	UNC-3B	2	.3487	.3486	.3852	.3847	.3515	.3514	.3633	.3628
3/8(.375)-16	UNC-3B	2	.4157	.4156	.4568	.4562	.4189	.4188	.4322	.4316
7/16(.4375)-14	UNC-3B	3	.4842	.4839	.5309	.5303	.4875	.4872	.5027	.5021
1/2(.500)-13	UNC-3B	3	.5502	.5499	.6005	.5999	.5537	.5534	.5701	.5695
9/16(.5625)-12	UNC-3B	3	.6170	.6167	.6714	.6708	.6208	.6205	.6385	.6379
5/8(.625)-11	UNC-3B	3	.6844	.6841	.7437	.7431	.6885	.6882	.7079	.7073
3/4(.750)-10	UNC-3B	4	.8152	.8149	.8805	.8799	.8196	.8193	.8410	.8404
7/8(.875)-9	UNC-3B	4	.9474	.9471	1.0200	1.0193	.9522	.9519	.9756	.9749
1(.000)-8	UNC-3B	5	1.0816	1.0812	1.1631	1.1624	1.0868	1.0864	1.1135	1.1128
1-1/8(1.125)-7	UNC-3B	5	1.2182	1.2178	1.3113	1.3106	1.2239	1.2235	1.2545	1.2538
1-1/4(1.250)-7	UNC-3B	5	1.3432	1.3428	1.4363	1.4356	1.3490	1.3486	1.3795	1.3788
1-3/8(1.375)-6	UNC-3B	5	1.4837	1.4832	1.5923	1.5915	1.4900	1.4895	1.5260	1.5252
1-1/2(1.500)-6	UNC-3B	5-1/2	1.6087	1.6082	1.7173	1.7165	1.6151	1.6146	1.6511	1.6503
Unified Fine Series										
3(.099)-56	UNF-3B	00	.1107	.1106	.1225	.1222	.1119	.1118	.1170	.1167
4(.112)-48	UNF-3B	00	.1257	.1256	.1394	.1391	.1271	.1270	.1331	.1328
6(.138)-40	UNF-3B	0	.1544	.1543	.1708	.1705	.1560	.1559	.1612	.1609
8(.164)-36	UNF-3B	0	.1822	.1821	.2004	.2001	.1840	.1839	.1898	.1895
10(.190)-32	UNF-3B	0	.2104	.2103	.2309	.2306	.2123	.2122	.2188	.2185
1/4(.250)-28	UNF-3B	1	.2733	.2732	.2969	.2964	.2754	.2753	.2829	.2824
5/16(.3125)-24	UNF-3B	1	.3396	.3395	.3671	.3666	.3421	.3420	.3508	.3503
3/8(.375)-24	UNF-3B	2	.4021	.4020	.4296	.4291	.4047	.4046	.4134	.4129
7/16(.4375)-20	UNF-3B	2	.4701	.4700	.5030	.5025	.4731	.4730	.4834	.4829
1/2(.500)-20	UNF-3B	3	.53265	.53250	.5655	.5650	.53570	.53555	.5460	.5455
9/16(.5625)-18	UNF-3B	3	.59875	.59860	.6352	.6347	.60200	.60185	.6136	.6131
5/8(.625)-18	UNF-3B	3	.66125	.66110	.6977	.6972	.6646	.6643	.6761	.6756
3/4(.750)-16	UNF-3B	3	.7908	.7906	.8318	.8312	.7945	.7942	.8075	.8069
7/8(.875)-14	UNF-3B	4	.9217	.9214	.9684	.9678	.9257	.9254	.9406	.9400
1(.000)-14	UNF-3B	4	1.0467	1.0464	1.0934	1.0928	1.0508	1.0505	1.0673	1.0667
1-1/8(1.125)-12	UNF-3B	5	1.1795	1.1792	1.2339	1.2333	1.1841	1.1838	1.2015	1.2009
1-1/4(1.250)-12	UNF-3B	5	1.3045	1.3042	1.3589	1.3583	1.3092	1.3089	1.3265	1.3259
1-3/8(1.375)-12	UNF-3B	5	1.4295	1.4292	1.4839	1.4833	1.4343	1.4340	1.4516	1.4510
1-1/2(1.500)-12	UNF-3B	5-1/2	1.5546	1.5542	1.6089	1.6083	1.5595	1.5591	1.5767	1.5761

NOTE: Thread plug gages above heavy line are class "W" gages and thread plug gages below heavy line are class "X" gages (see Handbook E28).

Table IV - Pitch and major diameters for class 2B gages.

Nominal Thread Size	Thread Series	Handle No.	"00" NIB Thread plug gage				"H1" NIB Thread plug gage			
			Pitch dia.		Major dia.		Pitch dia.		Major dia.	
			Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
Unified Coarse Series										
2(.086)-56	UNC-2B	00	.0977	.0976	.1095	.1092	.0996	.0995	.1036	.1033
3(.099)-48	UNC-2B	00	.1127	.1126	.1264	.1261	.1148	.1147	.1204	.1201
4(.112)-40	UNC-2B	00	.1284	.1283	.1448	.1445	.1308	.1307	.1356	.1352
5(.125)-40	UNC-2B	0	.1414	.1413	.1578	.1575	.1438	.1437	.1486	.1482
6(.138)-32	UNC-2B	0	.1584	.1583	.1789	.1786	.1611	.1610	.1672	.1667
8(.164)-32	UNC-2B	0	.1844	.1843	.2049	.2046	.1872	.1871	.1932	.1927
10(.190)-24	UNC-2B	0	.2171	.2170	.2446	.2441	.2203	.2202	.2286	.2281
12(.216)-24	UNC-2B	1	.2431	.2430	.2706	.2701	.2464	.2461	.2546	.2541
1/4(.250)-20	UNC-2B	1	.2826	.2825	.3155	.3150	.2864	.2861	.2963	.2958
5/16(.3125)-18	UNC-2B	2	.3487	.3486	.3852	.3847	.3529	.3526	.3640	.3635
3/8(.375)-16	UNC-2B	2	.4157	.4156	.4568	.4562	.4203	.4200	.4329	.4323
7/16(.4375)-14	UNC-2B	3	.4842	.4839	.5309	.5303	.4890	.4887	.5035	.5029
1/2(.500)-13	UNC-2B	3	.5502	.5499	.6005	.5999	.5554	.5551	.5710	.5704
9/16(.5625)-12	UNC-2B	3	.6170	.6167	.6714	.6708	.6225	.6222	.6394	.6388
5/8(.625)-11	UNC-2B	3	.6844	.6841	.7437	.7431	.6903	.6900	.7088	.7082
3/4(.750)-10	UNC-2B	4	.8152	.8149	.8805	.8799	.8216	.8213	.8420	.8414
7/8(.875)-9	UNC-2B	4	.9474	.9471	1.0200	1.0193	.9543	.9540	.9767	.9760
1(1.000)-8	UNC-2B	5	1.0816	1.0812	1.1631	1.1624	1.0890	1.0886	1.1146	1.1139
1-1/8(1.125)-7	UNC-2B	5	1.2182	1.2178	1.3113	1.3106	1.2262	1.2258	1.2556	1.2549
1-1/4(1.250)-7	UNC-2B	5	1.3432	1.3428	1.4363	1.4356	1.3514	1.3510	1.3807	1.3800
1-3/8(1.375)-6	UNC-2B	5	1.4837	1.4832	1.5923	1.5915	1.4926	1.4921	1.5273	1.5266
1-1/2(1.500)-6	UNC-2B	5-1/2	1.6087	1.6082	1.7173	1.7165	1.6177	1.6172	1.6524	1.6518
Unified Fine Series										
3(.099)-56	UNF-2B	00	.1107	.1106	.1225	.1222	.1126	.1125	.1174	.1171
4(.112)-48	UNF-2B	00	.1257	.1256	.1394	.1391	.1279	.1278	.1335	.1332
6(.138)-40	UNF-2B	0	.1544	.1543	.1708	.1705	.1569	.1568	.1617	.1613
8(.164)-36	UNF-2B	0	.1822	.1821	.2004	.2001	.1849	.1848	.1902	.1898
10(.190)-32	UNF-2B	0	.2104	.2103	.2309	.2306	.2133	.2132	.2193	.2188
1/4(.250)-28	UNF-2B	1	.2733	.2732	.2969	.2964	.2765	.2764	.2835	.2830
5/16(.3125)-24	UNF-2B	1	.3396	.3395	.3671	.3666	.3433	.3430	.3514	.3509
3/8(.375)-20	UNF-2B	2	.4021	.4020	.4296	.4291	.4059	.4056	.4140	.4135
7/16(.4375)-20	UNF-2B	2	.4701	.4700	.5030	.5025	.4744	.4741	.4841	.4836
1/2(.500)-20	UNF-2B	3	.5326	.5325	.5655	.5650	.5371	.5368	.5467	.5462
9/16(.5625)-18	UNF-2B	3	.5987	.5986	.6352	.6347	.6035	.6032	.6143	.6138
5/8(.625)-18	UNF-2B	3	.6612	.6611	.6977	.6972	.6661	.6658	.6768	.6763
3/4(.750)-16	UNF-2B	3	.7208	.7206	.7618	.7612	.7274	.7271	.7383	.7377
7/8(.875)-14	UNF-2B	4	.8217	.8214	.8684	.8678	.8274	.8271	.8383	.8377
1(1.000)-14	UNF-2B	4	1.0467	1.0464	1.0934	1.0928	1.0527	1.0524	1.0632	1.0626
1-1/8(1.125)-12	UNF-2B	5	1.0545	1.0542	1.1089	1.1083	1.0608	1.0605	1.0711	1.0705
1-1/4(1.250)-12	UNF-2B	5	1.1795	1.1792	1.2339	1.2333	1.1860	1.1857	1.2024	1.2018
1-3/8(1.375)-12	UNF-2B	5	1.3045	1.3042	1.3589	1.3583	1.3112	1.3109	1.3275	1.3269
1-1/2(1.500)-12	UNF-2B	5-1/2	1.4295	1.4292	1.4839	1.4833	1.4364	1.4361	1.4526	1.4520
			1.5546	1.5542	1.6089	1.6083	1.5615	1.5611	1.5777	1.5771

NOTES: 1. Thread plug gages above heavy line are class "W" gages and thread plug gages below heavy line are class "X" gages (see Handbook H28).

2. See 7.4 in regards to class 2B gage nonconformance with international agreements.

3.3.2 Gages, spark plug thread. Spark plug thread gages shall conform to the foregoing gage requirements except they shall conform to table V requirements for pitch and major diameters.



Table V - Pitch and major diameters for gages, spark plug threads.

Nominal Thread Size	Handle No.	"00" NIB Thread plug gage				"H" NIB Thread plug gage			
		Pitch dia.		Major dia.		Pitch dia.		Major dia.	
		Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
14-1.25mm	3	.5895	.5892	.6145	.6140	.5917	.5914	.6028	.6023
18-1.5mm	3	.7526	.7523	.7937	.7932	.7543	.7540	.7738	.7733

## 3.4 Type III, Inserting Tools.

## 3.4.1 Class 1, previnder tools.

- 3.4.1.1 Style A inserting tools for 1/2 (.500) and smaller Unified Coarse and Fine Series. The style A previnder tools shall consist of a steel mandrel and previnder. The front end of the previnder shall have an internal thread to accept the nominal size insert for which it is intended. The end of the mandrel shall be designed to engage the driving tang of the insert for driving the insert into the tapped hole. The mandrel must be retained in the previnder against inadvertent disassembly. The mandrel shall have a minimum surface hardness equivalent to Rockwell C 45. Depth of hardness shall not be less than 0.007 inch. The handle may be formed of a separate piece as shown in Figure 2, or may be an extension of the mandrel and be offset by bending. The handle shall be of sufficient strength to prevent bending under ordinary service conditions. Class 1, style A, previnder tools shall have threaded mandrels and be similar to Figure 2. Type III, class 1, style A, tools shall conform to table VI. Tools shall install inserts up to 3 diameters in length.

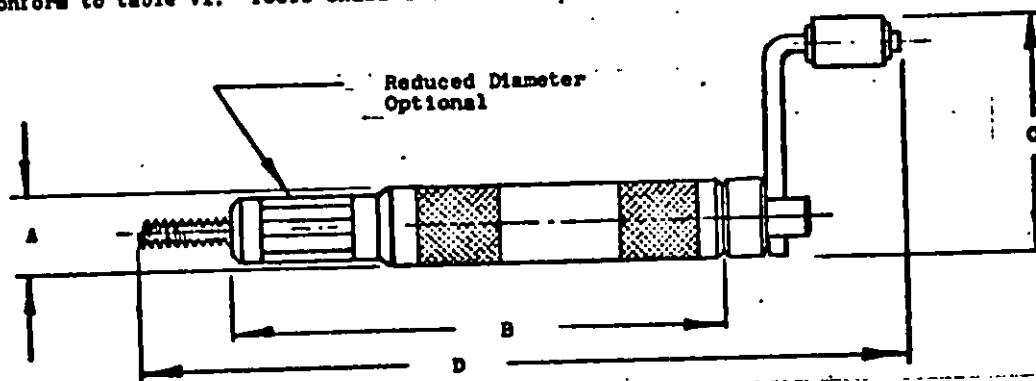


Figure 2 - Type III, class 1, style A, Previnder Inserting Tool with threaded mandrel for 1/2 (.500) and smaller Unified Coarse, Unified Fine and Spark Plug sizes.

Table VI - Type III, class 1, style A, threaded mandrel previnder inserting tools for 1/2(.500) and smaller Unified Coarse and Fine screw thread inserts.

Nominal Thread Size	A ± 1/64	B ± 1/8	C ± 1/8	D ± 1/8
Unified Coarse Series				
4(.112)-40	3/8	4-5/8	2-9/32	7-15/32
5(.125)-40	3/8	4-5/8	2-9/32	7-15/32
6(.138)-32	3/8	4-5/8	2-9/32	7-15/32
8(.164)-32	3/8	4-5/8	2-9/32	7-15/32
10(.190)-24	7/16	4-5/8	2-9/32	7-15/32
12(.216)-24	1/2	4-5/8	2-17/32	7-31/32
1/4(.250)-20	1/2	4-5/8	2-17/32	7-31/32
5/16(.3125)-18	5/8	4-5/8	3-23/32	7-11/32
3/8(.375)-16	11/16	5	3-23/32	7-31/32
7/16(.4375)-14	3/4	5-1/4	3-23/32	8-15/32
1/2(.500)-13	7/8	5-1/2	3-25/32	8-27/32
Unified Fine Series				
3(.099)-56	3/8	4-5/8	2-9/32	7-15/32
4(.112)-48	3/8	4-5/8	2-9/32	7-15/32
6(.138)-40	3/8	4-5/8	2-9/32	7-15/32
10(.190)-32	7/16	4-5/8	2-9/32	7-15/32
1/4(.250)-28	1/2	4-5/8	2-17/32	7-31/32
5/16(.3125)-24	5/8	4-5/8	3-23/32	7-11/32
3/8(.375)-24	11/16	5	3-23/32	7-31/32
7/16(.4375)-20	3/4	5-1/4	3-23/32	8-15/32
1/2(.500)-20	7/8	5-1/2	3-25/32	8-27/32



3.4.1.1.1 Style A inserting tools for 14mm and 18mm spark plug threads. Style A inserting tools for 14mm and 18mm spark plug threads shall be similar to Figure 2 or Figure 3. A straight or crank style handle shall be furnished at the suppliers option. Style A inserting tools for spark plug threads shall conform to table VII. 14-1.25mm tools shall install inserts up to .875 long and 18-1.5mm tools shall install inserts up to .750 long.

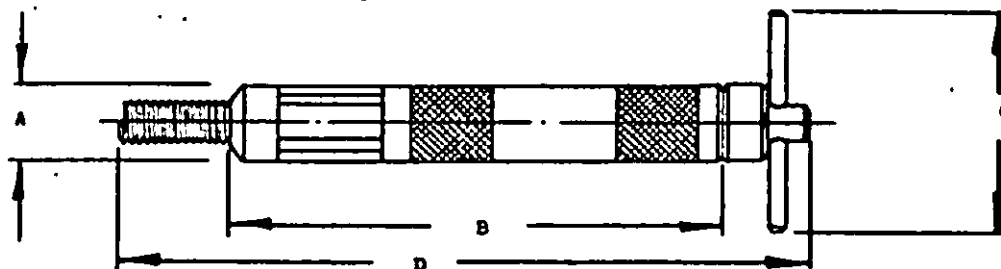


Figure 3 - Style A, class 1, prewinder inserting tools, with threaded mandrel for spark plug threads.

Table VII - Type III, class 1, prewinder inserting tools for 14mm and 18mm spark plug threads.

Nominal Thread Size	A	B	C	D
	$\pm 1/64$	$\pm 1/8$	$\pm 1/8$	$\pm 1/8$
14-1.25mm	7/8	5-1/2	3-25/32	8-11/32
18-1.5mm	1-1/16	5-1/2	4	7-3/8

- \* 3.4.1.2 Style B inserting tools for 9/16(.5625) through 1-1/2(1.500) Unified Fine Series. The style B inserting tool shall consist of a steel or aluminum prewinder; a steel or aluminum guide bushing; and a removable steel mandrel. The front end of the prewinder shall have an internal thread to accept the nominal size thread insert for which it is intended. When an aluminum prewinder is used, a threaded steel bushing shall be pressed in the prewinder. The mandrel shall have a minimum surface hardness equivalent to Rockwell C 45. Depth of hardness shall not be less than 0.007 inch. The tool shall be similar to Figure 4 and shall conform to the dimensions specified in Table VIII. The mandrel shall be threaded externally to accept the size insert for which it is intended. Sizes 9/16(.5625) through 7/8(.875) shall install inserts up to 3 diameters in length, and sizes 1(1.000) through 1-1/2(1.500) shall install inserts up to 2 diameters in length.

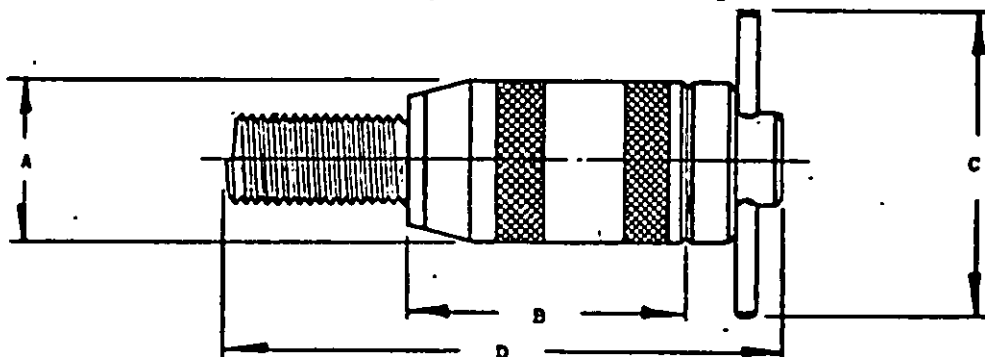


Figure 4 - Type III, class 1, style B prewinder inserting tool for 9/16(.5625) through 1-1/2(1.500) Unified Fine Series.

Table VIII - Type III, class 1, style B prewinder inserting tool for 9/16(.5625) through 1-1/2(1.500) Unified Fine Thread Series.

Nominal Thread Size	A	B	C	D
	$\pm 1/2$ $- 1/16$	$\pm 1/8$ $- 1/16$	$\pm 1/8$ $- 1/16$	$\pm 1/8$ $- 1/16$
9/16(.5625)-18	1-1/8	2-7/8	4	5-3/8
5/8(.625)-18	1-1/8	2-7/8	4	5-3/8
3/4(.750)-16	1-1/2	2-7/8	4	6
7/8(.875)-14	1-1/2	2-7/8	4-1/2	6-3/8
1(1.000)-14	1-3/4	2-7/8	4-1/2	5-7/8
1(1.000)-12	1-3/4	2-7/8	4-1/2	5-7/8
1-1/8(1.125)-12	2	3-1/16	4-1/2	6-5/16
1-1/4(1.250)-12	2	3-5/16	6	6-13/16
1-3/8(1.375)-12	2-1/4	3-9/16	6	7-5/16
1-1/2(1.500)-12	2-1/4	3-13/16	6	7-13/16

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## 3.4.2 Class 2, Mandrel Tools.

- # 3.4.2.1 Class 2, style A, inserting tool for #2(.086) and #3(.099) Unified Coarse thread series. The class 2, style A, inserting tool shall consist of a steel mandrel and an aluminum handle. The mandrel shall be through hardened to a minimum hardness equivalent to Rockwell C 50. The handle shall be affixed to the mandrel with adequate strength to prevent slippage under ordinary service conditions. The mandrel shall be threaded. The tools shall be similar to figure 5 and shall conform to the dimensions specified in Table IX. Tools shall install inserts up to 3 diameter in length.

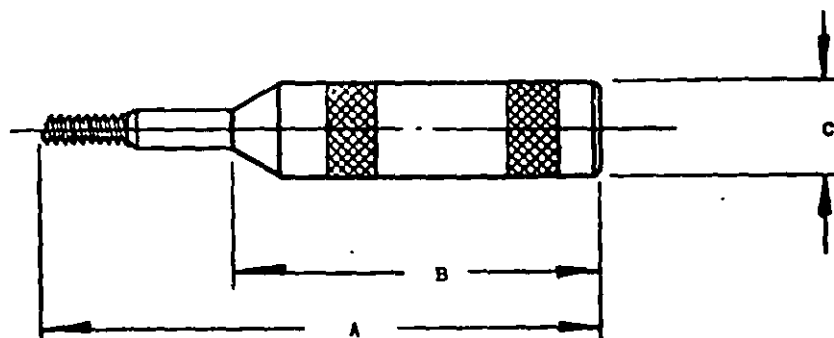


Figure 5 - Type III, class 2, style A mandrel inserting tool for #2(.086) and #3(.099) Unified Coarse thread series.

Table IX - Type III, class 2, style A mandrel inserting tool for #2(.086) and #3(.099) Unified Coarse thread series.

Nominal Thread Size	A	B	C
	$\pm 1/2$	$\pm 1/4$	$\pm 1/16$
2(.086)-56	2-7/16	2	5/16
3(.099)-48	6	3	5/8

- # 3.4.2.2 Class 2, style B, inserting tool for 9/16(.5625) through 1-1/2(1.500) Unified Coarse Series. The class 2, style B, inserting tool shall consist of a steel mandrel and steel handle. The mandrel shall have a minimum surface hardness equivalent to Rockwell C 45. Depth of hardness shall not be less than 0.007 inch. The mandrel shall have a frictionally retained sliding handle. The handle shall be of adequate strength to prevent bending under ordinary service conditions. The mandrel shall be threaded. The tool shall be similar to figure 6 and conform to the dimensions specified in Table I. Sizes 9/16(.5625) through 7/8(.875) shall install inserts up to 3 diameters in length, and sizes 1(1.000) through 1-1/2(1.500) shall install inserts up to 2 diameters in length.

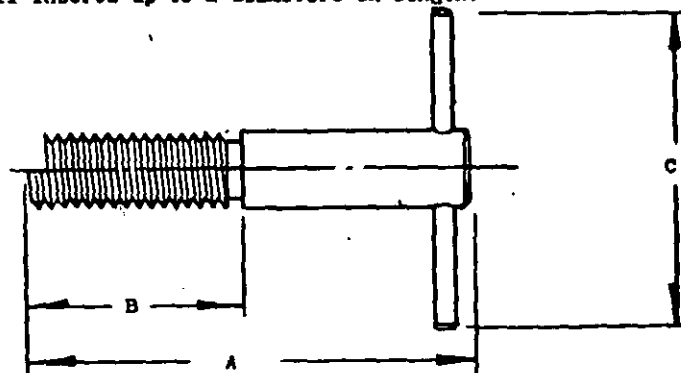


Figure 6 - Type III, class 2, style B Mandrel inserting tool for 9/16(.5625) and larger Unified Coarse threads.

Table X - Type III, class 2, style B mandrel inserting tool for 9/16(.5625) and larger Unified Coarse thread sizes.

Nominal Thread Size	A $\pm 1/4$	B $+ 1/4$ $- 0$	C $\pm 1/4$
9/16(.5625)-12	4-7/8	1-13/16	4
5/8(.625)-11	4-7/8	2	4
3/4(.750)-10	4-7/8	2-3/8	4
7/8(.875)-9	4-7/8	2-3/4	4-1/2
1(1.000)-8	4-7/8	2-1/8	4-1/2
1-1/8(1.125)-7	6-3/4	2-1/2	6
1-1/4(1.250)-7	6-3/4	2-3/4	6
1-3/8(1.375)-6	6-3/4	3	6
1-1/2(1.500)-6	6-3/4	3-1/4	6

- # 3.4.3 Expander tools, type III, class 3 (spark plug inserts only). Type III, class 3 expander tools shall be similar to figure 7 and shall conform to the requirements of table XI. The expander tools shall consist of a collet, plunger with back-out nuts and a body. The collet shall be threaded externally with the nominal screw thread size and split to allow an expanding action when the plunger is struck. The collet shall be of tool steel with a minimum hardness of 40 on the Rockwell "C" scale. The plunger and body shall be of steel with a minimum hardness of 35 on the Rockwell "C" scale.

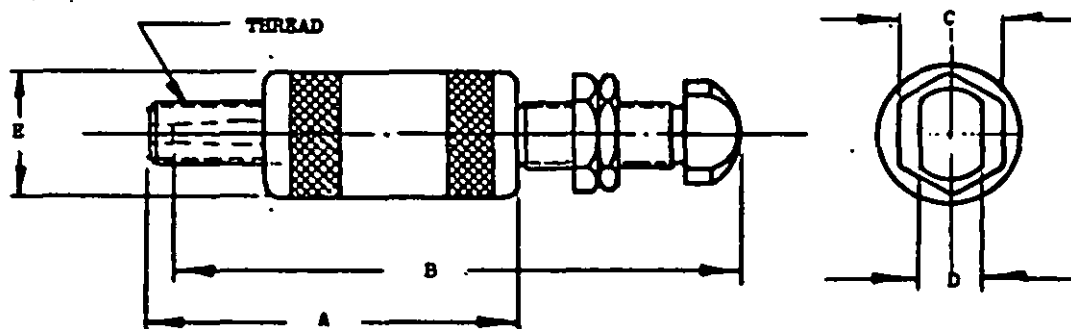


Figure 7 - Type III, class 3 expanding tools, plunger type, spark plug inserts.

Table XI - Type III, class 3, expanding tools, plunger type, spark plug threads.

Nominal Thread Size	A	B	C	D	E
14-1.25mm	2-7/8	4-5/16	7/8	11/16	1
18-1.5mm	3-1/8	4-9/16	7/8	11/16	1-1/8

- # 3.4.4 Type III, class 4, offset tools. Type III, class 4, offset tools shall be similar to figure 8 and shall conform to the requirements of Table XII. The offset tool shall be of tool steel with a minimum hardness of Rockwell C 50.

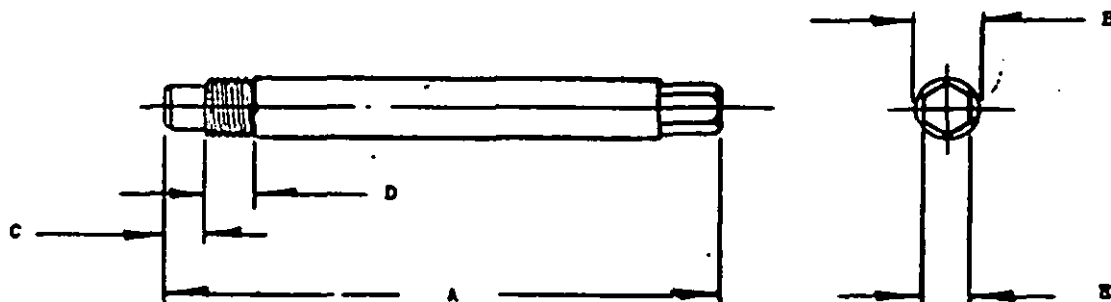


Figure 8 - Type III, class 4, offset tools, spark plug threads.

Table XII - Type III, class 4 offset tools, spark plug threads.

Nominal Thread Size	A	B		C	D	E
		Max.	Min.			
14-1.25mm	4-3/8	.541	.536	1/4	21/64	7/16
18-1.5mm	5	.698	.690	1/4	3/4	5/8

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- # 3.4.5 Type III, class 5, staking tools. Type III, class 5, staking tools shall be similar to figure 9 and shall conform to the requirements of Table XIII and shall be furnished when type III, class 4 tools are furnished. The staking tools shall be of steel, carburized to a depth of approximately .020 inch. The button insert in the end of the staking tool shall be of tool steel with a minimum hardness of Rockwell C 45.

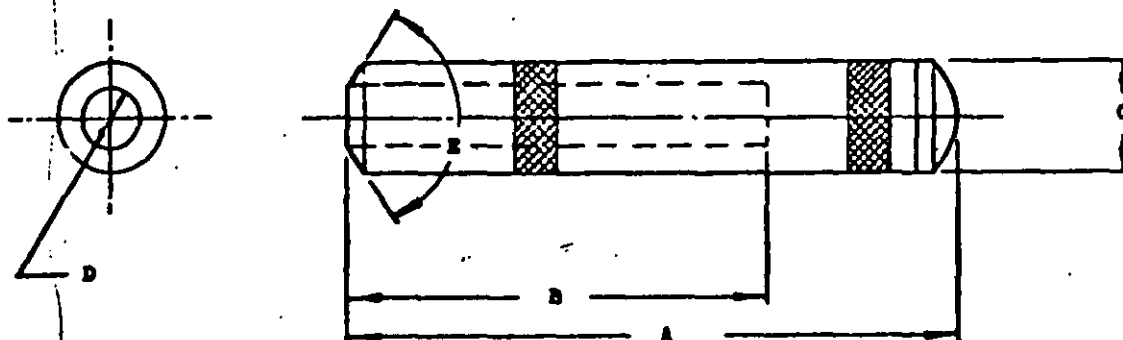


Figure 9 - Type III, class 5, staking tools, spark plug inserts.

Table XIII - Type III, class 5, staking tools, spark plug inserts.

Nominal Thread Size	A	B	C	D		E
				Max.	Min.	
14-1.25mm	4-15/16	4-1/16	7/8	.551	.546	120°
18-1.5mm	5-1/2	4-5/8	1	.708	.703	120°

### 3.5 Type IV, Tang Break-Off Tools.

- # 3.5.1 Type IV, class 1, style A, tang break-off tools. The class 1, style A, tang break-off tool for sizes 1/4(.250) and smaller shall be of the automatic punch type consisting of a spring actuated punch and appropriate sleeve assembly. The punch shall be of alloy steel hardened to a minimum of Rockwell C 35. The tool shall have a rubber or soft plastic tip to prevent damage when contacting the surface of the work piece. The tool shall be similar to figure 10 and shall conform to the dimensions of table XIV. The tool shall break tangs off inserts up to 2 diameter in length.

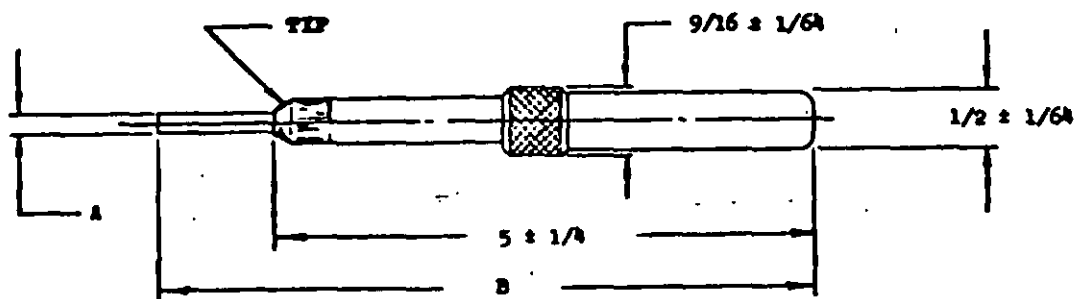


Figure 10 - Type IV, class 1, style A, tang break-off tool for 1/4(.250) and smaller Unified Coarse and Fine thread sizes.

Table XIV - Type IV, class 1, style A, tang break-off tools for 1/4(.250) and smaller Unified Coarse and Fine Thread sizes.

Nominal Thread Size	A Dia.	B
	Max.	Max.
2(.066) and 3(.099)	.058	5-7/16
4(.112) and 5(.125)	.076	5-1/2
6(.133)	.089	5-9/16
8(.154)	.112	5-5/8
10(.160) and 12(.216)	.125	5-3/4
1/4(.250)	.154	5-13/16

- # 3.5.2 Type IV, class 1, style B, tang break-off tool. The class 1, style B, tang break-off tool for sizes 5/16(.3125) through 1/2(.500) shall be of the automatic punch type consisting of a spring actuated punch and appropriate sleeve assembly. The punch shall be of alloy steel hardened to a minimum of Rockwell C 35. The tool shall have a rubber or soft plastic tip to prevent damage when contacting the surface of the work piece. The tool shall be similar to figure 11 and shall conform to the dimensions of table XV. The tool shall break tangs off inserts up to 2 diameters in length.

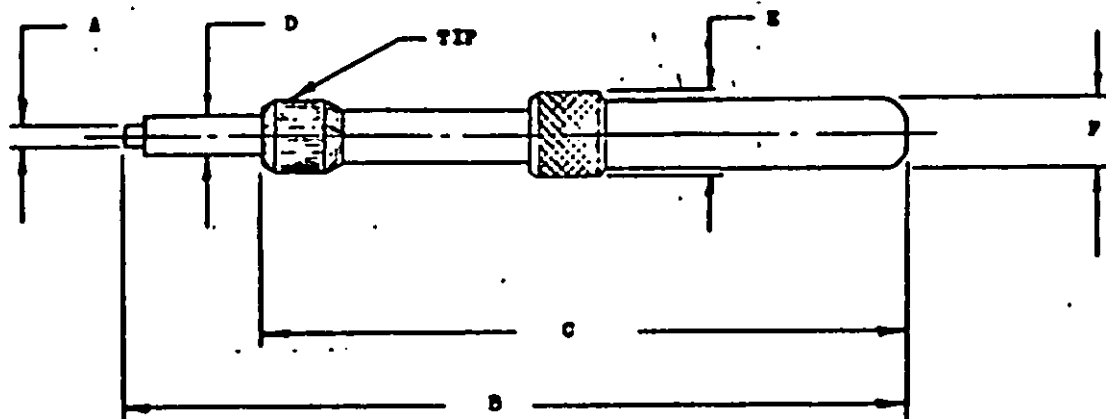


Figure 11 - Type IV, class 1, style B, tang break-off tool for Unified Coarse and Fine thread sizes 5/16(.3125) through 1/2(.500).

Table XV - Type IV, class 1, style B, tang break-off tool for Unified Coarse and Fine thread sizes 5/16(.3125) through 1/2(.500).

Nominal Thread Size	A Dia. Max.	B Max.	C $\pm 1/8$	D $\pm .005$	E $\pm 1/64$	F $\pm 1/64$
Unified: Coarse Series						
5/16(.3125)-18	.120	5-13/16	4-29/32	.223	11/16	5/8
3/8(.375)-16	.187	5-15/16	4-29/32	.283	11/16	5/8
7/16(.4375)-14	.229	7-7/32	6-3/32	.334	13/16	3/4
1/2(.500)-13	.292	7-11/32	6-3/32	.392	13/16	3/4
Unified: Fine Series						
5/16(.3125)-24	.120	5-13/16	4-29/32	.251	11/16	5/8
3/8(.375)-24	.187	5-15/16	4-29/32	.303	11/16	5/8
7/16(.4375)-20	.229	7-7/32	6-3/32	.360	13/16	3/4
1/2(.500)-20	.292	7-11/32	5-3/32	.414	13/16	3/4

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- 3.5.3 Type IV, class 3 tang break-off tool. The type IV, class 3, tang break-off tool (plain punch) shall consist of a solid steel punch. The punch shall have a minimum surface hardness equivalent to Rockwell C 45. Depth of hardness shall not be less than .005 inch. The tool shall be similar to figure 12, and shall conform to the dimensions of Table XVI. Tools shall break tangs off inserts up to 3 diameter in length.

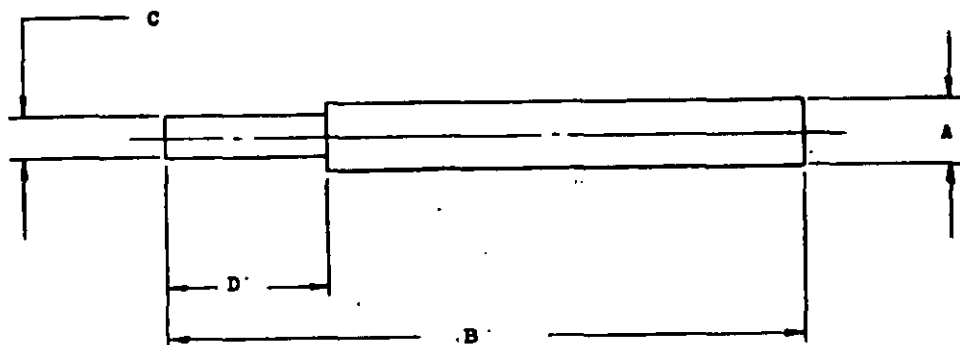


Figure 12 - Type IV, class 3, tang break-off tool for Unified Coarse and Fine thread sizes 1/2(.500) and smaller.

Table XVI - Type IV, class 3, tang break-off tool for Unified Coarse and Fine thread sizes 1/2(.500) and smaller.

Nominal Thread Size	A $\pm 1/64$	B $\pm 1/4$	C +.000 -.005	D $\pm 1/16$
2(.086)	1/4	$\frac{1}{4}$	.058	3/8
3(.099)	1/4	$\frac{1}{4}$	.058	3/8
4(.112)	1/4	$\frac{1}{4}$	.076	1/2
5(.125)	1/4	$\frac{1}{4}$	.086	9/16
6(.138)	1/4	$\frac{1}{4}$	.089	5/8
8(.164)	1/4	$\frac{1}{4}$	.112	11/16
10(.190)	1/4	$\frac{1}{4}$	.125	3/4
12(.216)	1/4	$\frac{1}{4}$	.150	15/16
1/4(.250)	1/4	$\frac{1}{4}$	.176	1
5/16(.3125)	1/4	$\frac{1}{4}$	.230	1-1/8
3/8(.375)	9/32	$\frac{1}{4}$	None	None
7/16(.4375)	11/32	$\frac{1}{4}$	None	None
1/2(.500)	25/64	$\frac{1}{4}$	None	None



- # 3.6 **Type V, extracting tool.** The type V extracting tool shall consist of a round steel shaft, a steel tapered blade and a handle. The shaft shall securely hold the tapered blade in a slot in one end and a handle in the opposite end. The tapered blade shall have a minimum hardness of 45 on the Rockwell "C" scale and shall have a relief angle on each tapered side to establish an edge capable of indenting and extracting the screw thread insert. The handle shall be of sufficient strength to prevent bending under ordinary service conditions. The extracting tool shall be similar to figure 13 and conform to the dimensions of table XVII for the size range specified (see 6.2).

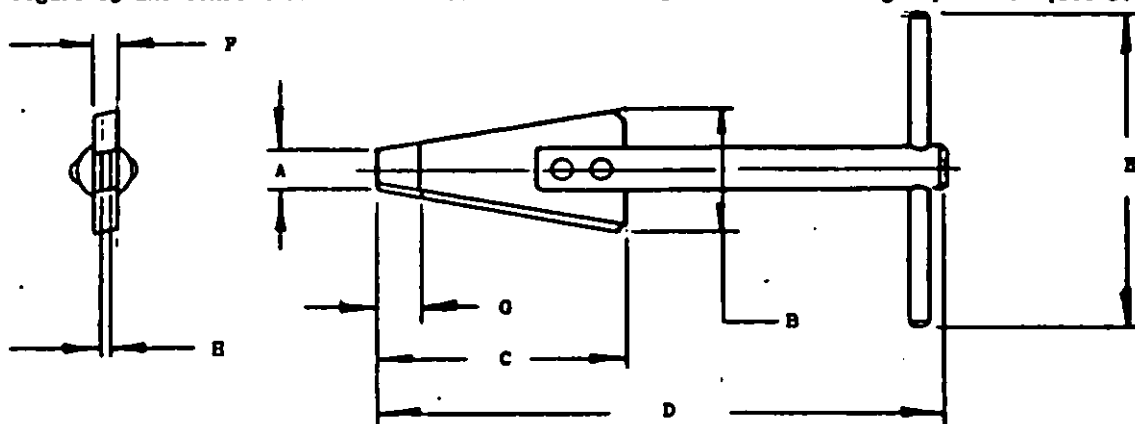


Figure 13 - Type V, extracting tool for Unified Coarse and Fine and Spark Plug thread series.

Table XVII - Type V, extracting tools.

Nominal Thread Size Range	A Max.	B Min.	C Min.	D ± 1/16	E ± 1/8	F ± .010	G ± 1/16	H ± .005
2(.086)	.078	--	5/8	4-29/64	3	.062	1/4	.045
3(.099) thru 8(.164)	.078	.375	5/8	4-29/64	3	.062	None	None
10(.190) thru 3/8(.375)	.145	.375	9/16	4-1/4	3	.062	None	None
7/16(.4375) thru 1(.500) and	.360	1.000	1-5/8	5-1/16	4	.093	None	None
14-1.25 & 18-1.5mm Spark Plug 1-1/8(1.125) thru 1-1/2(1.500)	.970	1.500	1-5/16	6-1/8	4	.125	None	None

- # 3.7 **Thread repair kits.** Thread repair kits shall consist of one (1) inserting tool, one (1) tang break-off tool (for kits of nominal thread size 1/2(.500) and smaller) and one (1) extracting tool, plus taps and helical coil inserts in quantities per table XVIII, and shall be contained in a Type XI module tool box in accordance with CGG-T-558/9. All taps, inserts and tools are to be the correct screw thread size and series for the nominal size of the particular kit. The box shall be of the minimum size needed to hold the specified tools and inserts (see 6.2).
- # 3.7.1 **Tool retention.** The tool box shall be furnished with clips or other permanent means to hold each individual tool and tap in its proper location within the box.
- # 3.7.2 **Helical coil screw thread inserts.** Helical coil screw thread inserts for the coarse and fine thread series for use in kits shall conform to MS122076 series and the MS124651 series for the free running inserts and MS21209 for the screw locking inserts as specified (see 6.2).
- # 3.7.3 **Insert Packets.** Inserts, 1(1.000) and smaller, are to be packaged in recloseable plastic tubes or vials. Size and type of inserts and identity of their manufacturer is to be clearly marked by a label, either inside the vial or affixed to its outside.
- # 3.7.3.1 Inserts 1-1/8(1.125) and larger are to be packaged in plastic bags. Size and type of inserts and identity of their manufacturer is to be clearly marked by a label, either inside the plastic bag or affixed to its outside.
- # 3.7.4 **Index list and instruction sheet.** An index and instruction sheet shall be inserted in each kit container. The index list shall give a complete listing of the container contents. The information shall include nomenclature, Federal Stock Number (where applicable) and manufacturer's part number and quantity of each item in the kit, and manufacturer's identification. The index and instruction sheet shall be enclosed in a greaseproof, waterproof bag or shall be treated so as to be resistant to water, oil, and fading.

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Table XVIII - Kit Compositions

Nominal Thread Size		Quantity of taps per kit	Insert Quantity per packet	Number of packets per kit Insert type and length			
				1-1/2 Dia.		2 Dia.	
				MS122076 or MS124651 Series	MS21209	MS122076 or MS124651 Series	MS21209
2(.086)-56		2	15	1	1	1	1
3(.099)-48	3(.099)-56	2	15	1	1	1	1
4(.112)-40	4(.112)-48	2	15	1	1	1	1
5(.125)-40		2	15	1	1	1	1
6(.138)-32	6(.138)-40	2	10	1	1	1	1
8(.164)-32	8(.164)-36	2	10	1	1	1	1
10(.190)-24	10(.190)-32	2	10	1	1	1	1
12(.216)-24		2	10	1	1	1	1
1/4(.250)-20	1/4(.250)-28	2	10	1	1	1	1
5/16(.3125)-18	5/16(.3125)-24	1	8	1	1	1	1
3/8(.375)-16	3/8(.375)-24	1	8	1	1	1	1
7/16(.4375)-14	7/16(.4375)-20	1	6	1	1	1	1
1/2(.500)-13	1/2(.500)-20	1	6	1	1	1	1
9/16(.5625)-12	9/16(.5625)-18	1	5	1	1	1	1
5/8(.625)-11	5/8(.625)-18	1	5	1	1	1	1
3/4(.750)-10	3/4(.750)-16	1	4	1	1	1	1
7/8(.875)-9	7/8(.875)-14	1	4	1	1	1	1
1(1.000)-8	1(1.000)-14	1	4	1	1	1	1
	1(1.000)-12	1	4	1	1	1	1
1-1/8(1.125)-7	1-1/8(1.125)-12	1	3	1			
1-1/4(1.250)-7	1-1/4(1.250)-12	1	3	1			
1-3/8(1.375)-6	1-3/8(1.375)-12	1	3	1			
1-1/2(1.500)-6	1-1/2(1.500)-12	1	3	1			

- # 3.7.2 Tool box for multiple kits. When specified (see 6.2) a tool box shall be furnished for holding the assortment of kits as ordered. The box shall be in accordance with GGG-T-558/9 type X.
- # 3.7.2.1 Dividers. The tool box shall contain the proper quantity and style of dividers for containment and separation of the individual kits.
- # 3.7.2.2 Index list. An index list shall be affixed to the inside of the lid of the tool box such that it can be read with the lid open. The index shall give a complete listing of all kits contained therein including nomenclature, Federal Stock Number (where applicable) manufacturer's part number, and manufacturer's identification. The index shall be protected by a plastic covering from grease, oil, and fading.
- # 3.8 Marking. Each tool shall be marked with the nominal screw thread size or range of sizes as applicable, and the manufacturers identification.
- # 3.8.1 Each tool shall have an instruction sheet or tag attached unless furnished as a part of a kit in which case the kit will contain the instruction sheet (see 3.7.2.2). The instruction sheet or tag shall contain complete instructions for operating the tool and shall also show the identification of the tool manufacturer and the manufacturer's part number.
- # 3.9 Surface Protection. All metal parts shall be corrosion resistant material, or shall have a corrosion resistant finish or protective coating.
- # 3.10 Finish. All parts shall be free from burrs, rust, rough edges, or any defects which may impair serviceability or durability.
- # 3.11 Workmanship. The workmanship of the tools shall be of the high quality prevailing among manufacturers normally producing tools of the types specified herein.
- # 3.12 Performance. The tools covered by this specification shall be capable of performing the intended use without deformation of contact surfaces, bending, twisting, or any other deformation either permanent or temporary while in use. Inserting and tang break-off tools shall not bind while the insert is in the hole.

#### 4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the supplier may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

#### 4.2 Sampling for quality conformance inspection.

4.2.1 Lot. All tools of the same type, class, style and size offered for delivery at one time shall be considered a lot for purposes of quality conformance inspection.

4.2.2. Sample. A random sample shall be selected from each lot in accordance with MIL-STD-105 at inspection level III.

4.2.3 Quality conformance inspection. Quality conformance inspection shall be performed on each sample tool selected in accordance with 4.2.2. Quality conformance inspection shall consist of the following:

- (a) Examination 4.3.
- (b) Tests 4.4
- (c) Inspection of preservation and packaging 4.5.

# 4.3 Examination. Each of the sample tools or kits selected in accordance with 4.2.2 shall be examined to verify compliance with the requirements of this specification not involving tests. When kits are inspected, the sample kits shall be opened and the contents also examined. Examination shall be conducted as specified in table XIX. Any tool or kits in the sample containing one or more visual or dimensional defects shall be rejected, and if the number of defective items in any sample exceeds the acceptance number for that sample, the lot represented by the sample shall be rejected. When kits are assembled from components which have been inspected and approved to the specification, the sample kits shall be opened and the contents examined to determine compliance with tool layout, identification and presence of instructions. The acceptable quality level (AQL) for major defects shall be 2.5 percent defects and for minor defects shall be 4.0.

Table XIX - Classification of defects in accordance with MIL-STD-105

Categories	Defects
<u>Major</u>	
101	Evidence of use of unauthorized materials.
102	Tap major, pitch and shank diameters, thread size or series, size of square nonconforming; tap not as specified.
103	Gage major and pitch diameters, thread size or series nonconforming; gage not as specified.
104	Inserting tool configuration nonconforming.
105	Prewinder opening for tools conforming to figure 2 (1/2(.500) and smaller) not large enough to receive largest insert for which tool is intended.
106	Prewinder inserting tool conforming to figure 4 (9/16(.5625) to 1-1/2(1.500)) mandrel not removable.
107	Tang break-off tool configuration nonconforming.
108	Extracting tool configuration nonconforming; not provided with relief angle on each tapered side.
109	Kit box configuration nonconforming; not provided with tool retention means.
110	Tool box nonconforming; dividers missing.
111	Identifying thread size not marked on kit tool box.
112	Kit not furnished with specified quantity, size and type of tools, taps or inserts.
113	Parts not free of burrs, sharp edges, rough spots, or parts are rusted.
114	Parts not marked with correct identification.
115	Inserts not corrosion resistant.
<u>Minor</u>	
201	Identification marking not provided; not permanent; not legible, data incomplete.
202	Tools not protected with corrosion resistant coating or finish.
203	Usage instructions not provided.

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- # 4.4 Tests. A random subsample of tools shall be selected from each sample selected in accordance with 4.2.3. The subsample level shall be S4. Each of the subsample tools shall be tested in accordance with 4.4.1 and 4.4.2. Any sample tool which does not pass the test shall be rejected, and if the number of nonconforming tools in any sample exceeds the acceptance number for that sample, the lot represented by the sample shall be rejected. The AQL shall be 2.5 percent defective for all tests.

- # 4.4.1 Hardness. The blade of the extracting tool, the mandrels of inserting tools and the mandrel of the tang break-off tools shall be tested to determine conformance with minimum hardness specified herein. When checking case depth, the inspector is cautioned to use the scale with the least loading available to avoid crushing through the case depth.

- # 4.4.2 Performance test. Each subsample tool other than taps and gages shall be subjected to actual use installing or extracting inserts according to its intended use and nominal screw thread size for one operation. The threaded test hole shall be gaged and shall conform to a class 3B fit. Any binding or deformation of tools other than a maximum flattening or rounding of .010 inch in width, either temporary or permanent shall be cause for rejection. Failure to accomplish the intended use shall also be cause for rejection.

- # 4.5 Examination of preparation for delivery. An examination shall be made to determine that preparation for delivery as specified in section 5 is in conformance with PPP-P-40.

## 5. PREPARATION FOR DELIVERY

- # 5.1 Preservation, packaging, packing, and marking. Preservation, packaging, packing and marking shall be in accordance with PPP-P-40. Levels of preservation and packaging and level of packing shall be as specified (see 6.2).

## 6. NOTES

- 6.1 Intended use. The tools and gages covered by this specification are intended to perform the operations indicated by the respective titles.
- # 6.2 Ordering data. Procurement documents should specify the following:
- (a) Title, number, and date of this specification.
  - (b) Type, class, style, and size of tools required (see 1.2, tables I through XVII and 6.3).
  - (c) Nominal screw thread size of tools required (see table I through XVII).
  - (d) When roughing taps are to be furnished for 1/2(.500) or larger screw thread inserts (see 3.2.2).
  - (e) Specify when class 4 taps shall be furnished with a pilot (see 3.2.4).
  - (f) Whether class 3B or class 2B gaging is required (see 3.3 and 6.4).
  - (g) Whether "GO" or "HI" gages are required (see 3.3).
  - (h) Specify when a tool box for multiple size insert kits shall be furnished (see 3.7.2).
  - (i) Specify kit composition when kits for individual sizes are required (see 3.7.2).
  - (j) Selection of applicable levels of preservation, packaging and level of packing required (see 5.1).

6.3 Offset tools and staking tools, type III, classes 4 and 5: Offset and staking tools, while separate tools, are used in conjunction with each other. Therefore type III, classes 4 and 5 tools should be specified as a single unit.

- # 6.4 Gaging for International Conformance. The pitch diameters and major diameters of gaging as shown in tables III and IV are the present practice of American industry. Since only class 3B gaging is standardized by international agreements (ABC Air Standard 17/28 of 15 November 1960 and ABC Navy Standard 34 of 10 May 1965), it is necessary that only 3B gaging as set forth in table III be procured by the Department of Defense activities when international conformance is required.

- # 6.4.1 Gages, major diameters. Major diameters of taps were changed to conform to the International Agreements by MIL-T-21309D, which also mandated revision of GO gage major diameters at its next revision. Tables III and IV show these revised major diameters. To enable American industry to change over to the new diameters with a minimum of hardship, gages with major diameters in accordance with previous revisions to this specification shall be acceptable for a period not to exceed one year from the effective date of this present revision. The effective date is the date immediately under MIL-T-21309E on page 1.

- # 6.5 Applicability of this specification. This specification is only applicable as a procurement document and is not to be construed as obsoleting any existing tooling within the Department of Defense or other Government stock in use unless otherwise so ordered by an individual authority.

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- 6.6 Sub-contracted material and parts. The preparation for delivery requirements of referenced documents listed in Section 2 do not apply when material and parts are procured by the supplier for incorporation into the equipment and lose their separate identity when the equipment is shipped.
- 6.7 Supersession data. Type IV, Class 2 of MIL-T-21309D has been deleted as there is no longer a requirement. Type III, Class 2, Style A mandrel inserting tool has been added along with provisions in all applicable tables included herein to cover new requirements for #2 and #3 thread sizes both unified coarse and fine series.
- 6.8 THE MARGINS OF THIS SPECIFICATION ARE MARKED "\*" TO INDICATE WHERE CHANGES (ADDITIONS, MODIFICATIONS, CORRECTIONS, DELETIONS) FROM THE PREVIOUS ISSUE HAVE BEEN MADE. THIS WAS DONE AS A CONVENIENCE ONLY AND THE GOVERNMENT ASSUMES NO LIABILITY WHATSOEVER FOR ANY INACCURACIES IN THESE NOTATIONS. BIDDERS AND CONTRACTORS ARE CAUTIONED TO EVALUATE THE REQUIREMENTS OF THIS DOCUMENT BASED ON THE ENTIRE CONTENT IRRESPECTIVE OF THE MARGINAL NOTATIONS AND RELATIONSHIP TO THE LAST PREVIOUS ISSUE.

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