AEROSPACE STANDARD

AS59158™ REV. A

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Superseding AS59158

Tools, Inserting and Extracting Helical Coil Wire Screw Thread Inserts Inch and Spark Plug Sizes

RATIONALE

This aerospace standard is being reviewed due to 5 year cycle; in addition, to incorporate customer requirements.

1. SCOPE

This SAE Aerospace Standard (AS) describes taps, thread plug gages, inserting tools, expanding tools, offset and staking tools, tang break-off tools, extracting tools and thread repair kits.

1.1 Purpose

These tools are used for inserting and extracting helical coil wire screw thread inserts as listed in Section 2, into threaded holes in accordance with NASM33537 and MS9071.

2. APPLICABLE DOCUMENTS

The following publications form a part of this document to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order. In the event of conflict between the text of this document and references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

2.1 ASME Publications

Available from ASME, P.O. Box 2900, 22 Law Drive, Fairfield, NJ 07007-2900, Tel: 800-843-2763 (U.S./Canada), 001-800-843-2763 (Mexico), 973-882-1170 (outside North America), www.asme.org.

ASME B1.2 Gages and Gages for Unified Screw Threads

ASME B47.1 Gage Blanks

ASME B94.9 Taps; Ground and Cut Threads

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
Tel: +1 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: CustomerService@sae.org
SAE WEB ADDRESS: **http://www.sae.org**

For more information on this standard, visit
https://www.sae.org/standards/content/AS59158A/

2.2 NAS Publications

Available from Aerospace Industries Association, 1000 Wilson Boulevard, Suite 1700, Arlington, VA 22209-3928, Tel: 703-358-1000, www.aia-aerospace.org.

NASM33537	Insert, Screw Thread, Helical Coil, Inch Series, Coarse and Fine Thread, Standard Assembly Dimensions For
NASM122076 Thru NASM122115	Insert, CRES Helical Coil Coarse Thread 1 Dia. Nominal Length
NASM122116 Thru NASM122155	Insert, CRES Helical Coil Coarse Thread 1-1/2 Dia. Nominal Length
NASM122156 Thru NASM122195	Insert, CRES Helical Coil Coarse Thread 2 Dia. Nominal Length
NASM122196 Thru NASM122235	Insert, CRES Helical Coil Coarse Thread 2-1/2 Dia. Nominal Length
NASM122236 Thru NASM122275	Insert, CRES Helical Coil Coarse Thread 3 Dia. Nominal Length
NASM124651 Thru NASM124690	Insert, CRES Helical Coil Fine Thread 1 Dia. Nominal Length
NASM124691 Thru NASM124730	Insert, CRES Helical Coil Fine Thread 1-1/2 Dia. Nominal Length
NASM124731 Thru NASM124770	Insert, CRES Helical Coil Fine Thread 2 Dia. Nominal Length
NASM124771 Thru NASM124810	Insert, CRES Helical Coil Fine Thread 2-1/2 Dia. Nominal Length
NASM124811 Thru NASM124850	Insert, CRES Helical Coil Fine Thread 3 Dia. Nominal Length
NASM21209	Insert, Screw Thread, Coarse and Fine, Screw Locking Helical Coil, CRES

2.3 U.S. Government Publications

Copies of these documents are available online at https://quicksearch.dla.mil.

MIL-STD-105	Sampling Procedures and Tables for Inspection by Attributes
MS9018	Insert, 18 - 1.5 mm Aviation Spark Plug Helical Coil
MS9071	Bosses, 18 - 1.50 mm Spark Plug Thread, Helical Coil Insert, Standard Dimensions For

3. DESIGNATION

The tools shall conform to the following types, classes, and styles:

3.1 Type I - Tap, Thread Cutting

Class 1 - Finishing, plug style

Class 2 - Roughing, plug style

Class 3 - Finishing, bottoming style

Class 4 - Spark plug

Style A - without pilot and reamer
Style B - with pilot and reamer

3.2 Type II - Gage, Plug, Thread

3.3 Type III - Inserting Tool, Screw Thread Inserts

Class 1 - Prewinder Tools

Style A - 1/2 (0.500) inch and smaller unified coarse and fine threads
Style B - 9/16 (0.5625) inch through 1-1/2 (1.500) inch unified fine threads and metric spark plug threads

Class 2 - Mandrel Tools

Style A - 2 (0.086) and 3 (0.099) unified coarse threads
Style B - 9/16 (0.5625) inch through 1-1/2 (1.500) inch unified coarse threads

Class 3 - Expanding Tools (14-1.25 and 18-1.5 mm spark plug threads only)

Class 4 - Offset Tools (14-1.25 and 18-1.5 mm spark plug threads only for use with Class 5)

Class 5 - Staking Tools (14-1.25 and 18-1.5 mm spark plug threads only)

Class 6 - Spot Facing Tools

3.4 Type IV - Tang Break-Off Tools

Class 1 - Semi-Automatic

Style A - 1/4 (0.250) inch and smaller, unified coarse and fine threads
Style B - 5/16 (0.3125) through 1/2 (0.500) inch unified coarse and fine threads

3.5 Class 2 - 1/2 (0.500) inch and smaller Unified Coarse and Fine Threads, plain punchType V - Extracting Tools

3.6 Type VI - Thread Repair Kit

3.7 Type VII - Multiple Kit, Tool Box

4. REQUIREMENTS

4.1 Materials

Materials shall be of a quality best suited for the purpose intended and shall be hardened as appropriate.

4.2 Finishes

The finish on all tools shall be in accordance with the manufacturer's standard practice. The tools shall not have burrs, rust, rough edges or slivers, or any defects which may impair serviceability or durability.

4.3 Surface Protection

All metal parts shall be protected against corrosion.

4.4 Workmanship

The workmanship of the tools shall be of the high quality prevailing among manufacturers and shall be free from imperfections that affect their appearance, serviceability, or durability.

4.5 Performance

The tools shall be capable of performing their intended function without deformation of contact surfaces, bending, twisting, or any other deformation, either permanent or temporary, while in use.

4.6 Marking

Each tool shall be marked with the nominal screw thread size or range of sizes as applicable and the manufacturer's identification. Other marking shall be as specified herein.

4.7 Instruction Sheet

Each tool except Type I, Taps and Type II, Gages shall have an instruction sheet or tag attached unless furnished as a part of a kit in which case the kit shall contain the instruction sheet. 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.

5. SPECIFICATIONS

5.1 Type I, Taps, Thread Cutting

Sizes of the Type I, Class 1, 2, and 3 taps for helical coil wire screw thread inserts shall be as specified in ANSI/ASME B94.9. All taps shall be marked either "screw thread insert" or "STI" in addition to the tap size and threads per inch or pitch in millimeters. Thread sizes shall be for Class 3B thread fit unless Class 2B is specified (see 8.2).

5.1.1 Class 1, Finishing, Plug Style Taps

Refer to ANSI/ASME B94.9.

5.1.2 Class 2, Roughing, Plug Style Taps

When specified (see 8.2) roughing taps for 1/2 (0.500) or larger screw thread inserts shall be furnished. The dimensions of the major diameter of the roughing taps shall be smaller than the major diameter of the finishing taps 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 0.002 inch.

5.1.3 Class 3, Finishing, Bottom Style Taps

Refer to ANSI/ASME B94.9 (see 8.2).

5.1.4 Class 4, Spark Plug Taps

Class 4 taps shall be furnished with an exterior male driving square. See Table 1 for sizes and dimension (see 8.2).

5.1.4.1 Style A

Spark plug taps without pilot and reamer.

5.1.4.2 Style B

Spark plug taps with pilot and reamer (see 8.2). The pilot section of the tap shall be threaded with the nominal spark plug thread size, followed by a reamer section the (diameter of the minor diameter of the hole that is to be tapped).

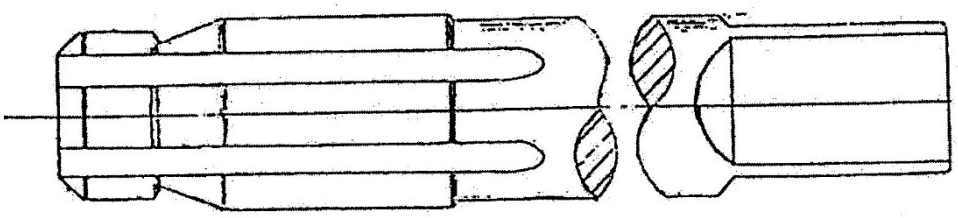

Figure 1 - Type I, Class 4, Style b - spark plug taps with pilot and reamer

Table 1 - Taps, spark plug, dimensions for screw thread inserts (STI)

	14-1.25 mm	18-1.5 mm	Tolerance
Length of Threaded Pilot 1/	5/16	3/8	±0.010
Length of Reamer Section 1/	0.125	0.156	±0.000 -0.015
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	0.625	0.625	±0.005
Square Size	0.465	0.465	±0.005
Square Length	11/16	11/16	±1/32
Major Diameter	0.6195/0.6205	0.7984/0.7994	
Pitch Diameter	0.5902/0.5907	0.7528/0.7533	
Pilot Major Diameter 1/	0.548	0.706	±0.002

1/ Not applicable when taps without pilots are specified.

5.2 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 Rockwell C 60 to 65. The gages shall be ground and lapped and conform to ANSI/ASME B1.2, except the pitch and major diameters. The pitch and major diameters shall conform to Table 2 for the 3B Class of thread fit and Table 3 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 2A or Figure 2B as applicable and fit the handle specified in Table 2 or 3. The gages shall be furnished in Unified Coarse, or Fine thread series for either a Class 2B or 3B thread fit as specified (see 8.2). In addition to size and thread series, each gage shall be marked either “Screw Thread Insert” or “STI.”

5.2.1 Gage Handles

The gage handles shall conform to ANSI/ASME B47.1 for the handle number specified in Tables 2 and 3.

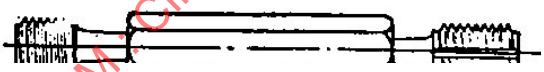

Figure 2A - Thread plug gage Type II

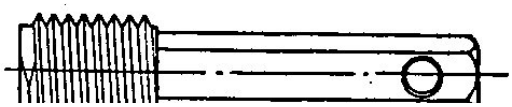

Figure 2B - Thread plug gage Type II

Table 2 - Pitch and major diameters for Class 3b gages

Nominal Thread Size	Handle No.	"GO" 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
UNC - 3B									
2 (0.086)-56	00	0.0977	0.0976	0.1095	0.1092	0.0989	0.0988	0.1033	0.1030
3 (0.099)-48	00	0.1127	0.1126	0.1264	0.1261	0.1140	0.1139	0.1200	0.1197
4 (0.112)-40	00	0.1284	0.1283	0.1448	0.1445	0.1299	0.1298	0.1352	0.1349
5 (0.125)-40	0	0.1414	0.1413	0.1578	0.1575	0.1430	0.1429	0.1482	0.1479
6 (0.138)-32	0	0.1584	0.1583	0.1789	0.1786	0.1601	0.1600	0.1667	0.1664
8 (0.164)-32	0	0.1844	0.1843	0.2049	0.2046	0.1862	0.1861	0.1928	0.1925
10 (0.190)-24	0	0.2171	0.2170	0.2446	0.2441	0.2192	0.2191	0.2281	0.2278
12 (0.216)-24	1	0.2431	0.2430	0.2706	0.2701	0.2453	0.2452	0.2541	0.2536
1/4 (0.250)-20	1	0.2826	0.2825	0.3155	0.3150	0.2851	0.2850	0.2957	0.2952
5/16 (0.3125)-18	2	0.3487	0.3486	0.3852	0.3847	0.3515	0.3514	0.3633	0.3628
3/8 (0.375)-16	2	0.4157	0.4156	0.4568	0.4562	0.4189	0.4188	0.4322	0.4316
7/16 (0.4375)-14	3	0.4842	0.4839	0.5309	0.5303	0.4875	0.4872	0.5027	0.5021
1/2 (0.500)-13	3	0.5502	0.5499	0.6005	0.5999	0.5537	0.5534	0.5701	0.5695
9/16 (0.5625)-12	3	0.6170	0.6167	0.6714	0.6708	0.6208	0.6205	0.6385	0.6379
5/8 (0.625)-11	3	0.6844	0.6841	0.7437	0.7431	0.6885	0.6882	0.7079	0.7073
3/4 (0.750)-10	4	0.8152	0.8149	0.8805	0.8799	0.8196	0.8193	0.8410	0.8404
7/8 (0.875)-9	4	0.9474	0.9471	1.0200	1.0193	0.9522	0.9519	0.9756	0.9749
1 (1.000)-8	5	1.0816	1.0812	1.1631	1.1624	1.0868	1.0864	1.1135	1.1128
1-1/8 (1.125)-7	5	1.2182	1.2178	1.3113	1.3106	1.2239	1.2235	1.2545	1.2538
1-1/4 (1.250)-7	5	1.3432	1.3428	1.4363	1.4356	1.3490	1.3486	1.3795	1.3788
1-3/8 (1.375)-6	5	1.4837	1.4832	1.5923	1.5915	1.4900	1.4895	1.5260	1.5252
1/1/2 (1.500)-6	5-1/2	1.6087	1.6082	1.7173	1.7165	1.6151	1.6146	1.6511	1.6503

Table 2 - Pitch and major diameters for Class 3b gages (continued)

Nominal Thread Size	Handle No.	"GO" 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
UNF - 3B									
3 (0.099)-56	00	0.1107	0.1106	0.1225	0.1222	0.1119	0.1118	0.1170	0.1167
4 (0.112)-48	00	0.1257	0.1256	0.1394	0.1391	0.1271	0.1270	0.1331	0.1328
6 (0.138)-40	0	0.1544	0.1543	0.1708	0.1705	0.1560	0.1559	0.1612	0.1609
8 (0.164)-36	0	0.1822	0.1821	0.2004	0.2001	0.1840	0.1839	0.1898	0.1895
10 (0.190)-32	0	0.2104	0.2103	0.2309	0.2306	0.2123	0.2122	0.2188	0.2185
1/4 (0.250)-28	1	0.2733	0.2732	0.2969	0.2964	0.2754	0.2753	0.2829	0.2824
5/16 (0.3125)-24	1	0.3396	0.3395	0.3671	0.3666	0.3421	0.3420	0.3508	0.3503
3/8 (0.375)-24	2	0.4021	0.4020	0.4296	0.4291	0.4047	0.4046	0.4134	0.4129
7/16 (0.4375)-20	2	0.4701	0.4700	0.5030	0.5025	0.4731	0.4730	0.4834	0.4829
1/2 (0.500)-20	3	0.53265	0.53250	0.5655	0.5650	0.53570	0.53555	0.5460	0.5455
9/16 (0.5625)-18	3	0.59875	0.59860	0.6352	0.6347	0.60200	0.60185	0.6136	0.6131
5/8 (0.625)-18	3	0.66125	0.66110	0.6977	0.6972	0.6646	0.6643	0.6761	0.6756
3/4 (0.750)-16	3	0.7908	0.7906	0.8318	0.8312	0.7945	0.7942	0.8075	0.8069
7/8 (0.875)-14	4	0.9217	0.9214	0.9684	0.9678	0.9257	0.9254	0.9406	0.9400
1 (1.000)-14	4	1.0467	1.0464	1.0934	1.0928	1.0508	1.0505	1.0673	1.0667
1 (1.000)-12	4	1.0545	1.0542	1.1089	1.1083	1.0589	1.0586	1.0772	1.0766
1-1/8 (1.125)-12	5	1.1795	1.1792	1.2339	1.2333	1.1841	1.1838	1.2015	1.2009
1-1/4 (1.250)-12	5	1.3045	1.3042	1.3589	1.3583	1.3092	1.3089	1.3265	1.3259
1-3/8 (1.375)-12	5	1.4295	1.4292	1.4839	1.4833	1.4343	1.4340	1.4516	1.4510
1/1/2 (1.500)-12	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 (refer to ANSI/ASME B1.2).

Table 3 - Pitch and major diameters for Class 2b gages

Nominal Thread Size	Handle No.	"GO" 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
UNC - 2B									
2 (0.086)-56	00	0.0977	0.0976	0.1095	0.1092	0.0996	0.0995	0.1036	0.1033
3 (0.099)-48	00	0.1127	0.1126	0.1264	0.1261	0.1148	0.1147	0.1204	0.1201
4 (0.112)-40	00	0.1284	0.1283	0.1448	0.1445	0.1308	0.1307	0.1356	0.1352
5 (0.125)-40	0	0.1414	0.1413	0.1578	0.1575	0.1438	0.1437	0.1486	0.1482
6 (0.138)-32	0	0.1584	0.1583	0.1789	0.1786	0.1611	0.1610	0.1672	0.1667
8 (0.164)-32	0	0.1844	0.1843	0.2049	0.2046	0.1872	0.1871	0.1932	0.1927
10 (0.190)-24	0	0.2171	0.2170	0.2446	0.2441	0.2203	0.2202	0.2286	0.2281
12 (0.216)-24	1	0.2431	0.2430	0.2706	0.2701	0.2464	0.2461	0.2546	0.2541
1/4 (0.250)-20	1	0.2826	0.2825	0.3155	0.3150	0.2864	0.2861	0.2963	0.2958
5/16 (0.3125)-18	2	0.3487	0.3486	0.3852	0.3847	0.3529	0.3526	0.3640	0.3635
3/8 (0.375)-16	2	0.4157	0.4156	0.4568	0.4562	0.4203	0.4200	0.4329	0.4323
7/16 (0.4375)-14	3	0.4842	0.4839	0.5309	0.5303	0.4890	0.4887	0.5035	0.5029
1/2 (0.500)-13	3	0.5502	0.5499	0.6005	0.5999	0.5554	0.5551	0.5710	0.5704
9/16 (0.5625)-12	3	0.6170	0.6167	0.6714	0.6708	0.6225	0.6222	0.6394	0.6388
5/8 (0.625)-11	3	0.6844	0.6841	0.7437	0.7431	0.6903	0.6900	0.7088	0.7082
3/4 (0.750)-10	4	0.8152	0.8149	0.8805	0.8799	0.8216	0.8213	0.8420	0.8414
7/8 (0.875)-9	4	0.9474	0.9471	1.0200	1.0193	0.9543	0.9540	0.9767	0.9760
1 (1.000)-8	5	1.0816	1.0812	1.1631	1.1624	1.0890	1.0886	1.1146	1.1139
1-1/8 (1.125)-7	5	1.2182	1.2178	1.3113	1.3106	1.2262	1.2258	1.2556	1.2549
1-1/4 (1.250)-7	5	1.3432	1.3428	1.4363	1.4356	1.3514	1.3510	1.3807	1.3800
1-3/8 (1.375)-6	5	1.4837	1.4832	1.5923	1.5915	1.4926	1.4921	1.5273	1.5266
1/1/2 (1.500)-6	5-1/2	1.6087	1.6082	1.7173	1.7165	1.6177	1.6172	1.6524	1.6518

Table 3 - Pitch and major diameters for Class 2b gages (continued)

Nominal Thread Size	Handle No.	"GO" 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
UNF - 2B									
3 (0.099)-56	00	0.1107	0.1106	0.1225	0.1222	0.1126	0.1125	0.1174	0.1171
4 (0.112)-48	00	0.1257	0.1256	0.1394	0.1391	0.1279	0.1278	0.1335	0.1332
6 (0.138)-40	0	0.1544	0.1543	0.1708	0.1705	0.1569	0.1568	0.1617	0.1613
8 (0.164)-36	0	0.1822	0.1821	0.2004	0.2001	0.1849	0.1848	0.1902	0.1898
10 (0.190)-32	0	0.2104	0.2103	0.2309	0.2306	0.2133	0.2132	0.2193	0.2188
1/4 (0.250)-28	1	0.2733	0.2732	0.2969	0.2964	0.2765	0.2764	0.2835	0.2830
5/16 (0.3125)-24	1	0.3396	0.3395	0.3671	0.3666	0.3433	0.3430	0.3514	0.3509
3/8 (0.375)-24	2	0.4021	0.4020	0.4296	0.4291	0.4059	0.4056	0.4140	0.4135
7/16 (0.4375)-20	2	0.4701	0.4700	0.5030	0.5025	0.4744	0.4741	0.4841	0.4836
1/2 (0.500)-20	3	0.53265	0.53250	0.5655	0.5650	0.5371	0.5368	0.5467	0.5462
9/16 (0.5625)-18	3	0.59875	0.59860	0.6352	0.6347	0.6035	0.6032	0.6143	0.6138
5/8 (0.625)-18	3	0.66125	0.66110	0.6977	0.6972	0.6661	0.6658	0.6768	0.6763
3/4 (0.750)-16	3	0.7908	0.7906	0.8318	0.8312	0.7961	0.7958	0.8083	0.8077
7/8 (0.875)-14	4	0.9217	0.9214	0.9684	0.9678	0.9274	0.9271	0.9414	0.9408
1 (1.000)-14	4	1.0467	1.0464	1.0934	1.0928	1.0527	1.0524	1.0682	1.0676
1 (1.000)-12	4	1.0545	1.0542	1.1089	1.1083	1.0608	1.0605	1.0791	1.0785
1-1/8 (1.125)-12	5	1.1795	1.1792	1.2339	1.2333	1.1860	1.1857	1.2024	1.2018
1-1/4 (1.250)-12	5	1.3045	1.3042	1.3589	1.3583	1.3112	1.3109	1.3275	1.3269
1-3/8 (1.375)-12	5	1.4295	1.4292	1.4839	1.4833	1.4364	1.4361	1.4526	1.4520
1/1/2 (1.500)-12	5-1/2	1.5546	1.5542	1.6089	1.6083	1.5615	1.5611	1.5777	1.5771

NOTE: Thread plug gages above heavy line are class "W" gages and thread plug gages below heavy line are class "X" gages (refer to ANSI/ASME B1.2).

5.3 Gages, Spark Plug Thread

Spark plug thread gages shall conform to the foregoing gage requirements except they shall conform to Table 4 requirements for pitch and major diameters.

Table 4 - Pitch and major diameters for gages, spark plug threads

Nominal Thread Size	Handle No.	"GO" 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
14-1.25 mm	3	0.5895	0.5892	0.6145	0.6140	0.5917	0.5914	0.6028	0.6023
18-1.5 mm	3	0.7526	0.7523	0.7937	0.7932	0.7543	0.7540	0.7738	0.7733

5.4 Type III, Inserting Tools

5.4.1 Class 1, Prewinder Tools

5.4.1.1 Style A Inserting Tools for 1/2 (0.500) and Smaller Unified Coarse and Fine Series

The Style A prewinder tools shall consist of a steel mandrel and prewinder. The body of the prewinder may be steel or plastic. The front end of the prewinder 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 prewinder 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 3, 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, prewinder tools shall have threaded mandrels and be similar to Figure 3. Type III, Class 1, Style A, tools shall conform to Table 6. Tools shall install inserts up to 3 diameters in length. The handle knob, which is retained, is free to swivel.

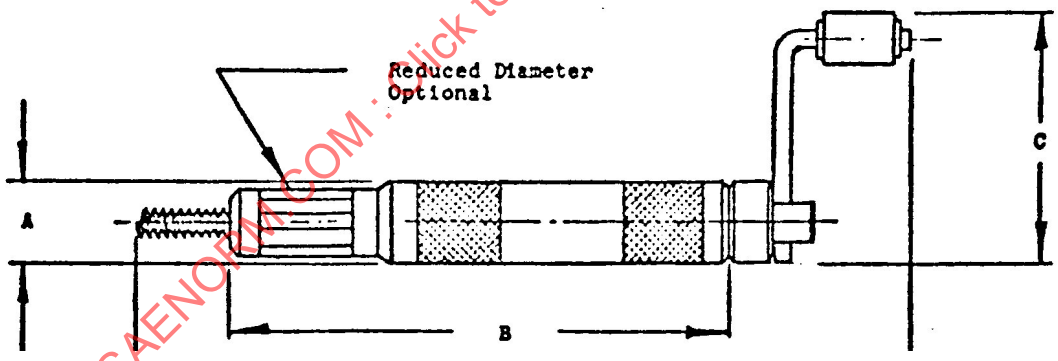

Figure 3 - Type III, Class 1, Style a, prewinder inserting tool with threaded mandrel for 1/2 (0.500) and smaller unified coarse, unified fine sizes

Table 5 - Type III, Class 1, Style a, prewinder inserting tool with threaded mandrel for 1/2 (0.500) 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 (0.112)-40	3/8	4-5/8	2-9/32	7-15/32
5 (0.125)-40	3/8	4-5/8	2-9/32	7-15/32
6 (0.138)-32	3/8	4-5/8	2-9/32	7-15/32
8 (0.164)-32	3/8	4-5/8	2-9/32	7-15/32
10 (0.190)-24	7/16	4-5/8	2-9/32	7-15/32
12 (0.216)-24	1/2	4-5/8	2-17/32	7-31/32
1/4 (0.250)-20	1/2	4-5/8	2-17-32	7-31/32
5/16 (0.3125)-18	5/8	4-5/8	3-23/32	7-31/32
3/8 (0.375)-16	11/16	5	3-23/32	7-31/32
7/16 (0.4375)-14	3/4	5-1/4	3-23/32	8-15/32
1/2 (0.500)-13	7/8	5-1/2	3-23/32	8-27/32
Unified Fine Series				
3 (0.099)-56	3/8	4-5/8	2-9/32	7-15/32
4 (0.112)-48	3/8	4-5/8	2-9/32	7-15/32
6 (0.138)-40	3/8	4-5/8	2-9/32	7-15/32
10 (0.190)-32	7/16	4-5/8	2-9/32	7-15/32
1/4 (0.250)-28	1/2	4-5/8	2-17/32	7-31/32
5/16 (0.3125)-24	5/8	4-5/8	3-23/32	7-31/32
3/8 (0.375)-24	11/16	5	3-23/32	7-31/32
7/16 (0.4375)-20	3/4	5-1/4	3-23/32	8-15/32
1/2 (0.500)-20	7/8	5-1/2	3-23/32	8-27/32

5.4.1.1.1 Style A Inserting Tools for 14 mm and 18 mm Spark Plug Threads

Style A inserting tools for 14 mm and 18 mm spark plug threads shall be similar to Figure 3 or Figure 4. A straight or crank style handle shall be furnished at the supplier's option. Style A inserting tools for spark plug threads shall conform to Table 6. 14-1.25 mm tools shall install inserts up to 0.875 long and 18-1.5 mm tools shall install inserts up to 0.750 long.

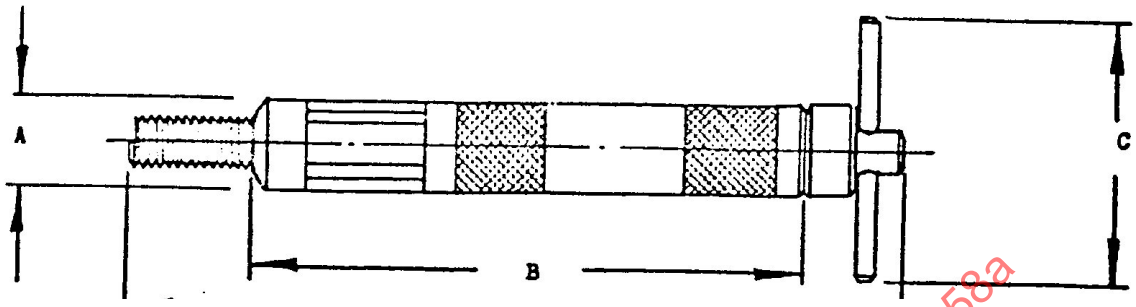

Figure 4 - Class 1 Style a, , prewinder inserting tools, with threaded mandrel for spark plug threads

Table 6 - Type III, Class 1, prewinder inserting tools for 14 mm and 18 mm spark plug threads

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

5.4.1.2 Style B Inserting Tools for 9/16 (0.5625) 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 5 and shall conform to the dimensions specified in Table 7. The mandrel shall be threaded externally to accept the size insert for which it is intended. Sizes 9/16 (0.5625) through 7/8 (0.875) 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.

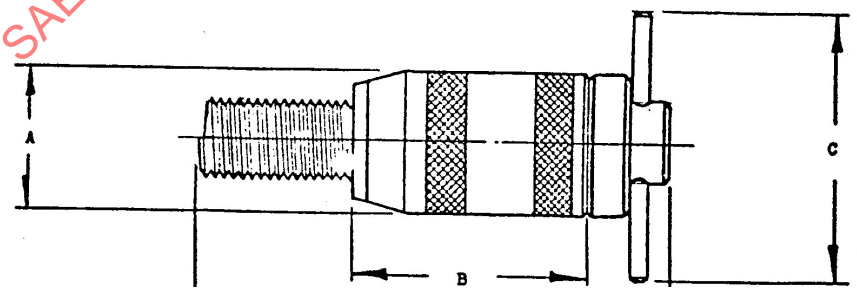

Figure 5 - Type III, Class 1, Style b prewinder inserting tool for 9/16 (0.5625) through 1-1/2 (1.500) unified fine series

Table 7 - Type III, Class 1, Style b prewinder inserting tool for 9/16 (0.5625) through 1-1/2 (1.500) unified fine thread series

Nominal Thread Size	A +1/2 –1/16	B +1/8 –1/16	C +1/8 –1/16	D +1/8 –1/16
9/16 (0.5625)-18	1-1/8	2-7/8	4	5-3/8
5/8 (0.625)-18	1-1/8	2-7/8	4	5-3/8
3/4 (0.750)-16	1-1/2	2-7/8	4	6
7/8 (0.875)-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

5.4.2 Class 2, Mandrel Tools

5.4.2.1 Class 2, Style A, Inserting Tool for #2 (0.086) and #3 (0.099) 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 6 and shall conform to the dimensions specified in Table 8. Tools shall install inserts up to 3 diameters in length.

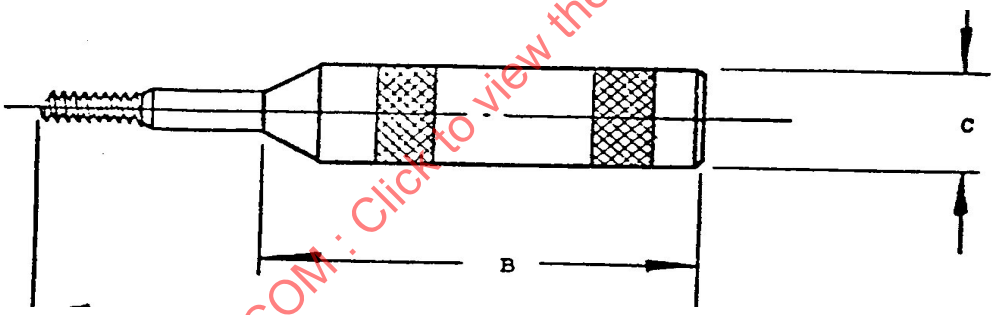

Figure 6 - Type II, Class 2, Style a mandrel inserting tool for #2 (0.086) and #3 (0.099) unified coarse thread series

Table 8 - Type II, Class 2, Style a mandrel inserting tool for #2 (0.086) and #3 (0.099) unified coarse thread series

Nominal Thread Size	A ±1/2	B ±1/4	C ±1/16
2 (0.086)-56	2-7/16	2	5/16
3 (0.099)-48	6	3	5/8

5.4.2.2 Class 2, Style B, Inserting Tool for 9/16 (0.5625) 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 7 and conform to the dimensions specified in Table 9. Sizes 9/16 (0.5625) through 7/8 (0.875) 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.

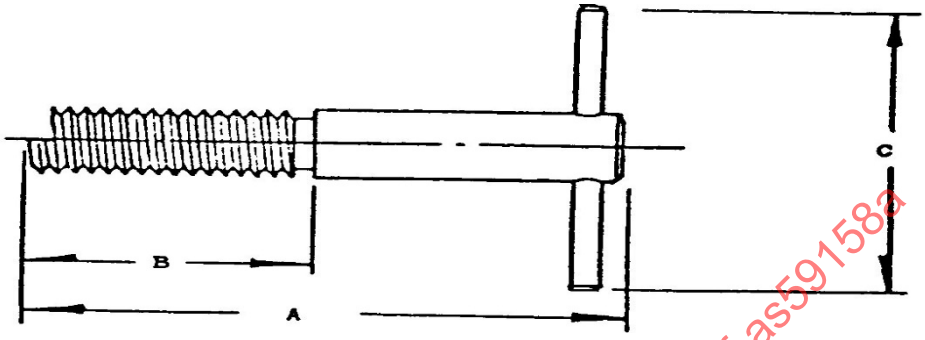

Figure 7 - Type III, Class 2, Style b mandrel inserting tool for 9/16 (0.5625) and larger unified coarse threads

Table 9 - Type III, Class 2, Style b mandrel inserting tool for 9/16 (0.5625) and larger unified coarse thread sizes

Nominal Thread Size	A ±1/4	B ±1/4 –0	C ±1/4
9/16 (0.5625)-12	4-7/8	1-13/16	4
5/8 (0.625)-11	4-7/8	2	4
3/4 (0.750)-10	4-7/8	2-3/8	4
7/8 (0.875)-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

5.4.3 Expanding Tools, Type III, Class 3 (Spark Plug Inserts Only)

Type III, Class 3 expanding tools shall be similar to Figure 8 and shall conform to the requirements of Table 10. The expanding tools shall consist of a collet, plunger with back-out 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 Rockwell C 40. The plunger and body shall be of steel with a minimum hardness of Rockwell C 35.

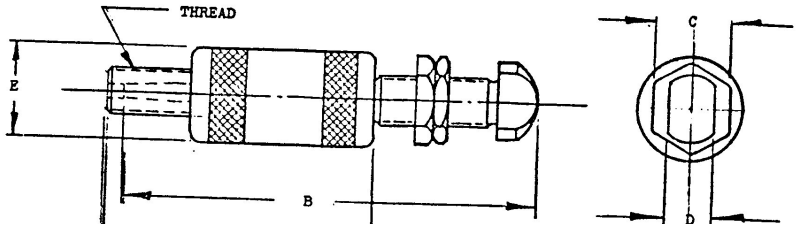

Figure 8 - Type III, Class 3 expanding tools, plunger type, spark plug inserts

Table 10 - Type III, Class 3 expanding tools, plunger type, spark plug inserts

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

5.4.4 Type III, Class 4, Offset Tools

Type III, Class 4, offset tools shall be similar to Figure 9 and shall conform to the requirements of Table 11. The offset tool shall be of tool steel with a minimum hardness of Rockwell C 50.

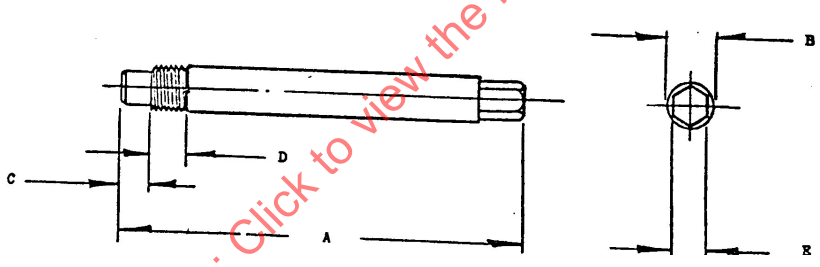

Figure 9 - Type III, Class 4, offset tools, spark plug inserts

Table 11 - Type III, Class 4, offset tools, spark plug inserts

Nominal Thread Size	A	B		C	D	E
		Max	Min			
14-1.25 mm	4-3/8	0.541	0.536	1/4	21/64	7/16
18-1.5 mm	5	0.698	0.690	1/4	3/4	5/8

5.4.5 Type III, Class 5, Staking Tools

Type III, Class 5, staking tools shall be similar to Figure 10 and shall conform to the requirements of Table 12 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 0.020 inch. The button insert in the end of the staking tool shall be of tool steel with a minimum hardness of Rockwell C 45.

Table 12 - Type III, Class 5, staking tools, spark plug inserts

Nominal Thread Size	A	B	C	D		E
				Max	Min	
14-1.25 mm	4-15/16	4-1/16	7/8	0.551	0.546	120 degrees
18-1.5 mm	5-1/2	4-5/8	1	0.708	0.703	120 degrees

NOTE: 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.

5.4.6 Type III, Class 6 Spot Facing Tool, 18-1.5 mm

Type III, Class 6 spot facing tool shall be similar to Figure 11. Teeth on the milling cutter end shall be capable of cutting cast aluminum.

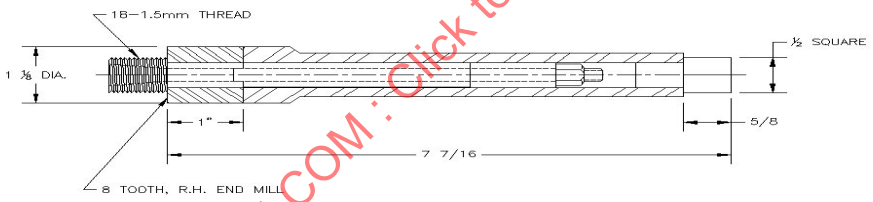

Figure 11 - Type III, Class 6 spot facing tool

5.5 Type IV, Tang Break-Off Tools

5.5.1 Type IV, Class 1, Style A, Tang Break-Off Tools

The Class 1, Style A, tang break-off tool for sizes 1/4 (0.250) and smaller shall be of the automatic punch type consisting of a spring actuated punch. 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 12 and shall conform to the dimensions of Table 13. The tool shall break tangs off inserts up to 2 diameters in length.

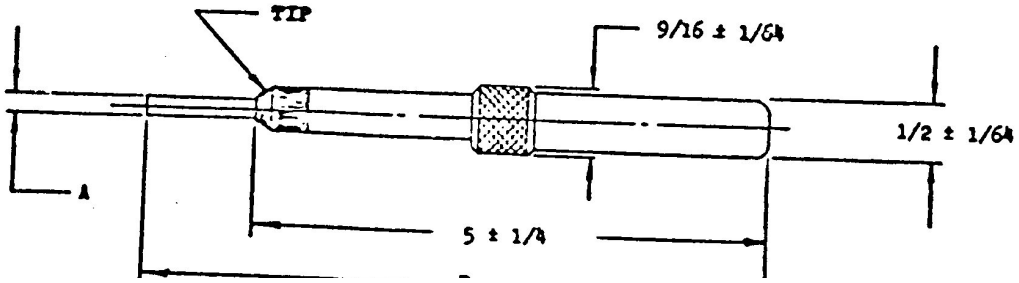

Figure 12 - Type IV, Class 1, Style a, tang break-off tool for 1/4 (0.250) and smaller unified coarse and fine thread sizes

Table 13 - Type IV, Class 1, Style a, tang break-off tool for 1/4 (0.250) and smaller unified coarse and fine thread sizes

Nominal Thread Size	A Dia Max	B Max
2 (0.086) and 3 (0.099)	0.058	5-7/16
4 (0.112) and 5 (0.125)	0.076	5-1/2
6 (0.138)	0.089	5-9/16
8 (0.164)	0.112	5-5/8
10 (0.190) and 12 (0.216)	0.125	5-3/4
1/4 (0.250)	0.154	5-13/16

5.5.2 Type IV, Class 1, Style B, Tang Break-off Tool

The Class 1, Style B, tang break-off tool for sizes 5/16 (0.3125) through 1/2 (0.500) 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. There shall be an outer steel sleeve surrounding the punch to prevent insert coils from dislodging (Figure 13, Dimension D). 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 12 and shall conform to the dimensions of Table 14. The tool shall break tangs off inserts up to 2 diameters in length.

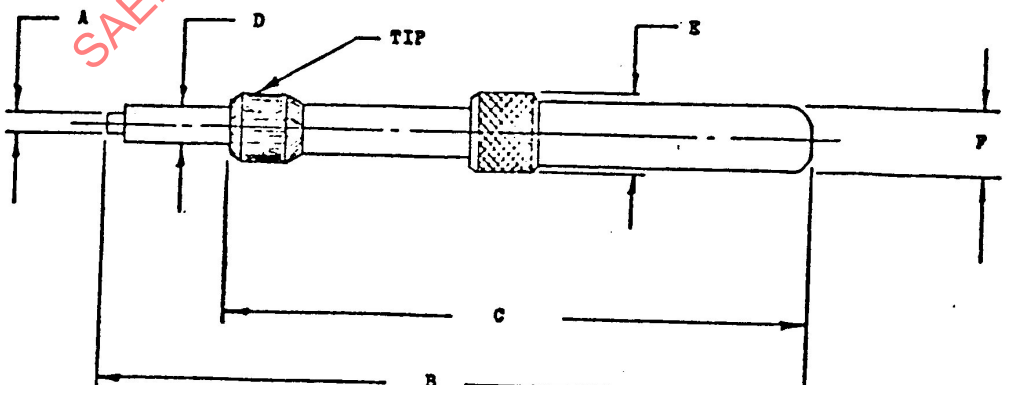

Figure 13 - Type IV, Class 1, Style b, tang break-off tool for unified coarse and fine thread sizes 5/16 (0.3125) through 1/2 (0.500)

Table 14 - Type IV, Class 1, Style b, tang break-off tool for unified coarse and fine thread sizes 5/16 (0.3125) through 1/2 (0.500)

Nominal Thread Size	A Dia Max	B Max	C ±1/8	D ±0.005	E ±1/64	F ±1/64
Unified Coarse Series						
5/16 (0.3125)-18	0.120	5-13/16	4-29/32	0.223	11/16	5/8
3/8 (0.375)-16	0.187	5-15/16	4-29/32	0.283	11/16	5/8
7/16 (0.4375)-14	0.229	7-7/32	6-3/32	0.334	13/16	3/4
1/2 (0.500)-13	0.292	7-11/32	6-3/32	0.392	13/16	3/4
Unified Fine Series						
5/16 (0.3125)-24	0.120	5-13/16	4-29/32	0.251	11/16	5/8
3/8 (0.375)-24	0.187	5-15/16	4-29/32	0.303	11/16	5/8
7/16 (0.4375)-20	0.229	7-7/32	6-3/32	0.360	13/16	3/4
1/2 (0.500)-20	0.292	7-11/32	6-3/32	0.414	13/16	3/4

5.5.3 Type IV, Class 2, Tang Break-off Tool

The Type IV, Class 2, 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 0.005 inch. The tool shall be similar to Figure 14, and shall conform to the dimensions of Table 15. Tools shall break tangs off inserts up to 3 diameters in length.

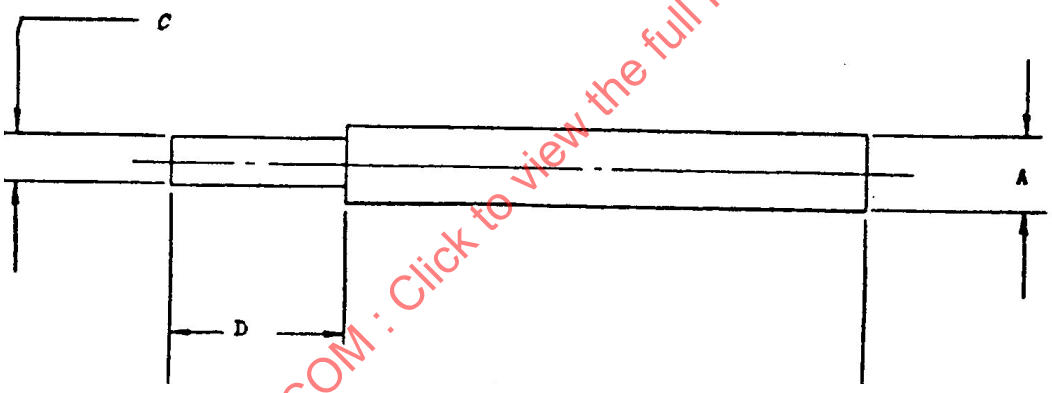

Figure 14 - Type IV, Class 2, tang break-off tool for unified coarse and fine thread sizes 1/2 (0.500) and smaller

Table 15 - Type IV, Class 2, tang break-off tool for unified coarse and fine thread sizes 1/2 (0.500) and smaller

Nominal Thread Size	A ±1/64	B ±1/4	C +0.000 –0.005	D ±1/16
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 (0.250)	1/4	4	0.176	1
5/16 (0.3125)	1/4	4	0.230	1-1/8
3/8 (0.375)	9/32	4	None	None
7/16 (0.4375)	11/32	4	None	None
1/2 (0.500)	25/64	4	None	None

5.6 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 Rockwell C 45 and shall have a relief angle on each tapered side to establish an edge capable of indenting and extracting the screw thread insert. The Type V extraction tools, otherwise known as “spade” tools, are potentially damaging for any insert deeper than 1.5p. Inserts are often installed too deep and therefore must be removed and replaced. The spade tools can make contact with the parent metal when the insert is too deep and thus carve up the STI threads. Most suppliers have their own home-made spade tools for when the inserts are too deep.

The handle shall be of sufficient strength to prevent bending under ordinary service conditions. The extracting tool shall be similar to Figure 15 and conform to the dimensions of Table 16 for the size range specified (see 8.2).

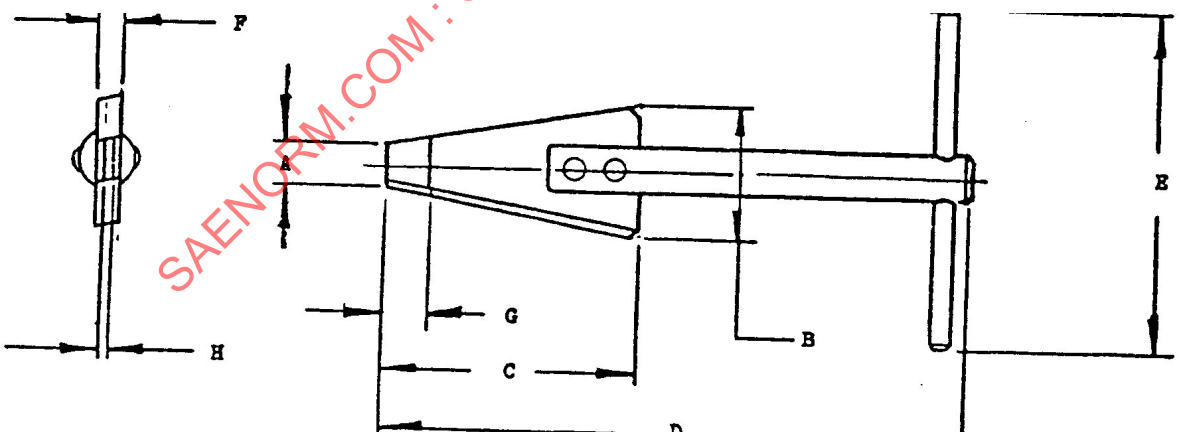

Figure 15 - Type V, extracting tool for unified coarse and fine and spark plug thread series

Table 16 - Type V, extracting tools

Nominal Thread Size Range	A Max	B Min	C Min	D ±1/16	E ±1/4	F ±0.010	G ±1/16	H ±0.005
2 (0.086)	0.078	--	5/8	4-29/64	3	0.062	1/4	0.045
3 (0.099) thru 8 (0.164)	0.078	0.375	5/8	4-29/64	3	0.062	None	None
10 (0.190) thru 3/8 (0.375)	0.145	0.375	9/16	4-1/4	3	0.062	None	None
7/15 (0.4375) thru 1 (1.000) And 14-1.25 & 18-1.5 mm Spark Plug	0.360	1.000	1-5/8	5-1/16	4	0.093	None	None
1-1/8 (1.125) thru 1-1/2 (1.500)	0.970	1.500	1-5/16	6-1/8	4	0.125	None	None

6. THREAD REPAIR KITS

These repair kits shall consist of one inserting tool, one tang break off tool (for kits of nominal thread size 1/2 (0.500) and smaller), and one extracting tool, plus taps and helical coil inserts in quantities per Table 17, and shall be contained in a module tool box per Figure 16. All taps, inserts, and tools are to be the correct screw thread size and series for the nominal size of the particular kit.

6.1 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.

6.2 Helical Coil Screw Thread Inserts

Helical coil screw thread inserts for the coarse and fine thread series for use in kits shall conform to NASM122116 and NASM122156 series for the free running inserts and NASM21209 for the screw locking inserts as specified (see Table 17).

6.2.1 Insert Packets

Inserts, 1 inch and smaller, are to be packaged in reclosable 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.

6.2.2 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.

6.3 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.