INCH-POUND

MIL-DTL-45932A
5 May 2015
SUPERSEDING
MIL-I-45932
21 April 1971

DETAIL SPECIFICATION

INSERT, SCREW THREAD, THIN WALL, LOCKED IN: GENERAL SPECIFICATION FOR

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

1. SCOPE

1.1 Scope. This specification covers the requirements for thin wall, solid bushing, locked in, screw thread inserts. The method of locking in the insert into the parent material to resist rotation should be by means of an integral locking device, either metallic or non-metallic (see 6.1).

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in sections 3 and 4 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications and standards form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

FEDERAL SPECIFICATIONS

L-P-410	Plastic, Polyamide (Nylon), Rigid: Rods, Tubes, Flats, Molded and Cast Parts

FEDERAL STANDARDS

FED-STD-H28	Screw-Thread Standards for Federal Service

Comments, suggestions, or questions on this document should be addressed to DLA Troop Support - Industrial Hardware Division (ATTN: Code FHTE), 700 Robbins Avenue, Philadelphia, PA 19111-5096 or email trpsptspecspa@dla.mil. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at https://assist.dla.mil .

DEPARTMENT OF DEFENSE SPECIFICATIONS

MIL-DTL-5541	Chemical Conversion Coatings on Aluminum and Aluminum Alloys
MIL-DTL-45932/1	Insert, Screw Thread - Thin Wall Locked In
MIL-DTL-45932/2	Insert, Screw Thread - Thin Wall, Locked-In, Non Metallic Locking Element (-60 Degree to +250 Degrees Fahrenheit)
MIL-DTL-45932/3	Insert, Screw Thread - Thin Wall, Locked-In, Oversize Replacer
MIL-PRF-46010	Lubricant, Solid Film, Heat Cured, Corrosion Inhibiting NATO Code - S-1738
MIL-S-7742	Screw Threads, Standard, Optimum Selected Series: General Specification for (Inactive)

(Copies of these documents are available online at http://quicksearch.dla.mil/ or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.3 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS

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

(Copies of this document are available from www.asme.org American Society of Mechanical Engineers, Three Park Avenue, M/S 10E, New York, NY 10016-5990.)

AMERICAN SOCIETY FOR QUALITY (ASQ)

ASQ Z1.4	Sampling Procedures and Tables for Inspection by Attributes.

(Copies of this document are available from www.asq.org American Society for Quality Control, 600 North Plankinton Avenue, Milwaukee, WI 53203.)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM B700	Standard Specification for Electrodeposited Coatings of Silver for Engineering Use
ASTM B928/B928M	Standard Specification for High Magnesium Aluminum-Alloy Sheet and Plate for Marine Service and Similar Environments
ASTM E1282	Standard Guide for Specifying the Chemical Compositions and Selecting Sampling Practices and Quantitative Analysis Methods for Metals, Ores, and Related Materials
ASTM E1417/E1417M	Standard Practice for Liquid Penetrant Testing
ASTM F1941	Standard Specification for Electrodeposited Coatings on Threaded Fasteners (Unified Inch Screw Threads (UN/UNR))

(Copies of these documents are available from www.astm.org or the American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.)

NATIONAL AEROSPACE STANDARD (NAS)

NASM1312-6	Fastener Test Methods, Method 6, Hardness

(Copies of this document are available from www.aia-aerospace.org or the Aerospace Industries Association, 1250 Eye Street, N. W., Suite 1200, Washington DC, 20005-3924.)

SOCIETY OF AUTOMOTIVE ENGINEERS (SAE)

SAE AIR4127	Steel: Chemical Composition and Hardenability
SAE AMS2411	Plating, Silver for High Temperature Applications
SAE AMS2700	Passivation of Corrosion Resistant Steels
SAE AMS4117	Aluminum Alloy, Rolled or Cold Finished Bars, Rods, and Wire and Flash Welded Rings 1.0Mg - 0.60Si - 0.28Cu – 0.20Cr (6061; -T6, -T651) Solution and Precipitation Heat Treated - UNS A96061
SAE AMS4128	Aluminum Alloy Bars, Rolled or Cold Finished 1.0Mg – 0.60Si - 0.30Cu - 0.20Cr (6061-T451) Solution Heat Treated and Stress Relieved by Stretching - UNS A96061
SAE AMS4650	Copper-Beryllium Alloys, Bars, Rods, Shapes, and Forgings 98Cu – 1.9e Solution Heat Treated TB00
SAE AMS5643	Steel, Corrosion-Resistant, Bars, Wire, Forgings, Tubing, and Rings 16Cr - 4.0Ni - 0.30Cb (Nb) - 4.0Cu Solution Heat Treated, Precipitation Hardenable - UNS S17400
SAE AMS5731	Steel, Corrosion and Heat-Resistant, Bars, Wire, Forgings, Tubing, and Rings 15Cr - 25.5Ni - 1.2Mo - 2.1Ti - 0.006B - 0.30V Consumable Electrode Melted, 1800 ºF (982 ºC) Solution Heat Treated - UNS S66286
SAE AMS5732	Steel, Corrosion and Heat-Resistant, Bars, Wire, Forgings, Tubing, and Rings 15Cr - 25.5Ni - 1.2Mo - 2.1Ti - 0.006B - 0.30V Consumable Electrode Melted, 1800 ºF (982 ºC) Solution and Precipitation Heat Treated - UNS S66286
SAE AMS5734	Steel, Corrosion and Heat-Resistant, Bars, Wire, Forgings, and Tubing 15Cr - 25.5Ni - 1.2Mo - 2.1Ti - 0.006B - 0.30V Consumable Electrode Melted, 1650 ºF (899 ºC) Solution Heat Treated - UNS S66286
SAE AMS5737	Steel, Corrosion and Heat-Resistant, Bars, Wire, Forgings, and Tubing 15Cr - 25.5Ni - 1.2Mo - 2.1Ti - 0.006B - 0.30V Consumable Electrode Melted, 1800 ºF (982 ºC) Solution and Precipitation Heat Treated - UNS S66286
SAE AMS6322	Steel Bars, Forgings, and Rings 0.50Cr - 0.55Ni - 0.25Mo (0.38 - 0.43C) (SAE 8740) - UNS G87400
SAE AMS6370	Steel, Bars, Forgings, and Rings 0.95Cr - 0.20Mo (0.28 - 0.33C) (SAE 4130)
SAE AMS-QQ-P-416	Plating, Cadmium (Electrodeposited)
SAE AMS-QQ-P-225/6	Aluminum Alloy, 2024, Bar, Rod, and Wire; Rolled, Drawn, or Cold Finished - UNS A92024
SAE AS8879	Screw Threads - UNJ Profile, Inch Controlled Radius Root with Increased Minor Diameter

(Copies of these documents are available from www.sae.org or the Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096-0001.)

2.4 Order of precedence. Unless otherwise noted herein or in the contract, in the event of a conflict between the text of this document and the 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.

3. REQUIREMENTS

3.1 Specification sheets. The individual item requirements shall be as specified herein and in accordance with MIL-DTL-45932/1, MIL-DTL-45932/2 and MIL-DTL-45932/3.

3.2 Material.

3.2.1 Carbon steel. Unless otherwise specified, (see 6.2), inserts made of carbon steel shall conform to the requirements of SAE AIR4127, composition 1117. (Inactive for new design after 12 November 1973.)

3.2.2 Alloy steel. Unless otherwise specified, (see 6.2), inserts may be made of alloy steel conforming to the requirements of SAE AMS6370, composition 4130 or SAE AMS6322, composition 8740.

3.2.3 Corrosion-resistant steel. When specified in the contract or order, inserts shall be made of corrosion-resistant steel conforming to the requirements of SAE AIR4127, composition 303; or SAE AMS5731, SAE AMS5732, SAE AMS5734 or SAE AMS5737, composition A286; or SAE AMS5643, composition 17-4 PH.

3.2.4 Beryllium copper. When specified in the contract or order, inserts shall be made of beryllium copper conforming to the requirements of SAE AMS 4650.

3.2.5 Recycled, recovered, environmentally preferable, or biobased materials. Recycled, recovered, environmentally preferable, or biobased materials should be used to the maximum extent possible, provided that the material meets or exceeds the operational and maintenance requirements, and promotes economically advantageous life cycle costs.

3.3 Protective plating or surface treatment. Inserts shall be furnished with a protective plating or surface treatment as specified herein.

3.3.1 Cadmium plating. Carbon steel, alloy steel, and beryllium copper inserts shall be cadmium plated in accordance with SAE AMS-QQ-P-416, Type II, Class 2 or as specified in the applicable specification sheet.

3.3.2 Passivation. Corrosion-resistant steel inserts shall be passivated in accordance with SAE AMS2700 or as specified in the applicable specification sheet.

3.3.3 Silver plating. Inserts made of corrosion-resistant steel, shall be silver plated in accordance with ASTM B700, Type 3, Grade D, Class N, 0.0002 inch minimum thickness or SAE AMS2411, grade B, .0002 thick minimum, as specified in the applicable specification sheet.

3.3.4 Zinc Nickel plating. As an alternative to cadmium plating, carbon steel, alloy steel and beryllium copper inserts may be ZnNi plated in accordance with ASTM F1941 Fe/Zn-Ni 8ET alkaline zinc nickel electroplate, 12%-16% mass percent nickel, with chemical conversion coating per MIL-DTL-5541 TYPE II CLASS 1A.

3.4 Lubrication. Inserts with self-locking internal threads shall be solid film lubricated as specified in the applicable specification sheet. The lubricant shall conform to MIL-PRF-46010 and be examined per 4.5.5.

3.5 Construction. The inserts shall be of metal, one piece, with an integral metallic or non-metallic locking device as specified on the applicable specification sheets.

3.6 Design, dimension, and tolerances. Inserts shall be in accordance with the design, dimensions, and tolerances as specified on the applicable specification sheets. These dimensions and tolerances shall apply after the protective plating or surface treatment and prior to the application of the lubricant as specified in 3.4.

3.7 Threads. Unless otherwise specified (see 6.2) the insert internal and external threads shall be right-hand.

3.7.1 Internal threads. Internal threads shall conform to MIL-S-7742 or SAE AS8879. Sizes and dimensions shall be as specified on the applicable specification sheet. Thread gaging shall be performed after plating and prior to the application of the lubricant where applicable. When an internal locking feature is employed, the GO plug gage shall enter a minimum of 3/4 turn before engagement of the internal locking device.

3.7.2 External threads. External threads shall be in accordance with SAE AS8879 except minor diameters shall be as specified on the applicable specification sheet.

3.7.3 Lead threads. External lead threads shall not exceed two pitches, including chamfer.

3.7.4 Thread forming. Threads may be produced either by machining, grinding, or fully formed by a single rolling process prior to plating.

3.7.5 Concentricity. The internal thread pitch diameter shall be concentric with the external thread pitch diameter within 0.006 TIR when tested as specified in 4.5.3.

3.7.6 Thread locking feature. The locking feature may be either metallic or non-metallic and may be installed in a location as described on the applicable specification sheet. The non-metallic locking feature shall be in accordance with L-P-410. When the insert is properly installed in the parent material, it will provide a locking torque with a mating screw or bolt that is within the limits of Table I when tested as specified in 4.6.1. Inserts shall not be subject to self-locking tests after testing as specified in 4.6.2, 4.6.3, or 4.6.4.

TABLE I. Internal Thread Self-Locking Torque (Inch-Pounds).

Insert Internal Thread Nominal Size Fine or Coarse	Max Locking Torque	Min Breakaway Torque
.060	1/	1/
.086	2.5	1/
.112	5	1/
.138	10	1.0
.164	15	1.5
.190	18	2.0
.250	30	3.5
.3125	60	6.5
.375	80	9.5
.4375	100	14.0
.500	150	18.0
.5625	200	24.0
.625	300	32.0
.750	400	50.0
.875	600	70.0
1.000	800	90.0

1/ Some indication of torque

3.8 Surface roughness. Surface roughness of the inserts prior to plating shall not exceed the values stated on the applicable specifications and shall conform to ASME-B46.1.

3.9 Mechanical properties. Inserts conforming to the design and dimensions of the applicable specification sheets shall be capable of developing a load rating, ultimate tensile strength, and a minimum axial strength and have shear engagement areas in accordance with Table II.

TABLE II. Mechanical Properties.

Load Rating PSI	Minimum Tensile Strength PSI	Shear Engagement Area (External Threads)
125,000	125,000	Table IV

3.9.1 Minimum applied axial load. The installed insert shall develop the axial load as specified on Table III. Axial values are based on the tensile stress area of 125,000 PSI test bolt and the minimum tensile strength as specified in Table II of the applicable specification when tested as specified in 4.6.2.

3.9.2 Resistance to pullout. Inserts shall demonstrate average shear engagement areas as specified in Table IV. The installed insert shall have a mean (arithmetical average) resistance to pullout from the parent material as specified in Table V when tested as specified in 4.6.3. The values on the table are based on the mean shear engagement areas of the inserts when properly installed in a test block having a shear strength of 25,000 PSI.

TABLE III. Axial Load for Inserts Internal Threads.

Nominal Size (Internal Threads)	Tensile 1/ Stress Area (In.²)		Minimum Applied Axial Load (Lbs.) 2/	
	Coarse Thread	Fine Thread	Coarse Thread	Fine Thread
.060	----	.0018	----	225
.086	.0037	.0039	460	490
.112	.0060	.0066	750	825
.138	.0091	.0101	1,140	1,260
.164	.0140	.0147	1,750	1,840
.190	.0175	.0200	2,190	2,500
.250	.0318	.0364	4,000	4,550
.3125	.0524	.0580	6,600	7,300
.375	.0775	.0878	9,700	11,000
.4375	.1063	.1187	13,300	14,800
.500	.1419	.1599	17,700	20,000
.5625	.182	.203	22,700	25,400
.625	.226	.256	28,200	32,000
.750	.334	.373	41,700	46,600
.875	.462	.509	57,700	63,600
1.000	.606	.663	75,700	82,800

1/ The tensile stress area used for the calculation of the axial load values are based on the stress area per Screw-Thread Standards for FED-STD-H28.

2/ The minimum applied axial load shown is the product of the applicable tensile stress area times 125,000 PSI.

TABLE IV. Shear Engagement Area Insert External Thread.

Nominal Size Internal Thread	Mean Shear Engagement Area (In.²) 1/					
	MIL-DTL-45932/1 and Inactive Dash Numbers of MIL-DTL-45932/2	MIL-DTL-45932/2 – Active Dash Numbers				
		-004 Thru -021	-104 Thru -121	-204 Thru -227	-304 Thru -327	-404 Thru -421
.060	.0090					
.086	.0196	.0196		.0330		.0155
.112	.0330	.0330		.0454		.0261
.138	.0504	.0504		.0618		.0358
.164	.0736	.0736		.0860		.0618
.190	.1000	.1000		.1389		.0723
.250	.1820	.1820		.2336		.1201
.3125	.2920	.2920		.3745		.1927
.375	.4400			.5523		
.4375	.5920					
.500	.8000			.9428		
.5625	1.0160					
.625	1.2800					
.750	1.8640					
.875	2.8430					
1.000	3.4010					

1/ Shear Engagement Area is the assembled dimensional value for the overall engaged area of mating thread members. It does not represent a dimension of either of the members in an unassembled condition.

TABLE V. Resistance to Pullout Insert External Thread.

Nominal Size Internal Thread	Mean Shear Engagement Area (Lbs.) 1/					
	MIL-DTL-45932/1 and Inactive Dash Numbers of MIL-DTL-45932/2	MIL-DTL-45932/2 – Active Dash Numbers				
		-004 Thru -021	-104 Thru -121	-204 Thru -227	-304 Thru -327	-404 Thru -421
.060	225					
.086	490	490		825		390
.112	825	825		1,130		650
.138	1,260	1,260		1,550		900
.164	1,840	1,840		2,150		1,550
.190	2,500	2,500		3,450		1,950
.250	4,550	4,550		5,850		3,000
.3125	7,300	7,300		9,350		4,800
.375	11,000			13,800		
.4375	14,800					
.500	20,000			23,500		
.5625	25,000					
.625	32,000					
.750	46,000					
.875	71,000					
1.000	85,000					

1/ Pullout Load = (Shear Engagement Area) X (25,000 PSI). To compute minimum pullout load in other materials, multiply Shear Engagement by applicable ultimate shear strength of material.

3.9.3 Rotational resistance. The installed inserts shall develop the values listed in Table VI when tested as specified in 4.6.4.

TABLE VI. Rotational Resistance Insert External Thread.

Nominal Size Internal Thread	Mean Shear Engagement Area (Lbs.) 1/					
	MIL-DTL-45932/1 and Inactive Dash Numbers of MIL-DTL-45932/2	MIL-DTL-45932/2 – Active Dash Numbers				
		-004 Thru -021	-104 Thru -121	-204 Thru -227	-304 Thru -327	-404 Thru -421
.060	4					
.086	10	10		20		8
.112	20	20		25		15
.138	30	30		35		20
.164	45	45		50		40
.190	60	60		75		50
.250	100	100		120		65
.3125	160	160		200		4,800
.375	240			260		
.4375	350					
.500	450			450		
.5625	600					
.625	900					
.750	1,200					
.875	1,500					
1.000	1,900					

3.9.4 Hardness. Inserts shall have a hardness range as specified on the applicable specification sheets when tested as specified in 4.6.5.

3.10 Metallurgical properties.

3.10.1 Discontinuities. Inserts shall not contain discontinuities which exceed the following limitations when examined as specified in 4.6.7. When visual inspection discloses discontinuities which show cause for further examination, magnetic particle or penetrant inspection as applicable shall be specified.

3.10.1.1 Cracks. Inserts shall be free from cracks in any direction or location.

3.10.1.2 Laps and seams. Inserts shall not have laps or seams except in locations as shown in Figure 1 and as specified in 3.10.2. Laps and seams shall not exceed 20% of the thread height (sharp V thread).

3.10.1.3 Inclusions. Inserts shall show no evidence of surface or subsurface inclusions at the thread root when examined as specified in 4.6.7. Small inclusions in other parts of the insert, not indicative of unsatisfactory quality, shall not be cause for rejection.

3.10.2 Thread discontinuities. (laps, seams, and surface irregularities in rolled threads). Threads shall have no laps at the root or along the flanks as shown in Figure 1. Laps at the crest shall not exceed 20% of the basic thread height. Slight deviation from the thread contour is permissible at the crest of the thread as shown in Figure 1. The incomplete thread at each end of the insert may also deviate slightly from contour. The basic thread height is shown in Table VII.

3.11 Workmanship. Workmanship shall be consistent with the type of product, finish and class of thread fit specified in the applicable specification sheets. Inserts shall be of uniform quality and free from defects which would be detrimental to the performance of the inserts.

TABLE VII. Basic Thread Height Unified Threads.

Threads Per Inch	Basic Thread Height (Ref)	20% Base Thread Height
48	0.0135	0.0027
40	0.0162	0.0032
32	0.0203	0.0041
28	0.0232	0.0046
24	0.0271	0.0054
20	0.0325	0.0065
18	0.0361	0.0072
16	0.0406	0.0081
14	0.0464	0.0093
13	0.0500	0.0100
12	0.0541	0.0108
11	0.0590	0.0118
10	0.0650	0.0130

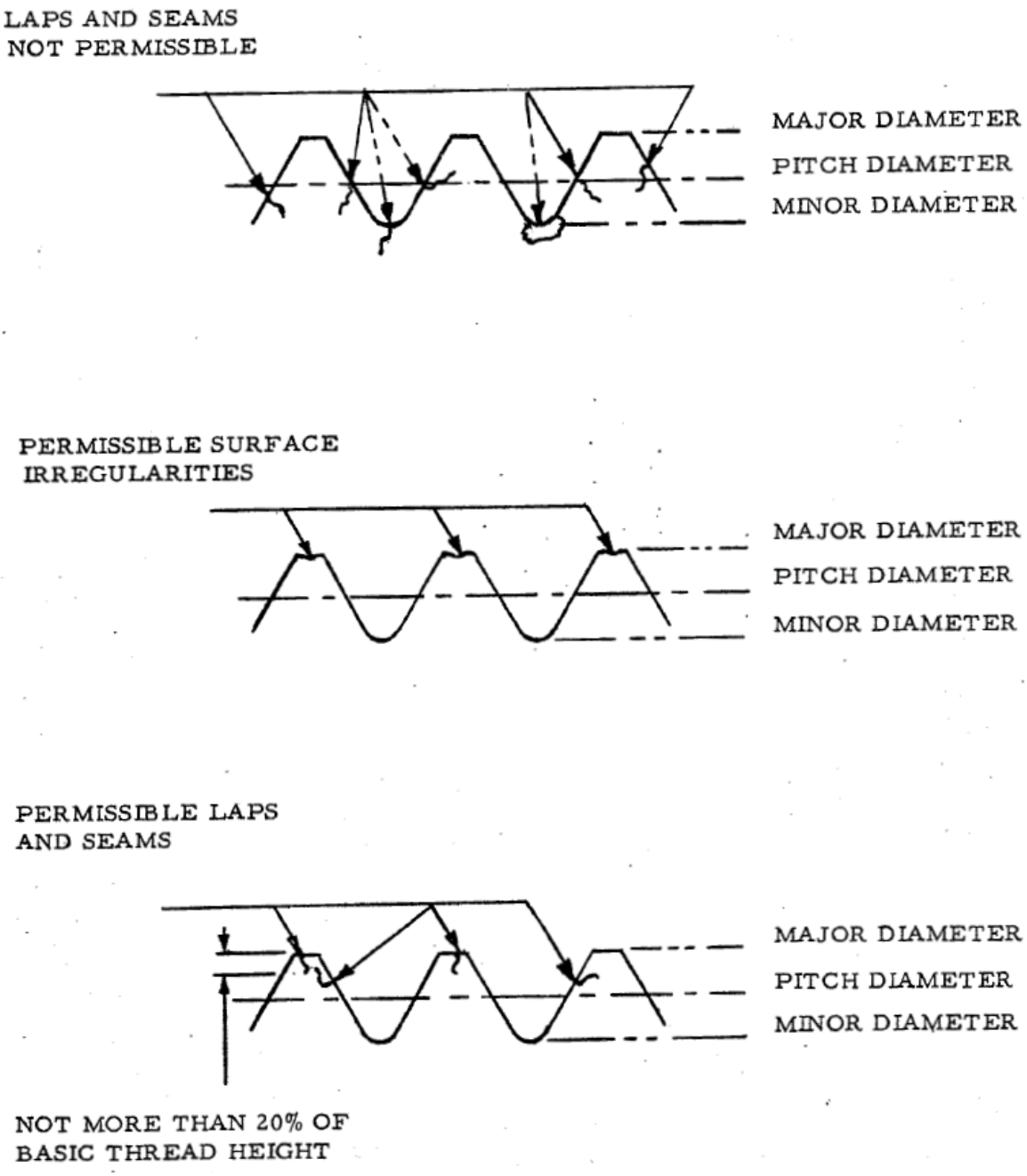


FIGURE 1. Thread Discontinuities.

4. VERIFICATION

4.1 Conformance inspection. Conformance inspection shall include the following.

4.2

4.3 Acceptance tests. Test methods for acceptance shall consist of examination and tests.

4.4 Sampling for lot inspections.

4.4.1 Lot. A lot shall consist of finished inserts which are of the same material, type, size, fabricated by the same process, and produced as one continuous run or order, or part thereof, and submitted for acceptance inspection at the same time.

4.4.2 Sampling for test materials.

4.4.2.1 Test blocks. Test blocks shall be fabricated as specified in Figure 2 as applicable. Larger test blocks for multiple testing of inserts are permissible except for test of 4.6.2 and 4.6.3.

4.4.2.2 Test specimens. Test specimens taken in accordance with 4.4.4 shall be installed in accordance with the applicable specification sheets in test blocks as specified in 4.4.2.1.

4.4.2.3 Test bolts and screws. Bolts and screws for use in all tests shall have Class 3A threads.

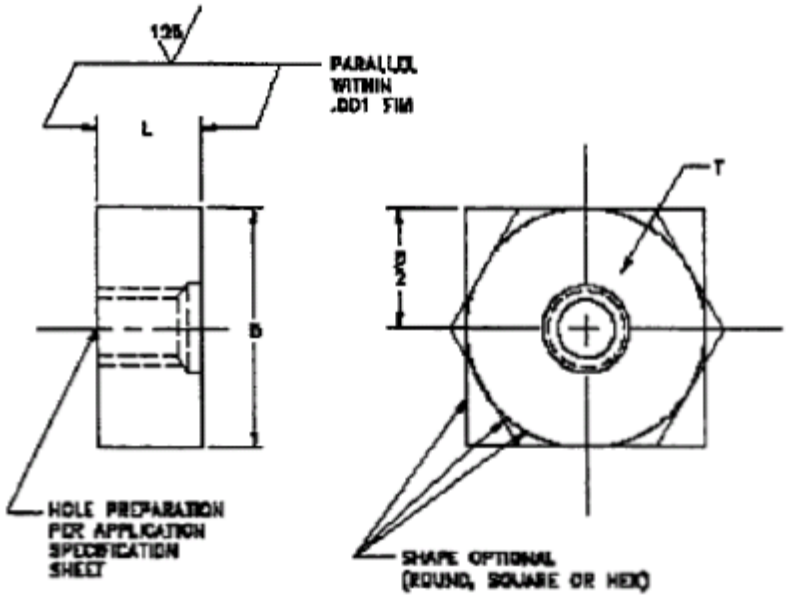
4.4.2.3.1 Bolts and screws used for testing as specified in 4.6.2, 4.6.3, and 4.6.4 shall be heat treated to 160,000 PSI minimum tensile strength and shall be cadmium plated per SAE AMS-QQ-P-416, Type II, Class 2.

4.4.2.3.2 Bolts and screws used for tests as specified in 4.6.1 shall be of corrosion-resistant steel and shall be passivated per SAE AIR4127 for testing with corrosion-resistant steel inserts. Cadmium plated noncorrosion-resistant steel bolts shall be used for testing carbon steel and alloy steel inserts.

4.4.3 Sampling for examination. A random sample of inserts shall be taken from each lot in accordance with ASQ Z1.4 at Inspection Level II.

4.4.4 Sampling for test. Sampling for test of inserts shall be in accordance with ASQ Z1.4, Inspection Level S-1.

4.4.5 Sampling for protective finishes. Sampling for test of protective finishes shall be in accordance with the applicable finish specification of 3.3.1, 3.3.2, and 3.3.3.



Notes:

1. Dimensions:

   T – Nominal thread diameter of applicable insert external thread.

   D – 4 x T. (Optional 2 x T may be used).

   (a) L – Length of applicable insert plus .020 for rotational resistance tests (see 3.9.3).

   (b) L – Length of applicable insert plus .063 for internal locking and breakaway torque tests (3.7.6).

   (c) L – Length of applicable insert plus .063 for axial and pullout tests (3.9.1), (3.9.2).

2. Material:

   (a) Aluminum alloy, 2024-T4 per SAE AMS-QQ-A-225/6 (bar) (UNS A92024)

   (b) Aluminum alloy, 2024-T4 per SAE AMS-QQ-A-225/6 (bars and rods) (UNS A92024)

   (c) Aluminum alloy 5083-H321 per ASTM B928/B928M (UNS A95083). For pullout (3.9.2) Optional material: 6061-R6 per AMS4117 or 6061-T651 per AMS4128.

FIGURE 2. Torque and Axial Load Test Blocks.

4.5 Examination.

4.5.1 External threads. External threads shall be checked for thread form per SAE AS8879, and minor diameter dimensions per applicable specification. Pitch diameter are to be inspected using the three (3) wire or equivalent method.

4.5.2 Internal threads. Internal threads shall be examined in accordance with SAE AS8879.

4.5.3 Concentricity. The concentricity of the internal and external thread pitch diameters shall be checked following examination per 4.5.1 and 4.5.2. The internal thread pitch diameter shall be concentric with the external thread pitch diameter per 3.7.5. Method used for checking concentricity is optional.

4.5.4 Finish, dimensions, and surface roughness. Finish, dimensions, and surface roughness shall be checked visually and by means of applicable gages.

4.5.5 Lubrication. The solid film lubricant coating shall be examined visually and microscopically at a magnification of 10X for uniformity in color, smoothness, and thickness, and evidence of cracks, bubbles, blisters, runs, foreign matter, grit, separation of ingredients, and other surface imperfections.

4.5.6 Classification of defects. The classification of defects for inserts shall be in accordance with Table VIII. Any insert containing one or more defects shall be considered a defective unit. The total number of defective units which will reject a lot shall be in accordance with Table I and IV-A of ASQ Z1.4.

TABLE VIII. Classification of Defects.

Categories	Defects	Method of Inspection
Critical	None	
Major		
101	Material (3.2)	Chemical Analysis
102	Lubrication (3.4)	Visual
103	Description and dimensions (3.6)	Measure
104	Thread size and form (3.7.1 & 3.7.2)	Measure
105	Concentricity (3.7.5)	Measure
106	Thread locking element present (3.7.6)	Visual
107	Surface roughness (3.8)	Measure or Comparison
108	Thread discontinuities (3.10.2)	Measure
Minor		
201	Lead threads (3.7.3)	Visual

4.5.7 Inspection of installed inserts. The inserts when installed as specified in the applicable specification sheets shall be visually inspected under 10X magnification. The presence of cracks in either test block or insert as a result of installation shall be cause for further examination, test specimen shall be penetrant inspected in accordance with ASTM E1417/E1417M.

4.6 Test methods.

4.6.1 Internal thread self-locking test. Test specimens installed in test blocks (Figure 2) as specified shall be used for the torque testing of the internal locking feature when applicable.

4.6.1.1 Screw locking torque. The locking torque shall consist of a 15-cycle room temperature torque test, using test blocks conforming to Figure 2 and screws conforming to 4.4.2.3.2 with sufficient thread length to extend beyond the locking feature a minimum of two (2) pitches (including bolt thread chamfer). A new bolt or screw and a new test specimen shall be used for each complete 15-cycle test. Bolts and screws must assemble freely, with the fingers up to the locking feature. The bolt or screw shall be engaged or disengaged from the assembled insert self-locking area for 15 full installation and removal cycles without axial load on the insert. The test shall be run at a rate slow enough to yield a dependable measure of torque and avoid heating the bolt. A bolt shall be considered fully installed when two threads extend past the end of the locking feature of the insert; the removal cycle shall be considered complete when the locking feature is disengaged.

4.6.1.2 Maximum locking torque. Maximum locking torque shall be the maximum torque value encountered on any installation or removal cycle, and shall not exceed values specified in Table I. Maximum locking torque readings shall be recorded on the first, seventh, and fifteenth installation cycles.

4.6.1.3 Minimum breakaway torque. Minimum breakaway torque shall be the minimum torque required to start removal of the screw or bolt from a fixed position located between the first 1/4 turn to 1 turn of the removal cycle. Minimum breakaway torque readings shall be recorded at the start of the first, seventh, and fifteenth removal cycles. The torque value for any cycle shall not be less than the applicable value shown in Table I.

4.6.2 Axial strength test. Test specimens installed in test blocks (Figure 2) as specified in 4.4.2.2 shall be used for axial strength testing. The test bolt shall assemble freely into the insert prior to engaging the self-locking device with finger torque. The test bolt thread shall be of sufficient length to fully engage the entire length of the insert internal thread. The bushing and test block clearance holes in the upper and lower yokes (see Figure 3) shall have a free fit not in excess of 0.060 inches greater than the bushing and test block diameters. The bolt clearance hole in the upper bushing (see Figure 4) shall be .005 to .015 inches diameter larger than the nominal diameter of the test bolt. The bolt clearance hole in the lower yoke shall have a diameter of 1 1/2 times the nominal insert external thread diameter ± .015. The axial load value determined by Table II and specified in Table III, shall be applied to the assembly and the failure of the insert shall not occur below the loads specified. In the event of bolt failure below the axial strength rating, the tests shall be repeated until the applicable axial strength rating of the insert is reached or exceeded. Rate of loading shall not exceed 100,000 PSI per minute based on the shank diameter area of the bolt.

4.6.3 Resistance to pullout test. Test specimens installed in test blocks (Figure 2) as specified in 4.4.2.2 shall be used for the resistance to pullout tests. The minimum single shear strength of the test block material, shall be determined by means of double shear tests of coupons taken from the material from which the test blocks are fabricated. The procedure shall be the same as required for 4.6.2 except to demonstrate the average shear engagement area, an axial load of a magnitude sufficient to produce failure (pullout) shall be applied to the assembly. The axial load test result shall be adjusted for test block shear strength as follows: the product of the axial load test results (pounds) and the ratio of the 25,000 PSI to the actual minimum shear strength shall be used as the resistance to pullout (pounds). The mean (arithmetical average) value as determined by five (5) or more tests, must meet or exceed the values as shown in Table V. In the event of bolt failure below the applicable strength rating, the test shall be repeated until the applicable pullout strength rating of the insert is reached or exceed. Rate of loading shall not exceed 100,000 PSI per minute per square inch based on the shank diameter area of the bolt. Whenever the pullout values exceed the capabilities of the test equipment, it is permissible to use lower shear strength materials (15,000 PSI approx.) in lieu of test block materials specified in 4.4.2.1. Double shear tests on coupons taken from the lower shear strength test blocks shall be performed and the resultant shear strength used to adjust the test results as stated above.

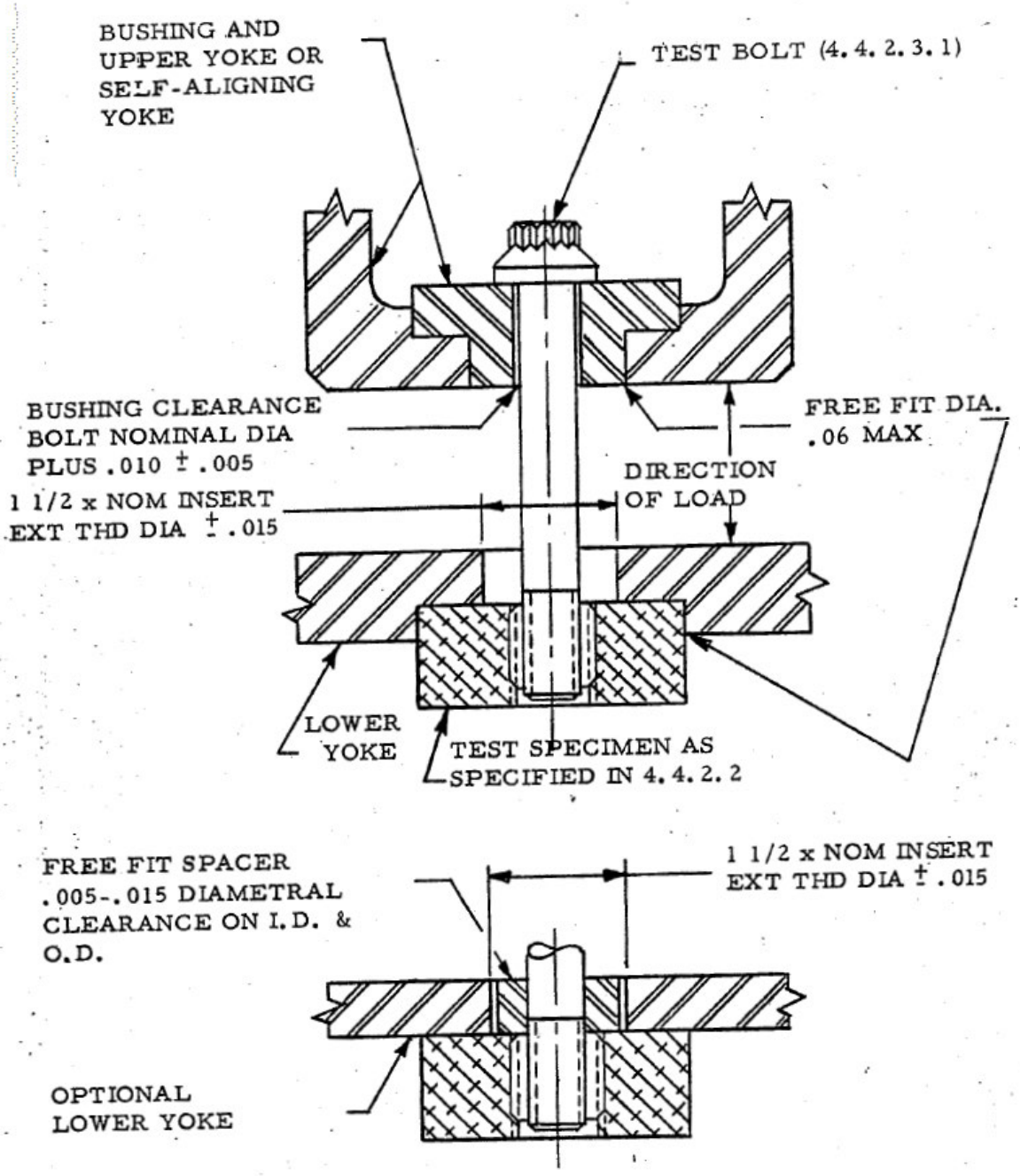


FIGURE 3. Axial Load Test Fixture (3.9.1) and Resistance to Pullout Fixture (3.9.2).

4.6.4 Rotational resistance tests. Test specimens installed in test blocks (Figure 2) shall be used for the rotational resistance test. Torque values shall not be less than the values specified in Table VI, using a test assembly as illustrated in Figure 4. When the forward side of the insert is installed per the applicable specification sheet, the far side of the insert shall be flush or below the far side of the test block. A hardened steel bushing, which has been counterbored shall be positioned over the insert. The counter bore in the steel bushing shall be to a diameter greater than the external thread major diameter of the applicable insert. The test bolt of 160,000 PSI minimum tensile shall be positioned through the bushing and shall enter the insert from the back side (opposite normal entry). The test bolt shall be torqued in a clockwise direction. Failure values below those specified in Table IV shall be cause for rejection.

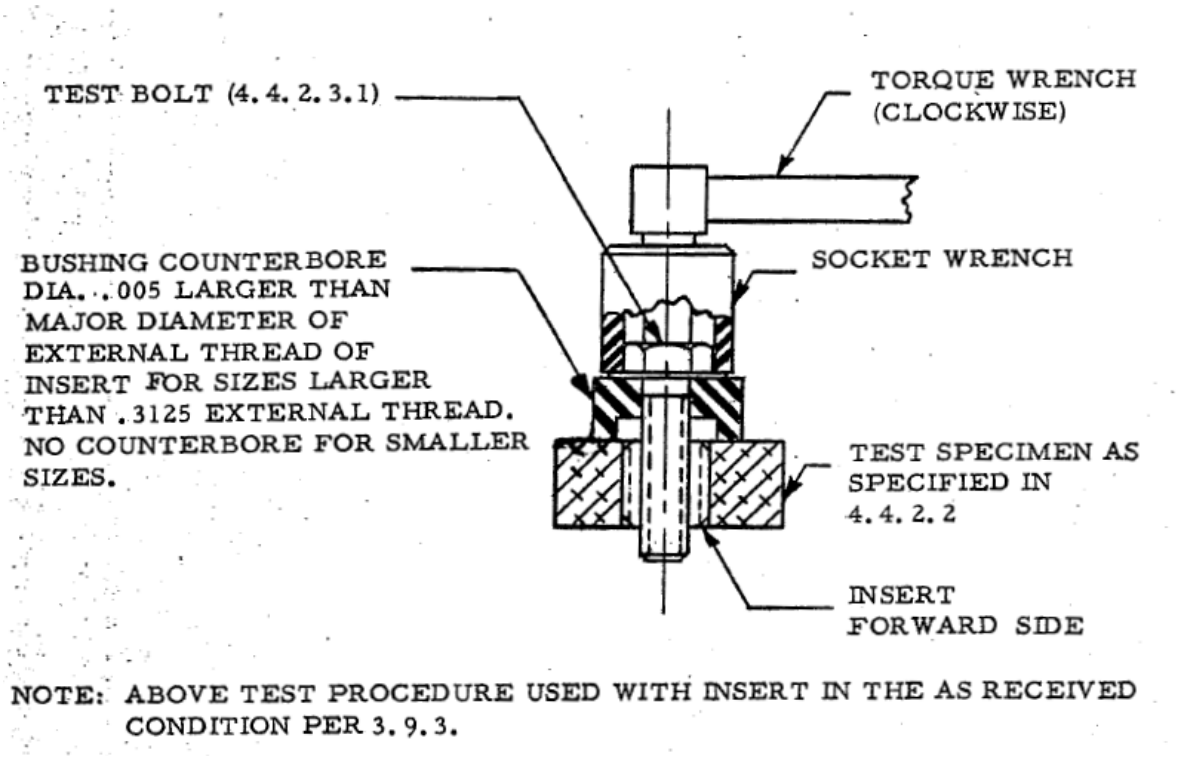


FIGURE 4. Torque Test Fixtures.

4.6.5 Hardness test. Samples taken in accordance with 4.4.4 shall be tested for hardness requirements of 3.9.4. The test procedure shall be NASM1312-6.

4.6.6 Chemical analysis. The sample insert taken in accordance with 4.4.4 shall be tested for composition requirements of 3.2. The test procedure shall be ASTM E1282.

4.6.7 Discontinuities. Penetrant inspection performed in accordance with ASTM E1417/E1417M for corrosion-resistant steel shall be used to determine the presence of discontinuities such as cracks, laps, seams, and inclusions. Penetrant inspection alone shall not be cause for rejection. If indications are considered cause for rejection, representative samples shall be taken from those inserts showing indications and these samples shall be further examined. Inserts may be sectioned and discontinuities measured microscopically under 10X magnification to determine conformance to the requirements of 3.10.1. The inspection shall be performed on finished inserts, free of lubrication and subsequent to any processing operation which could adversely affect the inserts. Requirements for dye as an indication of particle inspection may be waived.

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the military service's system commands. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. Inserts covered by this specification are intended for use as a general purpose fastener with a metallic or a non-metallic locking device to resist rotation.

6.2 Acquisition requirements. Acquisition documents should specify the following:

a. Title, number and date of this specification.
b. Title, number and date of applicable Military specification sheet (see 3.1).
c. Applicable part number.
d. Material, if other than as specified in 3.2.
e. Threads other than right-hand shall be specified (see 3.7).
f. Packaging requirements (see 5.1).

6.3 Definitions.

6.3.1 Crack. A crack is a clean crystalline break passing through the grain or grain boundary without the inclusion of foreign elements.

6.3.2 Lap. A lap is a surface defect appearing as a seam, caused by the folding over of metal fins or sharp corners and then rolling or forging them into the surface, but not welding them.

6.3.3 Seam. A seam is an unwelded fold or lap which appears as an opening in the raw material as received from the source.

6.3.4 Inclusions. Inclusions are non-metallic materials in a solid metallic matrix.

6.4 Subject term (key word) listing.

Beryllium copper
Cadmium
Passivation

6.5 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extent of the changes.

Custodian:
Army - AR
Navy - AS
Air Force - 99
DLA - IS

Preparing Activity:
DLA - IS

(Project 5325-2014-010)

Review Activity:
Army - AT, AV, CR4, MI
Navy – MC, OS, YD
Air Force – 71
Other - NS

NOTE: The activities listed above were interested in this document as of the date of document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at https://assist.dla.mil.