

FED. SUPPLY CLASS

5320

1. SCOPE

1.1 Scope. This specification covers installation formed high strength, corrosion resistant, heat resistant steel and titanium fasteners which can be installed from only one side of an assembly.

1.2 Classification. Fasteners furnished under this specification shall be of the following types and classes:

Type I – Pull Type - Positive Mechanically Locked (see 6.3.1)

Type II – Threaded - Self Locking (see 6.3.1)

Class 1 – 95 KSI Fsu, Corrosion and Heat Resistant Steel

Class 2 – 75 KSI Fsu, Titanium

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 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, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto, cited in the solicitation (see 6.2).

SPECIFICATIONS

DEPARTMENT OF DEFENSE

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

MIL-PRF-81329 Lubricant, Solid Film, Extreme Environment

MIL-STD-2073/1 Standard Practice For Military Packaging

Copies can be obtained from the Department of Defense Single Stock Point (DODSSP). <http://dodssp.daps.dla.mil>

STANDARDS

MILITARY

MIL-STD-129 Marking for Shipment and Storage

MIL-STD-889 Dissimilar Metals

Copies can be obtained from the Department of Defense Single Stock Point (DODSSP). <http://dodssp.daps.dla.mil>

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THE INITIAL RELEASE OF THIS DOCUMENT SUPERSEDES MIL-F-8975 REVISION B, AMENDMENT 4.

THIRD ANGLE PROJECTION	CUSTODIAN NATIONAL AEROSPACE STANDARDS COMMITTEE	REVISION 1
PROCUREMENT SPECIFICATION NONE	TITLE FASTENER, BLIND, HIGH STRENGTH, INSTALLATION FORMED, CRES, HEAT RESISTANT STEEL AND TITANIUM, GENERAL SPECIFICATION FOR	CLASSIFICATION PART STANDARD NASM8975 SHEET 1 OF 23

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 the documents which are DoD adopted are those listed in the issue of the DoDISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DoDISS are those of the documents cited in the solicitation (see 6.2).

AMERICAN SOCIETY FOR QUALITY (ASQ)

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

Copies can be obtained from the American Society for Quality, 600 North Plankinton Ave., Milwaukee, WI 53203. www.asq.org

ASME

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

Copies can be obtained from ASME, Three Park Ave., New York, NY 10016-5990. www.asme.org

ASTM INTERNATIONAL

ASTM E1417 Standard Practice for Liquid Penetrant Examination
ASTM D3951 Standard Practice For Commercial Packaging

Copies can be obtained from ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959. www.astm.org

AEROSPACE INDUSTRIES ASSOCIATION OF AMERICA (AIA/NAS)

NASM1312 Fastener Test Methods

Copies can be obtained from the Aerospace Industries Association, 1000 Wilson Blvd., Suite 1700, Arlington, VA 22209. www.aia-aerospace.org

SAE INTERNATIONAL

AMS5639 Bars, Forgings, Tubing and Rings – 19 Cr 10 Ni Sol. Heat Treated
AMS5641 Bars and Forgings, 18.5 Cr 10 Ni, Free Machining; Swaging or Upsetting Sol. Heat Treated
AMS5731 AND 5732 Bars, Forgings, Tubing and Rings – 15 Cr 26 Ni 1.3 Mo
AMS5737 Bars, Forgings and Tubing – 15 Cr 26 Ni 1.3 Mo 2.1 Ti
AMS2700 Passivation Treatments for CRES
AMS-QQ-P-416 Plating, Cadmium (Electrodeposited)
AMS-T-9047 Titanium and Titanium Alloy Bars, Forgings and Forging Stock
AS87132 Lubricant, Cetyl Alcohol, 1 Hexadecanol, Application to Fasteners
AS5272 Lubricant, Solid Film, Heat Cured, Corrosion Inhibiting

Copies can be obtained from SAE International, 400 Commonwealth Dr., Warrendale, PA 15096-0001. www.sae.org

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FORM 09-01

2.4 Order of precedence. In the event of 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 the applicable specification sheets. In the event of any conflict between requirements of this specification and the specification sheets, the latter shall govern.

3.2 Verification of compliance. Manufacturers shall verify that fasteners furnished under this specification meet specified requirements (see 4.3).

3.2.1 Retention of verification of compliance. Manufacturers shall maintain on file certified test reports (see 4.3.1) available for inspection by the procuring activity.

3.3 Design and construction (Type I). The fastener shall be of a multiple piece construction and furnished as an integral assembly. It shall consist of a bolt body, spindle and locking collar. It shall have a means, other than friction, of mechanically locking the spindle to the bolt body.

3.3.2 Dimensions. The fastener dimensions shall conform to the applicable specification sheet or standard.

3.3.3 Roundness and concentricity of heads. Fastener heads shall be round and concentric within the limits specified in Table I.

3.3.4 Blind head diameters. The blind head diameters shall be as specified in Table II.

3.3.5 Grip lengths. Grip lengths for all diameters shall be in 1/16 inch increments.

3.3.6 Materials (Type I). Fasteners furnished under this specification shall be in accordance with the applicable specification sheet or standard.

3.3.6.1 Dissimilar materials. The use of dissimilar materials shall be in accordance with MIL-STD-889.

3.3.7 Lubricant. Lubricant maybe used on any components, provided the lubricant is not detrimental to the corrosion resisting capabilities of the fastener. The lubricant may be Cetyl alcohol in accordance with AS87132; Lauric Acid, WWM Carbo Wax; or, dry film lubricant in accordance with ~~MIL-PRF-46010~~ AS5272.

3.3.8 Protective treatment. When specified, the steel shall be cadmium plated in accordance with AMS-QQ-P-416, Type II, Class 2.

3.3.9 Passivation. All corrosion and heat resistant steel components shall be passivated in accordance with AMS2700, Method 1, Class 4.

3.4 Performance characteristics (Type I)

3.4.1 Installation. Installation shall be accomplished by the spindle being pulled into the sleeve, forming a blind head on the back side of the assembly, and removing the pulling portion of the spindle. A means of visual inspection for proper installation shall be provided (see 4.6.1).

3.4.2 Tensile strength and tensile preload. The ultimate tensile strength and tensile preload of the installed fastener shall be as specified in Table III (see 4.5.3).

3.4.3 Sheet take-up. The fastener shall have sufficient sheet take-up or pull-together to meet the requirements of Table IV, when tested in steel plates having a total thickness equal to the maximum grip of the fastener (see 4.5.4).

3.4.4 Ultimate single shear strength. The ultimate single shear strength of the installed fastener shall be as specified in Table III (see 4.6.2).

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- 3.4.5 Tension-tension fatigue. The fastener shall withstand an average of not less than 60,000 cycles, but no single specimen shall fail in less than 40,000 cycles (see 4.6.3).
- 3.4.6 Spindle retention. The spindle of the installed fastener shall withstand a steadily applied axial push out minimum load as specified in Table IV (see 4.6.4).
- 3.5 Discontinuities (Type I)
- 3.5.1 Seam and tool marks. Except as specified in 3.5.2 and 3.5.3, fasteners may possess seams and tool marks on any of the components of the fasteners. Seams and tool marks shall not be greater than the limits specified in Table V.
- 3.5.2 Fastener head. The fastener head shall not contain more than three imperfections (openings, seams, inclusions, nicks, gouges). The depth of the imperfection shall not be greater than the following:
- a. On the top of the head exceeding twice the depth limits shown in Table V.
 - b. On the periphery of the head exceeding four times the depth limits shown in Table V for protruding and flush head fasteners.
 - c. On the bearing surface of the head to depths exceeding the Table V values. Fastener surface shall not be mutilated so that firm seating is prevented.
- 3.5.3 Head shank junction. Longitudinal seams not greater than the limits of Table V are permitted in the head shank junction. Slight tool marks or undercuts of depth not greater than the limits specified in Table V are permitted provided they fair into the shank with no sharp scratches, gouges or corners.
- 3.6 Design and construction (Type II). The fastener shall be of a multiple piece construction and furnished as an integral assembly. It shall consist of a nut body, a corebolt, and a sleeve. A visible means shall be provided to lock the installed components together. The dimensions, concentricity, roundness and marking requirements shall be as specified on the applicable specification sheet or standard.
- 3.6.1 Component heads. The heads of all corebolts and nuts shall be forged.
- 3.6.2 Threads. The threads shall be left hand threads and the corebolt thread shall be formed by a single rolling process.
- 3.6.3 Materials (Type II). Materials shall be as specified on the applicable specification sheet or standard.
- 3.6.4 Penetrant inspection. The fasteners shall be fluorescent penetrant inspected (see 4.5.2).
- 3.7 Performance characteristics (Type II)
- 3.7.1 Installation. The fasteners shall be capable of being properly installed by driving equipment available at commercial and Government facilities. In addition, separate attachable nose adapters shall be supplied by the vendors listed in the appendix of this specification. The installed fastener shall meet the visual acceptance criteria of Figure 2. The corebolt breakoff limits, the formed sleeve outside diameter, the backside protrusion and the seating torque shall be as specified in Table XII (see 4.7.1).
- 3.7.1.1 Corebolt protrusion. Corebolt protrusion shall be the method of visual inspection. The protrusion shall be as specified in Table XII.
- 3.7.2 Ultimate tensile strength and tensile preload. The tensile strength and tensile preload of the driven fastener shall be as specified in Table X (see 4.5.3).
- 3.7.3 Sheet take-up. The fastener shall conform to the sheet take-up requirements of Table XI when tested in steel plates having a total thickness equal to the maximum grip of the fastener (see 4.5.4).
- 3.7.4 Ultimate double shear strength. The shear strength of the fastener shall be as specified in Table X (see 4.7.2).

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- 3.7.5 Tension-tension fatigue. The fasteners shall withstand an average of not less than 30,000 cycles, but no single specimen shall fail in less than 15,000 cycles (see Table XI and 4.7.3). The test shall be discontinued if the fastener does not fail after 100,000 cycles. No value above 100,000 cycles shall be used in calculating the average.
- 3.7.6 Vibration. Fasteners shall withstand not less than 30,000 cycles without failure. The relative rotation of the nut and corebolt shall not be greater than 360°. The fastener shall not develop cracks or broken segments (see 4.7.4).
- 3.7.7 Locking torque. The assembled fasteners shall develop locking torque values equal or greater than the minimum required torque in Table XI (see 4.7.5).
- 3.7.8 Metallurgical properties, Class 2 (Titanium)
- 3.7.8.1 Hydrogen content. The hydrogen content in the titanium components shall not be greater than .0125 percent (125 PPM) (see 4.7.6.1).
- 3.7.8.2 Widmanstaetten -Alpha case. Titanium components shall show no evidence of widmanstaetten or alpha case (see Figure 8, 4.7.6.2 and 4.7.6.3).
- 3.8 Discontinuities (Type II)
- 3.8.1 Cracks. Fastener components shall be free of cracks in any direction or location (see 6.3.2).
- 3.8.2 Laps and seams. Fastener components may possess laps and seams not exceeding the depths specified in Table IX, except in prohibited locations (see Figure 2).
- 3.8.3 Nuts. Discontinuities shall not be permitted in the head to shank fillet. Laps, seams, nicks and gouges are acceptable on the non-bearing surface of the head provided the depth is not greater than two times the value specified in Table IX.
- 3.8.4 Corebolts. Discontinuities shall not be permitted in the head to shank fillet. Thread laps which are not permissible and thread laps which are permissible within the limits of Table IX are shown in Figure 2. Laps, seams, nicks and gouges are acceptable on the nonbearing surface of the head provided the depth is not greater than three times the value specified in Table IX.
- 3.8.5 Sleeves. There shall be no longitudinal discontinuities in the sleeves.
- 3.9 Workmanship. The fasteners shall be free of burrs, scale, excessive seams and other defects which would adversely affect their intended use.

4. QUALITY ASSURANCE PROVISIONS

- 4.1 Responsibility for inspection. Unless otherwise specified in the contractor purchase order, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or purchase order, the contractor 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 Classification of inspections. The inspection requirements specified herein are classified as follows:
- a. Verification of compliance (see 4.3).
 - b. Quality conformance inspection (see 4.4).

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- 4.3 Verification of compliance. Manufacturers shall verify in writing that fasteners comply with or exceed the following requirements:
- Type I – Preload, sheet take-up, and tension-tension fatigue as specified in paragraphs 3.4.2, 3.4.3, and 3.4.5, respectively.
- Type II – Sheet take-up, tension-tension fatigue, vibration, and metallurgical as specified in paragraphs 3.7.3, 3.7.5, 3.7.6, and 3.7.8, respectively.
- 4.3.1 Certified test reports. Manufacturers shall maintain on file certified test reports indicating that both verification of compliance and quality conformance tests are met. Each report shall be available to the buyer upon request.
- 4.4 Quality conformance inspection. Quality conformance inspection shall be as specified in Table VI for Type I and Table XIII for Type II.
- 4.4.1 Inspection lot. An assembly inspection lot shall consist of finished assembled components of the same configuration, diameter, and heat of material. The inspection lot assemblies and their components shall have been manufactured under the same conditions, heat treated in the same manner in one continuous run, and presented for delivery at the same time.
- 4.4.1.1 Plating lot. A plating lot shall consist of all parts processed in the plating bath within a 24-hour period. Cadmium plating shall be in accordance with AMS-QQ-P-416, Type II, Class 2.
- 4.4.2 Sampling. Samples shall be selected at random in accordance with ANSI/ASQ Z1.4, Inspection Level and Acceptance Quality Level (AQL) as specified in Table VI for Type I and Table XIII for Type II. Identical sample items may be used for any of the tests, provided selection of random samples is maintained and known characteristics of the sample are not used to influence the integrity of the test results. Reduced sampling level may be instituted after five consecutive lots have passed the acceptance criteria.
- 4.4.3 Manufacturer's inspection report. Each inspection lot shall be accompanied by a copy of the manufacturer's inspection report, signed by an authorized representative of the manufacturer. The report shall be retained by the manufacturer (for five years) and made available, upon request, to the government. The report shall state that the fasteners are from an assembly lot which was manufactured and inspected in accordance with the requirements of this specification. The report shall identify the part number, assembly lot number and component lot numbers and shall include the actual test results of each of the tests specified herein. In addition, the report shall contain information concerning the test procedures and instrumentation used in the quality conformance inspections.
- 4.4.4 Material certification. Mill certification on all materials shall be kept on file and available to the government.
- 4.5 Inspection methods (Type I and II)
- 4.5.1 Examination. Each of the sample fasteners, selected at random in accordance with Table VI for Type I and Table XIII for Type II shall be examined for conformance to the requirements for dimensions, concentricity, roundness, locking feature integrity, protective treatment, and marking. These examinations shall be visual. Optical aids or special gages shall be used when necessary. All dimensions are considered defective when out of tolerance.
- 4.5.2 Penetrant inspection. Fasteners shall be fluorescent penetrant inspected in accordance with ASTM E1417, Type I, Method B. Penetrant inspection shall be performed before plating or with plating removed. Fasteners shall not be marked for identification of penetrant inspection. If penetrant indications are apparent, representative samples showing the indications shall be sectioned, mounted and microscopically examined for conformance to 3.5 or 3.8, as applicable.

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- 4.5.3 Ultimate tensile strength and tensile preload. Tensile strength tests and tensile preload tests shall be performed in accordance with MIL-STD-1312-8 and -16, except load deflection curves are not required. Tensile strength and preload tests are not applicable to fasteners having a grip length of less than twice the nominal diameter.
- 4.5.4 Sheet take-up. Each fastener shall be installed in a fixture similar to Figure 7. Hole diameters for fasteners shall be in accordance with Table VII for Type I and Table XII for Type II. The nut supporting the lower plate shall be adjusted to provide a gap between the plates as specified in Table IV for Type I and Table XI for Type II. Each fastener shall engage the lower plate of the test fixture and shall clamp it against the upper plate when driven.
- 4.6 Inspection methods (Type I)
- 4.6.1 Installation (Type I). Fasteners shall be driven in minimum grip $+0.000/-0.002$ and maximum grip $+0.002/-0.000$ in holes drilled within tolerances specified in Table VII. Installed fasteners shall be visually examined for conformance to Figure 1 and Table II. The installed fasteners shall be visually inspected to establish that discontinuities of the blind head do not exceed the following limitations:
- a. Longitudinal discontinuities shall not be greater than three times the limits of Table V.
 - b. Circumferential discontinuities shall not be greater than twice the limits of Table V.
 - c. General folds shall not be greater than twice the limits of Table V.
- 4.6.2 Ultimate single shear strength (Type I). Ultimate single shear tests shall be performed within the specified grip range of the fasteners in accordance with MIL-STD-1312-20. Shear tests are not applicable to fasteners having a grip less than one diameter for protruding head type and one and one-half diameters for flush head type. Fasteners subjected to this test shall meet minimum loads specified in Table III. The test need not be continued to destruction.
- 4.6.3 Tension-tension fatigue (Type I). Tension-tension fatigue tests shall be conducted using a thimble type fixture in accordance with Figure 6. Hole diameters shall be within the limits specified in Table VII. Fasteners shall be tested in minimum grip $-0.002/+0.000$ and in maximum grip $-0.000/+0.002$. Setup in Figure 6 allows for visual inspection of blind head after driving. Fasteners in this test shall have the preload eliminated by removal of a low temperature melting washer (Cerrolow or equivalent 1/32 inch thick) from between the thimble and shim. Fatigue testing machine and test setup shall conform to MIL-STD-1312-11.
- Test loading shall cycle between the minimum and maximum loads shown in Table IV. The cycling speed shall not be greater than 3,600 cycles per minute and test shall be performed at room temperature. Tests shall not be conducted beyond 200,000 cycles.
- 4.6.4 Spindle retention (Type I). The spindle retention test shall be performed using test plates and fixtures in accordance with MIL-STD-1312-8, as modified in Figure 9. The hole diameter shall be within limits specified in Table VII. The load shall be steadily applied, at the rate shown in Table VIII, to the top of the spindle from the top of the fastener. The lock shall withstand the minimum axial pushout load values specified in Table IV. Caution shall be exercised to ensure that mandrel force is applied directly in line with the axis of the spindle. A means of accurately determining the force applied to the mandrel shall be provided. Fasteners having a grip length of less than one diameter shall be tested with a bushing support having a clearance of approximately 1/32 inch around the blind head.
- 4.7 Inspection methods (Type II)
- 4.7.1 Installation (Type II). The fasteners shall be driven in hardened steel plates having a hardness of not less than 46 HRC and a surface finish on the blind side of 63-125 Ra in accordance with ASME B46.1. The fasteners shall be driven in the maximum grip $+0.002/-0.000$ and the minimum grip $+0.000/-0.002$. The installation hole sizes shall be in accordance with Table XII and the countersinks for flush head bolts shall be equal to the maximum theoretical sharp head diameter $+0.003$. The installed fastener shall be examined for conformance to the requirements shown in Figure 3 and Table XII. The seating torque shall be checked on the minimum grip samples only.

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