AEROSPACE STANDARD

AS4958™	REV. B

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Superseding AS4958A

Performance, Nut, Self-Locking, Castellated, Prevailing Torque, UNJ 16 Pitch Thread Form

RATIONALE

This document has been determined to contain basic and stable technology which is not dynamic in nature.

STABILIZED NOTICE

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1. SCOPE

1.1 Type

This document covers all metal, castellated, self-locking nuts made from alloy steel of the types identified under the Unified Numbering System as UNS G41300 and UNS G43400.

1.2 Application

Where self-locking nuts with UNJ 16 pitch thread form are required for use with standard AS8879 external threads.

2. REFERENCES

2.1 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.

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

AMS2411 Plating, Silver for High Temperature Applications

AMS6370 Steel, Bars, Forgings, and Rings, 0.95Cr - 0.20Mo (0.28 - 0.33C) (SAE 4130)

AMS6371 Steel, Mechanical Tubing, 0.95Cr - 0.20Mo (0.28 - 0.33C) (SAE 4130)

AMS6414 Steel, Bars, Forgings, and Tubing, 0.80Cr - 1.8Ni - 0.25Mo (0.38 - 0.43C) (SAE 4340) Vacuum Consumable Electrode Remelted

AMS 6415 Steel, Bars, Forgings, and Tubing, 0.80Cr - 1.8Ni - 0.25Mo (0.38 - 0.43C) (SAE 4340)

AMS-H-6875 Heat Treatment of Steel Raw Materials

AS478 Identification Marking Methods

AS1310 Fastener Torque for Threaded Applications, Definitions of

AS3071 Acceptance Criteria - Magnetic Particle, Fluorescent Penetrant, and Contrast Dye Penetrant Inspection

AS8879 Screw Threads - UNJ Profile, Inch, Controlled Radius Root with Increased Minor Diameter

2.1.2 U.S. Government Publications

Available from DLA Document Services, Building 4/D, 700 Robbins Avenue, Philadelphia, PA 19111-5094, Tel: 215-697-6396, http://quicksearch.dla.mil/.

MIL-PRF-7808 Lubricating Oil, Aircraft Turbine Engine, Synthetic Base

MIL-PRF-23699 Lubricating Oil, Aircraft Turbine Engine, Synthetic Base, Nato Code Number 0-156

2.1.3 ASME Publications

Available from ASME, 22 Law Drive, P.O. Box 2900, 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 B46.1 Surface Texture (Surface Roughness, Waviness, and Lay)

2.1.4 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM E18 Standard Test Methods for Rockwell Hardness of Metallic Materials

ASTM D3951 Standard Practice for Commercial Packaging

2.2 Definitions

PRODUCTION INSPECTION LOT: Shall be all finished parts of the same part number, made from a single heat of alloy, heat treated at the same time to the same specified condition, produced as one continuous run, and submitted for suppliers inspection at the same time.

ROOM TEMPERATURE: Ambient temperature (68 °F approximately).

Refer to AS1310 for definitions related to fastener torque.

2.3 Unit Symbols

°F degree, Fahrenheit
lbf-in pound-force inch, torque
HRC hardness, Rockwell C scale

3. TECHNICAL REQUIREMENTS

3.1 Material

Shall be alloy steel 4130 per AMS6370 or AMS6371, or alloy steel 4340 per AMS6414 or AMS6415 as specified on purchase order, unless otherwise specified on part drawing.

3.2 Construction

Each nut shall be a self-contained unit including the self-locking device. The locking device shall not operate by means of separate movement from the installation and shall not depend on pressure from the bearing surface for the locking action. The locking area shall be set to meet the locking torque requirements of Table 1, when used with UNJ 16 pitch external thread form per AS8879.

TABLE 1 - LOCKING TORQUES

Nominal Thread Size Class 3B	Maximum Prevailing Torque lbf-in	Minimum Breakaway Torque lbf-in
1.5625-16	630	85
1.7500-16	690	100
2.0000-16	765	110
2.2500-16	825	120
2.5000-16	890	135
2.7500-16	950	145
3.0000-16	1000	155
3.2500-16	1015	165
3.5000-16	1100	175
3.7500-16	1150	185
4.0000-16	1200	195
4.2500-16	1225	205

3.3 Threads

Shall conform to AS8879 except in the thread locking area of the finished part.

3.3.1 Thread Perpendicularity

Prior to thread locking development, the bearing surface shall be perpendicular to the thread pitch cylinder axis within the limits specified on the part drawing. Perpendicularity shall be determined by a method agreed upon by the purchaser and the vendor. The perpendicularity requirement shall apply to the bearing surface of the nut. The nuts to be inspected shall permit at least two turns of free engagement on the thread arbor.

3.3.2 Plating

Nuts shall be plated on the threads and bearing surface, other surfaces optional in accordance with AMS2411, unless otherwise specified on the part drawing. The plating thickness shall not be less than 0.0002 inch when measured on the thread pitch diameter.

3.3.3 Plating Allowance

Internal thread plating allowance shall be as specified in AS8879, unless otherwise specified on the part drawing.

3.4 Heat Treatment

Nuts shall be heat treated in accordance with AMS-H-6875 so as to achieve a hardness as in 3.4.1.

3.4.1 Hardness

Hardness testing per ASTM E18. Unless otherwise specified on the part drawing, the hardness after heat treatment as in 3.4 shall be within the range of 28 to 38 HRC.

3.5 Nondestructive Testing

As specified on part drawing or purchase order. Acceptance criteria per AS3071.

3.6 Performance

Unless otherwise specified on the part drawing or purchase order, nuts shall conform to the performance requirements in 3.6.1, 3.6.2, and 3.6.3.

3.6.1 Locking Feature Torque

The locking feature torque shall be tested on sample quantity as in 4.3.1.3 of nuts selected at random from the lot. All tests shall be conducted at room temperature on representative nuts assembled on externally threaded mandrels with no axial stress and having thread limits as in 3.7. Mandrels to be marked accordingly as MAX and MIN. Mandrels to be of any convenient length so as to pass through the nut a minimum of three thread pitches. Nut must assemble freely, with the fingers, up to the self-locking area. The test shall be run in such a manner that a dependable measure of torque will be obtained. An increase in temperature of the nut during testing shall not be more than 74 °F. Sample quantity of nuts shall meet reusability requirements as in 3.6.2.

3.6.2 Reusability

Unless otherwise specified on purchase order or part drawing, the maximum prevailing or installation torque, and the minimum breakaway torque (see AS1310) shall be within torque limits of Table 1, after 12 cycle reusability.

3.6.2.1 Reusability Test Procedure

a. Of the representative sample nuts chosen at random in 3.6.1, one half of the sample quantity is to be tested on the maximum test mandrel, and the other half of the sample quantity is to be tested on the minimum test mandrel. Identify each nut with a tag as numbered 1, 2, 3, etc.

b. Nut and mandrel to be lubricated with oil as in 3.8 prior to torque testing.

c. Assemble selected nut on appropriate test mandrel. The end of the test mandrel shall extend into the bearing side of the nut 1.5 to 3 thread turns at the start of the test.

d. Perform a single cycle torque test. Installation and breakaway torque shall be measured and recorded for each nut tested. Check for damage to the threads of the mandrel and the nut, such as galling or cracking. Recorded single cycle installation and breakaway torque must be within the limits of Table 1.

e. If torque values conform, select the nut with the lowest breakaway torque value. This nut is to be reassembled on the minimum test mandrel and installation and breakaway torque measured and recorded for an additional 11 cycles. Allow the mandrel to cool to room temperature after each cycle. The additional recorded values shall be within the limits of Table 1.

f. For sample quantities greater than two pieces, the sample nut tested on the maximum test mandrel with the lowest breakaway torque value shall be reassembled on the minimum test mandrel and installation and breakaway torque measured and recorded for an additional 11 cycles as previously described.

g. If additional recorded torque values conform, the remaining single cycled nuts are deemed acceptable and can be returned to the lot.

h. All nuts subjected to 12 cycle testing shall be scrapped.

3.6.3 Permanent Set

At least three nuts shall be assembled on a maximum mandrel lubricated with oil as in 3.8 so that the mandrel protrudes through the nut not less than three thread turns. Nuts shall then be removed from the maximum mandrel and reassembled on a minimum mandrel in the same manner. Test shall be conducted at room temperature with no axial stress. Installation and breakaway torque shall be measured and recorded. The nuts shall not exceed the maximum installation torque value as in Table 1, and shall not be lower than the minimum breakaway torque value as in Table 1, during installation and removal on the minimum mandrel.

3.7 Test Mandrel Thread Limits

Dimensional limits for maximum and minimum test mandrels shall be as follows. Mandrel major diameter to be within 0.0005 and pitch diameter to be within 0.0010 of the maximum and the minimum dimensional limit as specified for applicable thread size in AS8879 for class 3A threads. Thread minor diameter to have the full limit of AS8879 thread specification. See example Tables 2 and 3.

TABLE 2 - MAXIMUM MANDREL EXAMPLE

Thread Size	Major Dia +0.0000 -0.0005	Pitch Dia +0.0000 -0.0010	Minor Dia
2.5000-16	2.5000	2.4594	2.4199-2.4278

TABLE 3 - MINIMUM MANDREL EXAMPLE

Thread Size	Major Dia +0.0005 -0.0000	Pitch Dia +0.0010 -0.0000	Minor Dia
2.5000-16	2.4906	2.4553	2.4199-2.4278

a. Material of mandrels to be steel having a hardness of 42 to 47 HRC.

b. Surface roughness to be 32 microinch Ra per ASME B46.1.

c. Mandrel to have 45 degrees lead-in chamfer.

d. Use of a bolt or stud meeting the previous requirements is optional.

3.8 Test Lubrication

Sample test nuts and test mandrel threads shall be lubricated with oil per MIL-PRF-7808 or MIL-PRF-23699.

3.9 Quality

Parts shall be uniform in quality and condition, clean, sound, smooth, and free from burrs and foreign materials, and from imperfections detrimental to their performance.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection and Compliance

The supplier of parts shall supply all parts for tests and shall be responsible for performing all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that parts conform to the requirements of this document.

4.2 Classification of Tests

4.2.1 Acceptance Tests

Tests for material (3.1), threads (3.3), locking feature torque (3.6.1), and dimensions per part drawing are classified as acceptance tests and shall be performed on each production inspection lot.

4.2.2 Preproduction Tests

Tests for all technical requirements of this document are classified as preproduction tests and shall be performed prior to or on the first-article shipment of a type and size of part desired by purchaser, and also, when purchaser deems confirmatory preproduction testing to be required.

4.3 Sampling

Shall be as follows:

4.3.1 For Acceptance Tests

4.3.1.1 Material

Per material specification.

4.3.1.2 Threads and Dimensions

All parts selected for locking feature torque reusability test shall be subjected to and have passed dimensional and thread inspection prior to torque testing.

4.3.1.3 Reusability Test

Parts selected at random from production inspection lot as described in Table 4.