



AEROSPACE STANDARD

AS4417™**REV. A**

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Superseding AS4417

(R) Nuts, Self-Locking, Alloy, Corrosion and Heat Resistant,
High Strength, All Metal, Solid Film Lubricated,
1400 °F, Procurement Specification

RATIONALE

Update thread specification to AS8879, add option for permanent set to test on bolt, revise coating allowance to AS8879 requirements, remove SI units throughout, update references throughout, general editorial update, redraw figures and re-format tables.

1. SCOPE

1.1 Type

This document covers all-metal, self-locking nuts, plate nuts, and gang channel nuts made of a corrosion and heat resistant nickel alloy.

1.2 Field of Application

For use in aerospace applications exposed to extreme environments where high strength nuts with unified "J" (AS8879) threads are required. The solid film used shall be capable of operating in a vacuum at a temperature elevated to 1400 °F.

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.

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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.

AMS2518	Thread Compound, Anti-Seize, Graphite-Petrolatum
AMS5709	Nickel Alloy, Corrosion and Heat-Resistant, Bars and Forgings, 58Ni - 19.5Cr - 13.5Co - 4.3Mo - 3.0Ti - 1.4Al - 0.05Zr - 0.006B, Consumable Electrode or Vacuum Induction Melted, 1975 °F (1079 °C) Solution, Stabilization, and Precipitation Heat Treated
AS1310	Fastener Torque for Threaded Applications, Definitions of
AS1701	Lubricant, Solid Film
AS7471	Bolts and Screws, Nickel Alloy, UNS N07001 Tensile Strength 165 ksi, Corrosion and Heat Resistant, Procurement Specification
AS8879	Screw Threads - UNJ Profile, Inch Controlled Radius Root with Increased Minor Diameter

2.1.2 ASME Publications

Available from American Society of Mechanical Engineers, 22 Law Drive, P.O. Box 2900, Fairfield, NJ 07007-2900, Tel: 973-882-1170, www.asme.org.

ASME B46.1	Surface Texture (Surface Roughness, Waviness, and Lay)
ASME Y14.36M	Surface Texture Symbols

2.1.3 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 E1417/E1417M	Standard Practice for Liquid Penetrant Testing
ASTM D3174	Standard Test Method for Ash in the Analysis Sample of Coal and Coke from Coal

2.1.4 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-STD-2073-1	Standard Practice for Military Packaging
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2.2 Definitions

Refer to AS1310 for definitions related to fastener torque.

ROOM TEMPERATURE: Ambient temperature (68 °F approximately)

3. TECHNICAL REQUIREMENTS

3.1 Nut Material

Shall be a corrosion and heat resistant nickel alloy, such as AMS5709 (UNS N07001), as specified.

3.2 Solid Film Lubricant

Shall meet the requirements of AS1701 Class IV.

3.3 Thread Compound

Shall meet the requirements of AMS2518 except it shall have no greater than 0.2% ash content as determined by ASTM D3174.

3.4 Construction

Each nut shall be a self-contained unit including the self-locking device. The locking device shall not operate by separate movement from the installation and shall not depend on pressure on the bearing surface for the locking action.

3.5 Threads

Threads shall conform to AS8879 except that the finished product may have an antiseizure allowance that provides a clearance fit as specified on the drawing.

3.5.1 Thread Squareness

The bearing surface shall be square with the thread pitch diameter axis within the limits specified on the part drawing. Squareness shall be determined by a method agreed upon by purchaser and vendor. The squareness requirement shall apply to the complete bearing surface of the nut except that, for non-floating plate nuts having a bearing surface exceeding 1.5 times the thread major diameter, the squareness requirement shall, unless otherwise specified, apply only to the portion of the bearing surface of the nut contained within a diameter equal to 1.5 times the thread major diameter. The nuts to be inspected shall permit at least three complete turns of engagement on the thread arbor of the gage, coating may be stripped if necessary to meet this requirement. Multipiece floating plate nuts shall have the nut element removed from the retainer for checking thread squareness.

3.5.2 Coating Allowance

Internal AS8879 threads to be coated with solid film lubricant shall have the maximum pitch diameter increased in accordance with AS8879 coating allowance. The solid film lubricant may be removed for gaging. If the parts are to be returned to stock, they shall be recoated with solid film lubricant.

3.6 Finish

Nuts shall be coated with solid film lubricant in accordance with AS1701 Class IV. On nuts with thread sizes 0.2500 inch and larger, the coating thickness shall be not less than 0.0002 inch when measured on the thread pitch diameter. Microscopic measurement on a sectioned nut shall be used as a referee method. Nuts with thread sizes 0.1900 inch and smaller shall show complete coating coverage on the threads. Coating on other surfaces shall be 0.0003 to 0.0006 inch thick.

3.7 Performance

Nuts shall conform to the following requirements; all tests shall be conducted on representative nuts assembled on bolts of any convenient length and on which the nuts will assemble freely, with the fingers, a minimum of one complete turn.

3.7.1 Axial Strength

Not less than four nuts in the as-received condition and four nuts which have been heated to 1400 °F ± 15 °F, held at heat for 6 hours ± 0.25 hour, and cooled to room temperature shall be assembled on nickel alloy bolts conforming to AS7471, and having AS8879 threads. Each nut-bolt assembly shall be tested at room temperature in axial tension, using a bearing plate to grip the nut. The diameter of the hole in the bearing plate shall be 0.030 to 0.034 inch greater than the basic major diameter of the bolt thread and the bearing plate thickness shall be not less than the major diameter of the bolt thread. Edges of the hole in the bearing plate shall be broken 0.010 to 0.015 inch. Axial strength of the nut shall be not lower than the values specified in Table 1 and the nuts shall not crack during test; tests need not be run to destruction. The axial tensile load shall be applied to the nut slowly at a minimum of 1.5 minute to reach the axial tensile load values specified in Table 1.

TABLE 1 - AXIAL TENSILE LOAD

Thread Size	Axial Tensile Load At Room Temperature lbf min /1/
0.1120-40 UNJC-3B	895
0.1120-48 UNJF-3B	1020
0.1380-32 UNJC-3B	1342
0.1380-40 UNJF-3B	1575
0.1640-32 UNJC-3B	2153
0.1640-36 UNJF-3B	2314
0.1900-32 UNJF-3B	3156
0.2500-28 UNJF-3B	5861
0.3125-24 UNJF-3B	9438
0.3750-24 UNJF-3B	14 556
0.4375-20 UNJF-3B	19 622
0.5000-20 UNJF-3B	26 758
0.5625-18 UNJF-3B	33 990
0.6250-18 UNJF-3B	43 207

/1/ The axial tensile load requirement is based on a stress of 180 000 psi x the tensile stress area

NOTE: The thread tensile stress area is based on the mating thread minor diameter and is calculated as follows:

$$A_s = .7854 [D - (1.2990 / n)]^2 \quad (\text{Eq. 1})$$

where:

A_s = thread tensile stress area in²

D = basic major diameter in

n = threads per inch

then,

The axial tensile load lbf = 180 000 psi × A_s

3.7.1.1 Shank Nuts

Nuts with shanks designed to be flared at assembly (see Figure 1) shall be tested as specified in 3.7.1 except that the hole in the bearing plate shall be 0.004 to 0.008 inch greater than the maximum allowable shank diameter. It is not necessary to flare the shank for this test. The bearing plate hole shall be chamfered sufficiently to clear the shank nut bearing surface-to-shank maximum fillet.

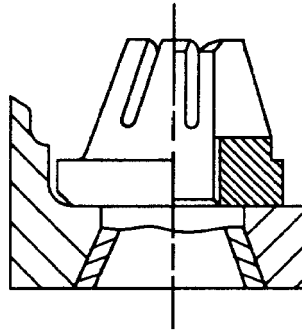


FIGURE 1 – SHANK NUTS

3.8 Qualification Tests

3.8.1 Completion of Testing

Self-locking nuts furnished to the requirements of this document shall be a product that meets the qualification tests specified herein. Completion within specified limits will establish conformance to the qualification tests requirements of this document. Successful completion of the qualification tests within the limits of this document does not relieve the supplier of responsibility for the design with respect to other requirements of this document.

3.8.2 Room Temperature Reusability

Nuts with lubricant applied shall demonstrate a minimum of five cycle reusability when tested in accordance with 3.8.4.1.

3.8.2.1 First Cycle Breakaway Torque

First cycle minimum breakaway torque shall meet the requirements of Table 2. The room temperature installation, removal, and breakaway torques on all subsequent cycles shall meet the requirements of Table 3.

3.8.3 Elevated Temperature Reusability

Lubricant which has been applied to nuts shall demonstrate a minimum of three cycle reusability when tested in accordance with 3.8.4.2.

3.8.3.1 Initial Installation Cycle

During the initial installation cycle, the minimum breakaway torque shall meet the requirements of Table 2 and the maximum installation torque shall meet the room temperature requirements of Table 3.

3.8.3.2 Elevated Temperature Exposure

The maximum installation or removal torque after elevated temperature exposure shall meet the requirements of Table 3.

3.8.4 Self-Locking Nut Qualification Bench Test

The qualification bench test specified in 3.8.4.1 through 3.8.4.8 shall be satisfactorily performed by the supplier prior to the initial shipment of the part.

TABLE 2 - FIRST CYCLE MINIMUM BREAKAWAY TORQUES

Thread Size	First Cycle Minimum Breakaway Torque lbf-in
0.1120-40 UNJC-3B	0.5
0.1120-48 UNJF-3B	0.5
0.1380-32 UNJC-3B	1
0.1380-40 UNJF-3B	1
0.1640-32 UNJC-3B	3
0.1640-36 UNJF-3B	3
0.1900-32 UNJF-3B	4
0.2500-28 UNJF-3B	7
0.3125-24 UNJF-3B	13
0.3750-24 UNJF-3B	19
0.4375-20 UNJF-3B	28
0.5000-20 UNJF-3B	36
0.5625-18 UNJF-3B	48
0.6250-18 UNJF-3B	64

TABLE 3 - INSTALLATION, REMOVAL AND BREAKAWAY TORQUE LIMITS /1/

Thread Size	Maximum Installation or Removal Torque Room Temperature lbf-in	Maximum Installation or Removal Torque After High Temperature Exposure lbf-in	Minimum Breakaway Torque lbf-in
0.1120-40 UNJC-3B	5	10	0.5
0.1120-48 UNJF-3B	5	10	0.5
0.1380-32 UNJC-3B	10	20	1
0.1380-40 UNJF-3B	10	20	1
0.1640-32 UNJC-3B	15	30	1.5
0.1640-36 UNJF-3B	15	30	1.5
0.1900-32 UNJF-3B	18	36	2
0.2500-28 UNJF-3B	30	60	3.5
0.3125-24 UNJF-3B	60	120	6.5
0.3750-24 UNJF-3B	80	160	9.5
0.4375-20 UNJF-3B	100	200	14
0.5000-20 UNJF-3B	150	300	18
0.5625-18 UNJF-3B	200	400	24
0.6250-18 UNJF-3B	300	600	32

/1/ Installation, Removal, and Breakaway Torque. The first cycle breakaway torque shall be within the limits of Table 2. The installation, removal, and breakaway torques on all subsequent cycles shall be within the limits of Table 3.