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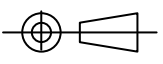
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THIRD ANGLE PROJECTION		CUSTODIAN NATIONAL AEROSPACE STANDARDS COMMITTEE	REVISION 7
PROCUREMENT SPECIFICATION NONE	TITLE NUT, SELF-LOCKING, 450 °F AND 800 °F, HIGH QUALITY	⑦	CLASSIFICATION SPECIFICATION NAS3350 SHEET 1 OF 18



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1. SCOPE

This specification covers the requirements for high quality, self-locking nuts, used at temperatures up to 800 °F, in conjunction with bolts and screws having Class 3A threads. These nuts are divided into classifications depending upon materials and room temperature axial tensile strength ratings as follows:

<u>Class</u>	<u>Minimum Axial Tensile strength</u>	<u>Material</u>
I	125 KSI	Alloy or Carbon Steel
IA	125 KSI	Corrosion Resistant Alloy
II	160 KSI	Alloy Steel
IIA	160 KSI	Corrosion Resistant Alloy
III	180 KSI	Alloy Steel
IIIA	180 KSI	Corrosion Resistant Alloy
IV	80 KSI	Alloy or Carbon Steel
IVA	80 KSI	Corrosion Resistant Alloy
V	220 KSI	Alloy Steel
VA	220 KSI	Corrosion Resistant Alloy

2. APPLICABLE DOCUMENTS

2.1 Specifications and Standards

Federal

GGG-W-641 Wrench, Socket (And Sockets, Handles, and Attachments for Socket Wrenches, Hand)

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

American Society for Quality

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

ASTM International

ASTM A370	Standard Test Methods and Definitions for Mechanical Testing of Steel Product
ASTM E112	Standard Test Methods for Determining Average Grain Size
ASTM E140	Standard Hardness Conversion Tables for Metals
ASTM E1417/E1417M	Standard Practice for Liquid Penetrant Inspection
ASTM E1444/E1444M	Standard Practice for Magnetic Particle Inspection
ASTM G44	Practice for Evaluating Stress Corrosion Cracking Resistance of Metals and Alloys by Alternate Immersion in 3.5% Sodium Chloride Solution

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

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Aerospace Industries Association

NAS3356	Lubricant Coatings, Suitability of Self-Locking Nuts
NAS3351	Stud and Mandrel Test Fixture, Self-Locking Nuts
NAS3352	Fixture, Stress Embrittlement Test, Self-Locking Nuts
NAS3353	Fixture, Bearing Surface Squareness Test, Self-Locking Nuts
NAS3354	Fixture, Vibration Test, Self-Locking Nuts
NASM1312	Fasteners, 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

AS5272	Lubricant, Solid Film, Heat Cured, Corrosion Inhibiting, Procurement Specification
AS3071	Acceptance Criteria – Magnetic Particle, FPI and Contrast Dye Penetrant Inspection
AS8879	Screw Thread, Controlled Radius with Increased Minor Diameter, General Inspection for
AMS2700	Passivation Treatment for CRES
AMS-QQ-P-416	Plating, Cadmium (Electroplated)
AMS2410	Plating, Silver, Nickel Strike, High Bake
AMS2750	Pyrometry
AMS5662	Nickel Alloy, Corrosion and Heat Resistant, Bars, Forgings, and Rings
AMS5731	Steel, Corrosion and Heat Resistant, Bars, Wire, Forgings, Tubing and Rings
AMS5732	Steel, Corrosion and Heat Resistant, Bars, Wire, Forgings, Tubing and Rings
AMS5734	Steel, Corrosion and Heat Resistant, Bars, Wire, Forgings, Tubing and Rings
AMS5737	Steel, Corrosion and Heat Resistant, Bars, Wire, Forgings and Tubing
AMS5853	Steel, Corrosion and Heat Resistant, Bars and Wire
AMS5962	Nickel Alloy, Corrosion and Heat Resistant, Bars and Wire
AMS6304	Low-Alloy Steel, Heat Resistant, Bars, Forgings and Tubing
AMS6322	Steel Bars, Forgings and Rings
AMS6348	Steel Bars, Normalized
AMS6349	Steel Bars, Normalized
AMS6415	Steel Bars, Forgings and Tubing
AMS6448	Steel Bars, Forging and Tubing
AMS6487	Steel Bars and Forgings

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

3. REQUIREMENTS

3.1 Design

The nut design shall conform to the applicable part drawing.

3.2 Materials

As specified on the applicable part drawing

3.3 Construction

The nut shall be a self-contained, all-metal unit including the self-locking device. The locking device shall be of prevailing torque type and shall not depend upon pressure on the bearing surface for locking action. For wrenchable nuts, dimension across flats and corners shall be applicable prior to incorporation of the locking feature. Finished wrenchable nuts shall have free engagement with sockets conforming to GGG-W-641, Type II, Class 2.

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3.3.1 Threads

Threads shall conform to AS8879, Class 3B, unless otherwise specified. Threads in the locking region may be displaced in any manner that provides self-locking nuts meeting the requirements of this specification.

3.3.2 Finish

The finish shall be in accordance with the requirements of the applicable drawing except for the following:

CLASS I, II, III, IV and V: Nuts cadmium plated per AMS-QQ-P-416 shall be baked after plating at 375 °F ± 25 °F for 23 hours minimum within 4 hours of plating when the nut hardness is 33 HRC and higher. For nuts with a hardness of 32 or lower, no baking is required.

CLASS IA, IIA, IIIA, IVA and VA: Both plated and unplated nuts shall be salt spray tested. Nuts to be plated shall be salt spray tested prior to plating. Salt spray test shall be conducted in accordance with MIL-STD-1312-1 (document NASM1312). The test duration shall be 2 hours as per AMS2700, Method 1, Class 4. Minor indications of corrosion products due to free iron on the non-bearing surfaces of the nut or originating in permissible laps per Table VIII are acceptable after salt spray testing.

3.3.3 Lubrication

3.3.3.1 Solid (dry) film lubricant

When required by applicable standard drawing, nuts shall be coated with a lubricant classified as dry film. Lubricant so specified shall meet the requirements of NAS3356, Suitability of Lubricant Coatings. The lubricant shall not be changed without requalification of the nut.

If the lubricant is in accordance with AS5272, no testing of the lubricant is required. Nickel and/or copper plate as a pretreatment for the application of solid (dry) film lubricant is optional.

3.3.3.2 Soluble Lubricant

When required by the applicable standard drawing, nuts shall be coated with a lubricant classified as non-dry film such as cetyl alcohol or wax.

Nuts may be provided with a wax type coating that will prevent nut-bolt seizure at initial installation provided such treatment is applicable to all production nuts of the same part number.

3.3.4 Workmanship

Workmanship shall be consistent with the type of product, finish, and class of thread fit specified. Sharp edges shall be broken; hanging burrs and slivers which might become dislodged in service or which interfere with thread fit shall be removed.

3.4 Performance

The nuts furnished under this specification shall be a product capable of passing the tests as specified in Paragraph 4, Quality Assurance Provisions. Unless otherwise specified, test bolts shall be in accordance Paragraph 7, Test Bolts. All tests shall be conducted in accordance with NASM1312 except as noted.

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3.4.1 Acceptance Tests

The acceptance tests consist of the tests specified in 3.4.1.1 through 3.4.1.12 which may be applied to any or all lots by the purchaser. Manufacturer shall use sufficient in-process controls, which include tests of unfinished parts, and/or inspection of product to assure conformance to the requirements of this specification. Tests of unfinished parts shall not be invalidated by subsequent operations.

3.4.1.1 Examination of Product

Check for:

- (1) Visual Presence of Locking Configuration
- (2) Finish
- (3) Loose or Hanging Burrs
- (4) Dimensional Characteristics
- (5) Product Identification as applicable on Part Drawing

3.4.1.2 Thread Fit

Thread gaging shall be performed after plating in accordance with the applicable thread specification except that the nut with locking device incorporated but without lubricant shall allow the go plug gage members to enter the threaded element 1/2 of one turn minimum. When parts are received with lubricant which prevents the use of standard gages, the nut shall permit free rotational (finger torqued) Class 3A threaded bolt engagement of at least 3/4 turn.

3.4.1.3 Axial Tensile Strength

Static tensile tests shall be conducted in accordance with MIL-STD-1312-8. The nut shall support the axial tensile strength load listed in Table IV without rupture. Bolt failure below rated axial strength is not cause for rejection. Such failure shall not constitute a valid test; a new sample nut shall be tested using a higher strength bolt. Failure due to nut splitting is not acceptable.

3.4.1.4 Discontinuities

Thread Sizes .1900-32 and Larger Only. For alloy steel nuts the presence of discontinuities such as laps, seams and inclusions shall be determined by magnetic particle inspection per ASTM E1444/E1444M. The nuts shall be magnetically inspected circularly only. The magnetic field shall be normal to the longitudinal axis of the nut.

For corrosion resistant material nuts, the presence of discontinuities such as laps, seams and inclusions shall be determined by penetrant inspection per ASTM E1417/E1417M. Penetrant inspect CRES nuts prior to, or with plating or lubrication removed.

Magnetic or penetrant indications in themselves shall not be cause for rejection. The specific nuts that show indications may be sectioned and measured microscopically for conformance to Table VIII. Nuts shall not be marked as an indication of magnetic or penetrant inspection.

Non-Ratable Discontinuities: Any discontinuity that is not a crack, regardless of location, with a depth of .0005 in. or less, is considered a non-ratable discontinuity and shall not be cause for rejection.

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3.4.1.5 Stress Embrittlement

Class III and V only. Nuts shall be installed on a standard test bolt as specified in Paragraph 7 in a steel test fixture in accordance with NAS3352, and torqued to the assembly torque test values in Table III. Unless otherwise specified, the test bolt shall be clean and dry and the nut in "as received" condition. Test procedure shall be in accordance with MIL-STD-1312-14. The nuts shall be torqued until the bolt elongates the amount specified in Table V. The assemblies shall then be baked at 450 °F +25 °F/-0 °F, for 96 hours, and air cooled to room temperature.

After removing the nuts, their bearing surfaces shall be polished and examined at 10X to 50X magnification for cracks. The presence of cracks found in any nut shall be cause for rejection of the entire lot.

3.4.1.6 Bearing Surface Squareness

The nut, or nut element of an assembly, shall be turned on a fixture per NAS3353. At least one full thread must penetrate the nut locking device. Use a feeler gage to determine the maximum gap under the nut at the outside circumference of the bearing surface. Bearing surface squareness shall conform to the requirements of Table IX.

3.4.1.7 Surface Texture

Surface texture of the bearing surface of wrenchable nuts shall be 63 microinches maximum per ASME B46.1

3.4.1.8 Torque Effectivity, Room Temperature

For these tests, installation shall be considered complete when the bolt end has protruded through three full turns after being flush with the top of the nut.

THREAD SIZES .0860-56 THROUGH .1640-32: Nuts shall be installed and removed one time on standard test bolts as specified in Paragraph 7. Maximum locking torque and breakaway torque shall be recorded. Of the first cycle specimens, the nut with the highest locking torque and the nut with the lowest breakaway torque shall be selected and 14 additional unseated cycles, or the number of cycles specified in the part standard, shall be run. The maximum installation and breakaway torques on seventh and fifteenth cycles shall be recorded. For nuts with less than 15 cycles requirement, torque values for the first, middle and last cycles shall be recorded.

THREAD SIZES .1900-32 THROUGH .6250-18: Nuts shall be installed and removed one time on standard test bolts as specified on Paragraph 7 and bushing per NAS3352. The nuts shall be seated to the assembly torques of Table III. Maximum locking torque and breakaway torque shall be recorded for the first cycle. Of the first cycle test specimens, the nut with the highest locking torque and the nut with the lowest breakaway torque shall be selected and tested for 14 additional unseated installation and removal cycles or the number of cycles specified in the part standard. The maximum installation and breakaway torques shall be recorded for the seventh and fifteenth cycles. For nuts with less than 15 cycles requirement, torque values for the first, middle and last cycles shall be recorded. All values shall be within limits of Table I, Columns 1 and 3.

THREAD SIZES .7500-16 and LARGER: The total number of reuse cycles shall be 5 or as specified on the part standard. Otherwise, the test procedure shall be as described above for thread sizes .1900-32 through .6250-18.

At the conclusion of the test, the nuts and bolts used in the test shall be examined for damage to the threads. Noticeable distortion, thread peel, galling or scratches shall be cause for rejection. The threads on the bolt shall remain in serviceable condition and permit the installation of a new nut freely with fingers up to self-locking element.

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