

AERONAUTICAL MATERIAL SPECIFICATIONS

AMS 7250

SOCIETY OF AUTOMOTIVE ENGINEERS, Inc. 485 Lexington Ave., New York 17, N.Y.

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Revised

NUTS, SELF-LOCKING, CORROSION AND HEAT RESISTANT
High Strength, Prevailing Torque, All-Metal
1200 F

1. ACKNOWLEDGMENT: A vendor shall mention this specification number in all quotations and when acknowledging purchase orders.
2. TYPE: All-metal, self-locking, prevailing torque nuts and all-metal, self-locking, prevailing torque plate nuts for use up to 1200 F.
3. MATERIAL: Shall be as specified on the drawing.
4. TECHNICAL REQUIREMENTS:
 - 4.1 General:
 - 4.1.1 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 on the washer face for the locking action.
 - 4.1.2 Threads: Unless otherwise specified on the drawing, threads shall conform to MIL-S-7742 on the finished product.
 - 4.1.2.1 Thread Squareness: The squareness of the thread pitch diameter to the washer face shall be within the limits specified on the drawing. Unless otherwise agreed upon by purchaser and vendor, an expanding type threaded gage that positions on the thread pitch diameter with a dial indicator that positions on the nut washer face shall be used to check squareness. The nuts to be inspected shall permit at least 3 complete turns of engagement on the thread arbor of the gage; plating 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.
 - 4.1.3 Finish: Unless otherwise specified on the drawing, nuts shall be silver plated in accordance with the latest issue of AMS 2410. Plate thickness, measured on any external surface of the nut, shall be not less than 0.0002 in.; threads shall show complete coverage but thickness requirement on thread is waived.
 - 4.1.4 Lubrication: The nuts may be provided with a wax-type coating which will prevent nut-bolt seizure provided such treatment is applicable to all production nuts.
 - 4.2 Performance: Nuts shall conform to the following requirements, but testing after conditioning as in 4.3.3.1 will not be required as a routine inspection procedure. Unless otherwise specified, all tests shall be conducted on representative nuts assembled on bolts of any convenient length and on which the nuts will assemble freely up to the self-locking device, with the fingers.

Section 8.3 of the SAE Technical Board Rules provides that: "All technical reports, including standards approved and practices recommended, are advisory only. Their use by anyone engaged in industry or trade is entirely voluntary. There is no agreement to adhere to any SAE standard or recommended practice, and no commitment to conform to or be guided by any technical report. In formulating and approving technical reports, the Board and its Committees will not investigate or consider patents which may apply to the subject matter. Prospective users of the report are responsible for protecting themselves against liability for infringement of patents."

4.3 Properties:

- 4.3.1 Axial Strength: Not less than 4 nuts in the as-received condition and 4 nuts which have been conditioned as in 4.3.3.1 shall be assembled on alloy steel bolts hardened and tempered to not lower than Rockwell C 40 or equivalent and having threads in accordance with 4.3.6. Each nut-bolt assembly shall be pulled, at room temperature, in tension, axially, using a bearing plate to grip the nut. The diameter of the hole in the bearing plate shall be 0.032 in. + 0.002 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. Axial strength of the nut shall be not lower than the values specified in Table I; tests need not be run to destruction.

TABLE I

Thread Size	Reference Tensile Stress Area (Based on Bolt Minor Diameter) sq in.	Axial Strength, lb (See Note 1)
0.112-40	0.00496	795
0.138-32	0.00745	1,190
0.138-40	0.00874	1,400
0.164-32	0.01196	1,915
0.164-36	0.01285	2,060
0.190-32	0.0175	2,800
0.250-28	0.0326	5,220
0.3125-24	0.0524	8,380
0.375-24	0.0809	12,940
0.4375-20	0.1090	17,440
0.500-20	0.1486	23,780
0.5625-18	0.1888	30,210
0.625-18	0.2400	38,400

Note 1. Calculated on basis of 160,000 psi stress

- 4.3.2 Wrench Torque: At least 3 nuts shall be tested at room temperature for wrench torque by assembling a nut on a bolt having sufficient strength. The nut shall be tightened against a bushing with a hole diameter as in 4.3.1 and having hardness not lower than Rockwell C 40 or equivalent and surface roughness on the bearing surface of 63 microinches or less. Nuts shall withstand, using a wrench of proper size, 12 successive applications of the torque specified in Table II without destroying the wrenchability of the nut. This test shall not be applicable to nuts which do not have provisions for use of a wrench.

TABLE II

Thread Size	Wrench Torque lb-in.
0.112-40	12
0.138-32	20
0.138-40	20
0.164-32	40
0.164-36	40
0.190-32	60
0.250-28	170
0.3125-24	340
0.375-24	600
0.4375-20	860
0.500-20	1250
0.5625-18	1700
0.625-18	2300

- 4.3.3 Starting Torque: The torque necessary to start a nut turning on or off a bolt shall be measured for not less than 10 nuts as received and 10 nuts after conditioning as in 4.3.3.1. Bolts conforming to AMS 7478 shall be used. Test shall be conducted at room temperature with no axial stress and with nuts assembled on bolts so that the bolts project through the nuts not less than 3 turns at start of test. Test shall be run in such a manner that a dependable measure of torque will be obtained. The increase in temperature of the nuts during test shall not exceed 75 F. Torque shall be as specified in Table III except that, after conditioning, minimum torque shall be measured only on removal.

TABLE III

Thread Size	Starting Torque, lb-in.		
	min	max (1)	max (2)
0.112-40	0.5	3	6
0.138-32	1.0	6	12
0.138-40	1.0	6	12
0.164-32	1.5	9	18
0.164-36	1.5	9	18
0.190-32	2.0	13	26
0.250-28	3.5	30	60
0.3125-24	6.5	60	120
0.375-24	9.5	80	160
0.4375-20	14.0	100	200
0.500-20	18.0	150	300
0.5625-18	24.0	200	400
0.625-18	32.0	300	600

- (1) At initial installation, values may be exceeded when bolt first enters locking feature.
- (2) Maximum for first removal after conditioning only.

- 4.3.3.1 Conditioning: Nut-bolt assemblies shall be axially loaded initially to 75,000 psi at room temperature in a spacer-type fixture in accordance with 4.3.3.1.2. Loading shall be determined by elongation measurement of the bolt at room temperature. Bolt length conforming to 4.3.6 shall be used. Allow assembly to remain stressed at room temperature for at least 1 hr, remeasure, and adjust loading to agree with the required stress. The assemblies shall then be placed in a furnace which is at $1200\text{ F} + 15$, for 6 hr, removed, cooled to room temperature, and unloaded by backing off nut $1/2$ turn. Starting torque shall be measured at this point.
- 4.3.3.1.1 Loading: The correct elongation for loading the bolt to 75,000 psi shall be determined by using a modulus of elasticity value of 29,500,000 psi. Stress area shall be based on the basic minor diameter of the thread.
- 4.3.3.1.2 Fixture: The spacer-type fixture shall be made of AMS 5735 steel. The diameter of the bolt hole in the fixture shall be 0.032 in. $\pm$ 0.002 greater than the basic major diameter of the bolt thread (see Figure 1).
- 4.3.4 Reusability: Nuts shall be assembled on bolts conforming to AMS 7478 and tested in accordance with 4.3.3 as modified below. After testing, nut threads shall show no distortion, galling, or scratches of such depth as to prevent reassembly of nut freely, with the fingers, up to the self-locking device. Bolt threads shall remain serviceable and permit assembly of a new nut freely, up to the self-locking device, with the fingers.
- 4.3.4.1 As Received: Nuts shall be installed and completely removed from the bolt 12 consecutive times. Starting torque for the first installation shall be not greater than the maximum, and for the twelfth removal shall be not less than the minimum, value specified in Table III.
- 4.3.4.2 Conditioned: After conditioning in accordance with 4.3.3.1, nuts shall be installed, heated, and completely removed from the bolt. Conditioning cycle shall be repeated 4 consecutive times and the starting torque for each installation and each removal shall be as specified in Table III.
- 4.3.5 Vibration: Nuts shall be capable of withstanding vibration as agreed upon by purchaser and vendor.
- 4.3.6 Test Bolts: Unless otherwise specified, test bolts 0.190 in. in diameter and larger shall have threads reduced 0.003 in. from Class 3A limits of MIL-S-7742 or Part I of the 1957 National Bureau of Standards Handbook H28, on the major, minor, and pitch diameters. Bolts smaller than 0.190 diameter shall have Class 2A tolerances. Bolts as specified in 4.3.3.1 shall have lengths in accordance with Table IV.