



# AEROSPACE STANDARD

## AS 1349

Society of Automotive Engineers, Inc.  
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Revised

### INSERT, SCREW THREAD, HELICAL COIL, LOCKING (LOW FRICTION SYSTEMS), PERFORMANCE STANDARD FOR

1. **PURPOSE:** To establish the performance requirements of helical coil locking screw thread inserts for use in fastening systems utilizing a lubricant which induces a low coefficient of friction between insert and fastener.
2. **SCOPE:** This standard covers helical coil locking screw thread inserts made from formed wire in which the inner surface of the coil, after assembly, provides threads of standard Unified 60° form as specified on the assembly drawing. This standard also covers the performance requirements of the locking feature of the insert which will retain Unified (UN) or MIL-S-8879 (UNJ) external threaded parts.
3. **REQUIREMENTS:**
  - 3.1 **Material:** The material of the insert shall be as specified on the drawing.
  - 3.2 **Design:** The insert shall conform to the requirements of the applicable drawing. The locking feature shall be located to allow the engaging fastener to enter the insert a minimum of one turn before locking action occurs.
  - 3.3 **Locking Torque:** The insert, when installed into a hole threaded to Class 3B requirements of MS33537 and tested per Section 4, shall provide a frictional lock to retain the bolt threads within the locking torque limits specified in Table I.

TABLE I

Insert torque at room temperature

Nominal insert thread size	Maximum locking torque, installation or removal		Minimum breakaway torque	
	lbf-in.	N. m	lbf-in.	N. m
.190-32	13	1.47	2.0	0.22
.250-28	30	3.39	3.5	0.40
.3125-24	60	6.78	6.5	0.73
.375-24	80	9.04	9.5	1.07
.4375-20	100	11.30	14.0	1.58
.500-20	150	16.95	18.0	2.05

- 3.3.1 **Maximum Locking Torque:** Maximum locking torque shall be the maximum torque value encountered during any part of the installation or removal cycle with the bolt in motion and with no axial load on the bolt. Torques shall not exceed the maximum values listed.
- 3.3.2 **Minimum Breakaway Torque:** Minimum breakaway torque shall be the minimum torque required to start removal of the bolt from the fully engaged position, but with no axial load on the test bolt. The torque value for any cycle shall not be less than the minimum values listed.

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- 3.4 Vibration: The insert, when installed into a hole threaded to the requirements of MS33537, shall perform satisfactorily when subjected to a vibration test per Section 4.
- 3.5 Identification: The inserts shall be identified with a black color. Color shall be a reasonable facsimile of Federal Standard No. 595 Color Chip 37038 or 37056.
4. PERFORMANCE TESTS:
- 4.1 Locking Torque Test: Assembled inserts shall be torque tested with bolts that have Unified threads per MIL-S-7742 or MIL-S-8879, cadmium plated per AMS 2400, a hardness of HRC 36-40 and sufficient thread length to engage the complete length of insert plus extend one full turn past the end of the test block. The assembled insert shall be capable of meeting the requirements of 3.3 when a test bolt is installed and removed fifteen times as specified in 4.1.1. Torque readings shall be taken on the 1st, 7th and 15th cycles.
- 4.1.1 Test Methods: The test bolts shall be assembled through test spacers specified in 4.1.3 and the bolt threads lubricated with a uniformly applied film of MIL-T-5544. The bolt and spacer shall be assembled into the test blocks specified in 4.1.2. The bolt threads may be relubricated at the beginning of each cycle. The test bolt shall be considered fully installed when the bolt extends at least one full turn past the test block. During the first five cycles, the test bolt shall be tightened in the test block to the values listed in Table II. From the sixth through the fifteenth cycle, the bolt shall be fully installed, however, no clamp load shall be applied. The removal cycle shall be considered complete when the locking coils are disengaged. The test shall be run at room temperature and at a rate slow enough to yield a dependable measure of torque. The increase in temperature of the bolts during each test shall not exceed 75°F (24°C).
- 4.1.2 Test Block: The insert to be tested shall be installed per MS33537 in a metal test block meeting the requirements of Figure 1 and made from 2024T4 aluminum alloy. After installation the tang shall be removed. The surface of the test block from which the insert is assembled shall be marked "TOP" and shall be marked to indicate the radial location of where the assembled insert begins.
- 4.1.3 Test Spacer: The test spacer shall be made of case hardened low carbon steel or equivalent. The diameter of the bolt hole shall be .030-.040 in. (0.76-1.01 mm) greater than the basic major diameter of the bolt thread. The spacer length shall be sufficient to allow the test bolt to engage the insert as specified in 4.1 without either the bolt shank or incomplete thread entering the test block. A 32 microinch (0.8 micrometres) surface texture shall be provided on the area which contacts the bolt head bearing surface.
- 4.2 Vibration Test: Five assembled inserts shall be tested with double hexagon head bolts of the same type used in 4.1. The assembled inserts shall be capable of meeting the requirements of para. 3.4 when tested in accordance with MIL-STD-1312 Test No. 7. The vibration test may be waived at the discretion of the purchaser for inserts of nominal lengths greater than 1.5 diameters provided the vibration test has been passed by inserts of 1.5 diameters nominal lengths with the same diameter, thread pitch, and type and design of locking elements.
- 4.2.1 Test Set-up: The test bolts shall be lubricated with a uniformly applied film of MIL-T-5544 and assembled into test nuts specified in 4.2.2 such that the bolts pass through the cylinder in the test rig fixture as specified in MIL-STD-1312, Test No. 7. The test nut shall be assembled so that the countersunk side is next to the cylinder. The nuts shall be tightened to the torque specified in Table II. The maximum locking torque before clamping shall be recorded. The balance of the test requirements shall be as specified in MIL-STD-1312 Test No. 7.

TABLE II  
Assembly Torque

Nominal insert thread size	Torque	
	lbf-in.	N-m
.190-32	30	3.39
.250-28	60	6.78
.3125-24	120	13.56
.375-24	160	18.08
.4375-20	200	22.60
.500-20	300	33.90

- 4.2.2 **Test Nuts:** The inserts to be tested shall be installed per MS33537 in test nuts made from 2024T4 aluminum alloy, having a minimum thickness equal to the nominal length of the insert and having other dimensions as required to permit testing in the test stand required by MIL-STD-1312 Test No. 7. After installation the tang shall be removed. Recommended across flats and thickness dimensions are given in Table III for inserts of 1.5 diameters nominal length.

TABLE III

Recommended Dimensions - Insert Nuts  
for 1.5 D Nominal Length Inserts

Nominal insert thread size	Across Flats (maximum)		Thickness	
	(inches)	(mm)	(inches)	(mm)
.190-32	.437	11.10	.285-.295	7.24- 7.49
.250-28	.500	12.70	.375-.385	9.53- 9.77
.3125-24	.562	14.28	.469-.479	11.92-12.16
.375-24	.688	17.48	.562-.572	14.28-14.52
.4375-20	.750	19.05	.656-.666	16.67-16.91
.500-20	.875	22.22	.750-.760	19.05-19.30

- 4.2.3 **Test Methods:** The fixture shall be vibrated with an essentially sinusoidal waveform at a frequency of 1750 to 1800 cycles per minute and a double amplitude of .435-.465 inch (11.05-11.81 mm). The test run shall be for 30,000 cycles. If, prior to the completion of 30,000 cycles, an insert-nut assembly rotates completely off a bolt, the test shall be stopped. At the completion of the test, breakaway torque shall be measured after the insert-nut assembly has been unseated 90° from the clamped position.
- 4.3 **Quality:** The inserts shall be considered to have failed if at the conclusion of either the locking torque test or the vibration torque test any of the following conditions exist:
- Any break or crack in the insert.
  - Installation or removal torque exceeds the maximum locking torque value in Table I.
  - Breakaway torque less than the values in Table I.
  - Movement of the insert beyond  $\pm 45^\circ$  relative to the TOP surface when installing or removing the test bolt after the first installation and removal cycle.
  - Movement of the insert-nut assembly beyond 360° relative to the test bolt during the vibration test.
  - Seizure or galling of the insert or test bolt.
  - Cross threading at assembly.
  - Tang not broken off cleanly leaving a fin or burr which interferes with the test bolt at installation.
  - Insert turns out of the test nut or test block upon removal of the bolt.
5. **REJECTION:** Parts not conforming to the requirements of this specification or to authorized modifications will be subject to rejection.