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1. Scope

1.1 Scope. This standard establishes a conformance test procedure for the performance of pre-applied adhesive coatings applied to metric series nuts, in nominal sizes M5 thru M20 intended for application temperatures of – 40°C to 180°C.

Torque values for performance level I and level II given in this standard, Table 2, are conformance requirements for nuts which have adhesive coated threads and apply only to the combination of test conditions described in the performance ability test procedure (Section 6.0). **RESULTS OBTAINED BY THESE TESTS ARE RELEVANT TO THE TEST CONDITIONS PRESCRIBED HEREIN AND SHOULD NOT BE UTILIZED FOR SPECIFIC APPLICATIONS.** Such values can only be determined through testing the nut in its actual application.

This standard is not concerned with dimensional features such as nut thickness or flanges, or with other mechanical or performance properties such as strength properties, corrosion resistance, sealing, and/or consistency of torque-to-tension relationships during assembly. Such features and properties are covered in other standards and must be referenced when specifying a nut with adhesive coated threads to ensure that all service conditions of the particular application are properly met.

Reference information is also included in the Appendix.

1.2 Designation. There are a variety of pre-applied adhesives with differences in performance, therefore, there are two performance levels of pre-applied adhesives for which conformance test procedures are covered in this standard. These are designated as performance levels I and II, respectively. The performance level shall be specified by the purchaser on the purchase order.

2. General

2.1 Definition

A nut with adhesive coated threads is an internally threaded fastener which derives its resistance to loosening from the interaction of the adhesive with the threads of the mating part.

2.2 Type. The test procedure specified in this standard pertains to nuts having threads with preapplied adhesive coatings following manufacturing and prior to delivery for assembly.

3. Referenced Documents

All standards are latest issue, unless otherwise agreed between manufacturer and purchaser.

3.1 ASME Standards

- B1.3M *Screw Thread Gaging Systems for Dimensional Acceptability – Inch and Metric Screw Threads, (UN, UNR, UNJ, M and MJ)*
- B1.13M *Metric Screw Threads – M Profile*
- B18.2.3.1M *Metric Hex Cap Screws*
- B18.2.4.1M *Metric Hex Nuts, Style 1*

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- B18.12 *Glossary of Terms for Mechanical Fasteners*
- B18.18.2 *Inspection and Quality Assurance for High-Volume Machine Assembly Fasteners*

ASME standards can be obtained from the American Society of Mechanical Engineers, Three Park Avenue, New York, NY 10016-5990.

3.2 ASTM Specifications

- ASTM A563M *Carbon and Alloy Steel Nuts*
- ASTM F1137 *Phosphate/Oil and Phosphate/Organic Corrosion Protective Coatings for Fasteners*
- ASTM F1789 *Terminology for F-16 Mechanical Fasteners*
- ASTM F568M *Carbon and Alloy Steel Externally Threaded Metric Fasteners*

ASTM standards can be obtained from the American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428.

3.3 SAE Standards

- J1199 *Mechanical and Material Requirements for Metric Externally Threaded Steel Fasteners*

SAE standards may be obtained from the Society of Automotive Engineers, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

4. Test Nut Requirements

4.1 Nut Finish. Plain finish nuts shall be furnished. The finish shall not interact, or prevent adherence of the adhesive coating material.

4.1.1 Trial Application. Values shown in Table 2 are those for plain finished (not coated) nuts. When using adhesives on very smooth finishes (including chrome and nickel platings, stainless steel and some zincs), a trial application should be conducted for proper performance. Smooth finishes will produce minimal torque values. Other finishes, such as dry phosphate, will increase the locking forces due to its excellent bonding surface, and generate higher breakaway values. Values for other than plain finish nuts shall be developed and agreed upon between manufacturer and user.

4.2 Nut Threads

4.2.1 Thread Tolerances. Prior to plating or coating, threads shall conform to Class 6H tolerance in accordance with ASME B1.13M. Other classes and tolerances can be provided upon agreement between purchaser and manufacturer. The area of the adhesive coating need not conform to thread gaging requirements.

4.2.2 Thread Acceptance. Nut thread acceptance shall be in accordance with ASME B1.3M.

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4.3 Performance Ability

4.3.1 Reduced Thread Lengths. Nuts which have reduced thickness or which have thread lengths too short to permit testing in accordance with Section 6.1, shall have their prevailing-torque requirements and test procedures established by agreement between purchaser and manufacturer.

4.3.2 Thread Availability. Table 1 shows the number of threads available with standard nut thicknesses. Torque values for other nut thicknesses shall be based upon agreement between supplier and purchaser.

**Table 1 Thread Availability for Adhesive
Feature Application**

Thread Size	Standard Hex Nut Style 1	
	Total Threads	Usable
M5	4	2
M6	4	2
M8	4	2
M10	5	3
M12	6	4
M14	5	3
M16	5	3
M20	5	3

NOTES:

1. Hex flange nuts are thicker, add two threads.
2. Acorn (cap) nuts, add one thread.

4.3.3 Assembly Position. Protrusion of the external thread beyond the distance of two thread pitches of the nut face will decrease the adhesive performance.

5. Test Equipment

5.1 Torque Measuring Device

The torque measuring device shall be capable of measuring the torque while the test nut is in motion. Test results may be recorded by an analog or digital device which is capable of forming a permanent record. The measuring system shall have a measurement uncertainty at the point of measurement of ± 2 percent or less. Test equipment may be hand held or electronic, provided that accuracy and speed restrictions are also maintained. A manual wrench and manual recording may also be used upon agreement with the purchaser.

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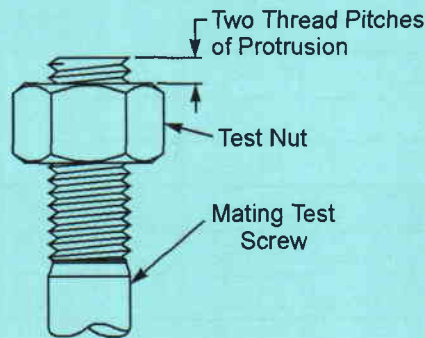
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5.2 Test Screws

Test screws shall be heat treated and correspond to the size and strength level of the nut. They shall have thread Class 6g and be hex head screws. Screws shall be coated in phosphate and oil finish in accordance with ASTM F1137, Grade I. The test screws used shall be from a single manufactured lot and shall be conforming to the applicable ASME, ASTM and/or SAE standards. No additional lubricants or handling which could alter frictional characteristics is allowed. Parts shall be free of rust and dirt. A new screw shall be used for each test. Reuse of test screws is expressly prohibited. The screw thread length shall meet the requirements specified in Section 6.1.

6. Performance Ability Test

6.1 Test Assembly. The nut to be tested shall be assembled on a test screw such that the end of the test screw extends above the face of the test nut a distance equivalent to two thread pitches. During nut rotation, the head of the test screw shall be restrained to prevent rotation.



6.2 Ambient Test Procedure

The sample nut shall be assembled onto a new test screw until all of the chemical coating has been engaged and until two threads protrude – see Section 2.3. During the initial installation, the maximum torque observed while the nut is in motion to the stated position shall be measured and recorded. A curing time of 24 hours at ambient temperature shall be observed before further testing is initiated. The breakaway torque (first movement of the nut in the off direction from the position), shall be measured and recorded.

The prevailing off torque is measured during the first 360° revolution after breakaway. Prevailing off torque is defined as the highest removal torque occurring during the first 360° of off rotation after breakaway. The largest absolute value observed shall be recorded. This value will be positive when using a torque wrench and may appear as a negative value when recorded and/or plotted electronically.

Speed of testing shall not exceed 30 RPM.

7. Inspection

7.1 Inspection Procedure. Nuts shall be inspected to determine conformance with this standard. Inspection procedures may be specified by the purchaser on the inquiry, purchase order, or the engineering drawing or shall be as agreed upon between the purchaser and supplier prior to acceptance of the order. In the absence of a defined agreement, the requirements of B18.18.2 shall apply.

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**Table 2 Performance Level I and II Requirements for Nuts With Adhesive
Coated Threads — Metric Series**

Thread Size	Performance Level I			Performance Level II		
	Initial Installation Maximum N•m	Breakaway Torque Minimum N•m	Prevailing-Off Torque 1st 360° After Breakaway Minimum N•m	Initial Installation Maximum N•m	Breakaway Torque Minimum N•m	Prevailing-Off Torque 1st 360° After Breakaway Minimum N•m
M5 × 0.8	0.7	0.3	0.2	0.5	0.5	0.3
M6 × 1	0.9	0.4	0.2	0.7	0.8	0.4
M8 × 1.25	1.4	1.0	0.5	1.1	1.5	0.8
M10 × 1.5	2.8	2.8	1.0	2.1	4.2	1.5
M12 × 1.75	3.6	4.0	1.8	2.7	6.0	2.7
M14 × 2	5.5	5.5	2.5	4.1	8.3	4.2
M16 × 2	7.0	8.3	4.0	5.3	12.5	6.0
M20 × 2.5	11.0	11.3	5.5	8.3	17.0	9.0

NOTES:

1. Nuts, Grade B, plain finish, HRC 28 maximum.
2. Screws, Grade 5, phos and oil, HRC 25-34.
3. The above values apply to finishes specified in notes 1 and 2 (above) only.

Appendix

A.1 Design Considerations. The composition and application of the adhesive coating shall be in accordance with the practice of the manufacturer. For applications where temperatures may exceed 93°C and/or a lubricant is present or applied for protection or ease of assembly, an adverse effect may result. The applicator or coater's data should be consulted to determine suitability of the selection.

A.2 Performance Heat Test

When so specified on the part drawing, nuts shall meet the requirements for breakaway torque as listed in Table 2 level I or level II, as noted on the original inquiry or purchase order after exposure to the following heat test:

A.2.1 Assemble the sample nut onto a test bolt to the prevailing-torque first installation position, which is two full threads protruding above the top of the nut.

A.2.2 Place the nut and bolt assembly in an oven or other heating device capable of non-flame heat for one hour at 122°C ± 3°C.

A.2.3 Remove the assembled nut/bolt combination from the heating oven and immediately measure the breakaway torque. The measured and recorded value must not be less than the value listed in Table 2.

A.2.4 All recorded values must meet the requirements shown in Table 2.

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