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1.0 Introduction

1.1 Scope. This standard establishes a test procedure for nonmetallic resistant element prevailing-torque nuts having coarse threads, to determine their conformance with specified prevailing-torque requirements in nominal sizes #10 thru 1 in. intended for application temperatures of - 49°F to 250°F. Both partial (less than 360°) and full circumference (360°) element designs are included. It does not include nuts with adhesive coated threads which are included in IFI-160 or top insert two piece construction nuts which are included in IFI-100/107.

The prevailing-torque values given apply only to the combination of test conditions established in this standard. If conditions of any actual service/application differ from those included in this standard, the prevailing-torques may differ. Variables which may cause variation in prevailing-torque values include such conditions as length of thread engagement, thread tolerance and fit, speed of installation, materials, platings or coatings, and environment. Such values may only be determined by tests in actual application.

This standard is not concerned with dimensional features such as nut thickness or flanges; refer to IFI-100/107. Other mechanical or performance properties such as strength properties, corrosion resistance, sealing, and/or consistency of torque-to-tension relationships during assembly are not included in this specification. Such features and properties are covered in other standards and specifications and must be referenced when specifying a nut to ensure that all service conditions of the particular engineering application are properly met. For editorial convenience, the words, "Resistant Element Prevailing-Torque", shall henceforth be referred to as "REPT".

2.0 General

2.1 Definition

A REPT nut is an internally threaded fastener which derives its resistance to loosening from the frictional interaction with the threads of the mating part. All circumference element designs are considered in this standard.

Partial elements function through the offside loading of the REPT nut when threaded onto a mating fastener, causing an eccentric action which jams the REPT nut member threads against the threads of the externally threaded part at the side opposite of the element. The full circumference element design functions to provide uniformly distributed prevailing-torque resistance against the threads of the externally threaded mating part.

2.2 Application. Nonmetallic elements which consist of inserts, pellets, patches, or other shapes that are installed in the REPT nut thread area shall be in accordance with the practice of the manufacturer. The nonmetallic element shall be affixed to the internal threads of the REPT nut. The element material may be of any polymeric substance which meets the requirements of this standard and is not otherwise restricted because of chemicals or reportable substances.

3.0 Referenced Documents

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

3.1 ASME Standards

- B1.1 *Unified Screw Threads*
- B1.3M *Screw Thread Gaging Systems for Dimensional Acceptability – Inch and Metric Screw Threads (UN, UNR, UNJ, M and MJ)*
- B18.2.1 *Square and Hex Bolts and Screws*

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- B18.2.2 *Square and Hex Nuts (Inch Series)*
- B18.12 *Glossary of Terms for Mechanical Fasteners*
- B18.18.2 *Inspection and Quality Assurance for High-Volume Machine Assembly Fasteners*

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

3.2 ASTM Specifications

- F1137 *Standard Specification for Phosphate and Oil and Phosphate Organic Corrosion Protective Coatings for Fasteners*
- F1789 *Terminology for F-16 Mechanical Fasteners*
- F1941 *Electrodeposited Coatings on Threaded Fasteners*

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

3.3 IFI Standards

- IFI-100/107 *Prevailing-Torque Type Steel Hex and Hex Flange Nuts Regular and Light Hex Series*
- IFI-160 *Test Procedure for the Performance of Nuts With Adhesive Coated Threads*

IFI standards may be obtained from the Industrial Fasteners Institute, 1717 East Ninth Street, Suite 1105, Cleveland, OH 44114

4.0 Requirements

4.1 Nut Finish

Nuts shall be electrodeposited zinc finished in accordance with ASTM F1941, unless otherwise specified. The finish shall not interact with or prevent adherence of the nonmetallic element material. At the option of the manufacturer, nuts may be provided with a supplementary lubricant.

4.2 Threads

4.2.1 Thread Tolerances. Prior to plating or coating, threads of REPT nuts shall be coarse Class 2B as specified in ASME B1.1 for inch thread series product, except that the portion of the threaded length containing the nonmetallic element need not conform. Other classes and tolerances can be provided upon agreement between purchaser and manufacturer.

4.2.2 REPT nuts shall assemble a minimum of one full turn by the fingers onto the mating test bolt before encountering the nonmetallic element.

4.2.3 Thread Acceptance. Nut thread acceptance shall be in accordance with ASME B1.3M, System 21, unless otherwise specified.

4.3 Performance Ability

4.3.1 REPT nuts which have reduced thickness or which have thread lengths too short to permit testing in accordance with Section 6.0, shall have their prevailing-torque requirements and test procedures established by agreement between purchaser and manufacturer.

4.3.2 The prevailing-torque of the REPT nut occurring during the first installation shall not exceed the maximum prevailing-torque specified for the

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respective type as listed in Table 1 when tested as specified in Section 6.0. In addition, the prevailing-torque developed by the REPT nut during first and third removal shall not be less than the minimum values listed in Table 1, when tested as specified in Section 6.0.

4.3.3 REPT nuts which are altered in any manner by any source following shipment by the manufacturer or element applicator to the purchaser shall be considered as nonconforming material. The REPT nut manufacturer or element applicator shall not be

held responsible for failures of the nut to meet dimensional or performance requirements traceable to the alteration.

4.3.4 Values on part drawings shall be derived from actual applications and listed on drawings as such.

4.3.5 Nonmetallic Element Location. The circumferential distance and the thread height of the nonmetallic element in partial circumferential elements shall be sufficient to meet the requirements of the prevailing-torque in Table 1.

Table 1 Prevailing-Torques for Circumferential Elements

Nominal Size or Basic Nut Diameter and Threads per Inch	Initial Installation lb. in.	Prevailing 1st Off lb. in.	Prevailing 3rd Off lb. in.
		Max	Min
10-24 0.1900	13	2	0.8
1/4-20 0.2500	28	4	1.6
5/16-18 0.3125	60	8	3.2
3/8-16 0.3750	77	10	4
7/16-14 0.4375	105	14	6
1/2-13 0.5000	154	20	8
9/16-12 0.5625	196	25	10
5/8-11 0.6250	245	32	13
3/4-10 0.7500	322	42	17
7/8-9 0.8750	490	64	26
1-8 1.0000	630	82	33

NOTE: The above values apply to nuts having electrodeposited zinc finishes in accordance with ASTM F1941.

5.0 Test Equipment

5.1 Torque Measuring Device. The torque measuring device shall be capable of measuring the torque while the test REPT 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 an instrument accuracy at the point of measurement of ± 2 percent or less. Test equipment may be hand held or electronic, provided that accuracy and speed restrictions as noted elsewhere in this standard are observed. A manual wrench and manual recording may be used upon agreement with the purchaser.

5.2 Test Bolt

The test bolt shall correspond to the size and strength level of the nut. Parts shall be furnished in phosphate and oil finish in accordance with ASTM F1137 Grade I. The test bolt used for a single lot of nuts shall be from a single manufactured lot. No additional lubricants or handling which could alter frictional characteristics are allowed. Parts shall be free of rust and dirt. A new bolt shall be used for each test. Reuse of test bolts is expressly prohibited. The bolt length shall be such that at least two full threads shall protrude beyond the top of the nut.

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6.0 Performance Ability Test

6.1 Test Procedure

The sample REPT nut shall be assembled onto a new test bolt until all of the nonmetallic element has been engaged. During the first installation, the maximum prevailing-on torque obtained while the REPT nut is in motion with no clamp load being developed shall be measured and recorded. The nut shall continue rotation until a clamp load of 75 percent of bolt proof load is achieved. At least two full threads shall protrude beyond the top of the nut. The nut shall be removed from the test bolt. The minimum prevailing-off torque observed in the first 360° of rotation during removal, and after all clamp load has been dissipated, shall be measured and recorded. The nut shall be loosened until the nonmetallic element is disengaged from the test bolt threads. The nut shall be reassembled and disassembled until three on/off cycles have been carried

out. During the third removal, the minimum prevailing-off torque shall be measured and recorded during the first 360° of off rotation. Sufficient time shall elapse between installations and removals to prevent overheating of the test parts. Speed of testing shall not exceed 30 RPM.

6.2 All recorded values must meet the requirements shown in Table 1.

7.0 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.

APPENDIX

X.1 Optional Performance Heat Test

When so specified on the part drawing, REPT nuts shall meet the requirements for the first removal prevailing-off torques as listed in Table 1 after exposure to the following heat test:

X.1.1 Assemble the sample REPT nut onto a test bolt so that the nonmetallic element is fully engaged.

X.1.2 Place the REPT nut and bolt assembly in an oven or other heating device capable of non-flame heat for one hour at 250°F ± 5°F.

X.1.3 Measure the minimum prevailing-off torque in the first 360° of rotation of the assembled REPT nut/bolt combination after removal from the heating oven. The measured and recorded value must not be less than the value listed in Table 1.

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