

INDUSTRIAL FASTENERS INSTITUTE
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1.0 Scope.

This standard provides a test method for determining the torque-tension relationship on both external and internal threaded fasteners for the purpose of measuring the frictional characteristics of the threaded fasteners. The results obtained by this test are relevant to the test conditions only and should not be utilized for specific applications.

2.0 Referenced Standards.

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

2.1 ASME standards are available from The American Society of Mechanical Engineers, Three Park Avenue, New York, NY 10016-5990.

B1.1 *Unified Inch Screw Threads (UN and UNR Thread Form)*

B1.3M *Screw Thread Gaging Systems for Dimensional Acceptability*

B18.2.1 *Square and Hex Bolts and Screws, Inch Series*

B18.2.2 *Square and Hex Nuts*

2.2 ASTM standards are available from The American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

A563 *Carbon and Alloy Steel Nuts*

2.3 SAE standards are available from the Society of Automotive Engineers, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

J121 *Decarburization in Hardened and Tempered Threaded Fasteners*

3.0 Test Materials.

3.1 Test Screws for Nut Testing. Test screws shall correspond to the size and strength level of the nut to be tested. Decarburization of the screw threads shall be within the limits defined in SAE J121, Class 3/4 H.

Threads shall conform to ASME B1.1, Class 2A. Screws shall be zinc electroplated 0.00012 inch thickness minimum, when measured on the hex flats. After plating, the basic thread size shall not be exceeded when confirmed with a 2A GO ring gage as defined by System 21 of ASME B1.3. Threads on all screws, one inch and smaller, shall be rolled. The thread surface shall be clean, free of burrs, additional lubricant, or other contamination that might affect an accurate determination of the performance of the nut.

The screw length shall be such that a minimum of four full thread pitches as measured from the end of the bolt will protrude through the nut when the nut is fully seated against the test washer. The thread length shall be such that a minimum of two full threads are within the grip after the nut is fully seated. Refer to Appendix A.

A new test screw shall be used for testing each nut.

3.2 Test Nuts for Screw Testing. Test nuts shall correspond in size to the screw to be tested. The nuts shall be heat treated and conform to the requirements of ASME B18.2.2 and ASTM A563 Grade DH. Nuts shall be zinc electroplated 0.00012 inch thickness minimum, when measured on hex flats. The thread surface must be completely covered with zinc electroplating.

IFI STANDARD ®	TEST FOR EVALUATING THE TORQUE-TENSION RELATIONSHIP ON BOTH EXTERNALLY AND INTERNALLY THREADED FASTENERS	IFI-143 Page 1 of 5
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Threads shall conform to ASME B1.1 for Class 2B tolerances confirmed by System 21 of ASME B1.3, after plating. The thread surface shall be clean, free of burrs, additional lubricant, or other contamination that might affect an accurate determination of the performance of the screw.

A new test nut shall be used for each screw tested.

3.3 Test Washer. Test washers shall conform to the dimensional, metallurgical, mechanical and finish requirements given in Table 1.

For testing of captive nut and washer or screw and washer assemblies, the test washer shall be unhardened mild steel and shall conform to the dimensions of Table 1.

A new test washer shall be used for each test sample.

4.0 Test Equipment.

4.1 Torque Measuring Device. The torque measuring device shall be a strain gage torque transducer. The uncertainty of the torque measurement shall be within 2.0 percent of the torque being read.

4.2 Load Measuring Device. The load measuring device shall be a tension test fixture with a load cell. The uncertainty of load measurement shall be within 2.0 percent of the load being read.

4.3 Data Collection Device. The data collection device shall have the capability to simultaneously record torque and tension. The sampling rate and frequency response of the recording system shall be such that at the test speeds (RPM) specified in Section 4.4, the measurements of torque and load shall meet the accuracies specified in Sections 4.1 and 4.2.

4.4 Drive Tool. The drive tool shall be a fixtured DC electric power tool or hydraulic motor device capable of meeting the continuous speed requirement and shut-off capabilities as specified. The tools shall be capable of producing torques greater than the requirements of the parts to be tested and must be able to maintain a continuous speed of 100 ± 10 RPM for the duration of the test. For parts greater than 5/8 inches, the speed shall be 30 ± 3.0 RPM.

Sockets shall not be allowed to contact the test washer during the rundown.

5.0 Test Procedure.

5.1 The test shall consist of one installation of the sample fastener in a test fixture using a constant speed power tool. For the test, the test sample shall be assembled onto an appropriate mating test part (i.e., a nut will be tested by being driven onto a test screw). The test sample shall be driven against a test washer as the bearing surface.

5.2 Loosely assemble by hand the test sample, the appropriate mating test part and the test washer into the test fixture. The parts are to be installed such that the test sample can be driven by the drive tool as its bearing surface rotates against the test washer. The test washer must be prevented from turning during the rundown. In the event of dispute, the washer shall be placed such that its punch entry side is placed against the test specimen. Adjust the grip length of the test fixture such that when the parts are fully seated the screw protrudes a minimum of four full thread pitches through the nut. A suitable fixture is shown in Appendix A.

5.3 Set the power tool to shut off at a torque approximately 2.0 percent greater than the maximum torque at clamp value (typically the clamp value is 75 percent of the proof load for the external fastener) allowed for the test sample.

5.3.1 Alternatively, the tool may be set to shut off on a tension value approximately 1.0 percent greater than the clamp value. This method is preferred if this test is performed in conjunction with prevailing-torque testing.

Tighten the joint by driving the test sample with the power tool at the appropriate speed for the sample being tested. Both torque and tension are to be recorded during the rundown.

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