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# MILITARY STANDARD

FASTENER TEST METHODS

METHOD 31,

TORQUE



**FSC 53GP**

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DEPARTMENT OF DEFENSE  
Washington, DC 20301

Fastener Test Methods, Method 31, Torque

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FOREWORD

This standard sets forth a standard test method for torque testing threaded fasteners.

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1. SCOPE

1.1 Applicability. This test method describes the test procedure for determining room temperature transmission and locking torque of threaded fasteners.

2. REFERENCED DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards and handbooks. Unless otherwise specified, the following specifications, standards and handbooks of the issue listed in the current Department of Defense Index of Specifications and Standards (DoDISS) and the supplement thereto (if applicable), form a part of this standard to the extent specified herein.

SPECIFICATIONS

FEDERAL

GGG-W-686                      Wrench, Torque

MILITARY

MIL-T-26639                    Tester, Torque Wrench

STANDARDS

MILITARY

MIL-STD-1312                    Fastener Test Methods

2.1.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part of this standard to the extent specified herein.

PURCHASE DESCRIPTION

Naval Air Systems Command

AS1310                            Torque Terms, Definitions of

(Application for copies should be addressed to the Commander, Naval Air Systems Command, AIR-51122E, Washington, D.C. 20361.)

(Copies of specifications, standards, handbooks, drawings and publications required by contractors in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting officer.)

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## 3. DEFINITIONS

3.1 Lock area. Lock area is the area where the self-locking feature applies to either the externally threaded or internally threaded member of the fastener.

3.2 Torque terms. Torque terms shall be as defined in AS1310.

## 4. GENERAL REQUIREMENTS

4.1 Test apparatus.

4.1.1 Torque wrenches. Torque wrenches shall be in accordance with GGG-W-686, Type I, Class 1 and certified to MIL-T-26639. Torque wrenches shall have been calibrated within 12 months for production testing and within 3 months for qualification testing. Torque wrenches shall be selected so that torque values are within twenty percent and ninety percent of the torque wrench capacity. If the torque values are not within the limits, the test shall be repeated with an appropriate torque wrench.

4.1.2 Power tools. Pneumatic, reversible drivers shall be calibrated at the beginning of the test to the accuracy specified herein. Power tools shall be adjusted to produce torques as specified in the procurement specification within  $\pm 3$  inch-pounds or  $\pm 5$  percent, whichever is greater. The maximum allowable speed shall be 500 rpm.

4.1.3 Torsion machines. Torsion machines shall be accurate within  $\pm 2$  percent. Torsion machines shall have been calibrated within 12 months for production testing and within 3 months for qualification testing. The torque indicating scale of the torsion machine shall be selected so that indicated torque readings are within 10 percent and 90 percent of the scale capacity. If the torque values are not within the limits, the test shall be repeated using an appropriate scale.

4.1.4 Test fixtures. The construction of the test fixtures shall be such that the torque required to overcome friction through the wrench holding device does not exceed 1 inch-ounce for wrench capacity up to 300 inch-pounds, and 3 inch-ounces for larger wrench capacities.

The concentricity between the torquing device and the fastener shall be within 0.010 inch FIM (full indicator movement). The plane of the torquing shall be perpendicular to the axis of the fastener within 3 degrees. A typical fixture is shown in Figure 1.

4.1.5 Specimens. The fasteners shall be as specified in the procurement specification. If all the fastener test members are not specified, the fastener elements normally used with the fastener being tested shall be used.

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Unless otherwise specified, a single fastener test member shall be used for all cycles of one torque test.

Unless specified otherwise, no supplementary lubrication shall be used. Cadmium and silver plating are not considered to be lubricants when used as the final coating.

Reduced or selected tolerance test members are not recommended if the test result does not represent actual application values.

## 5. DETAIL REQUIREMENTS

5.1 Test procedures.

5.1.1 Self-locking torque. The fastener elements shall be assembled in a manner that will ensure that the externally threaded member protrusion beyond the internally threaded member lock area (see 3.1) will range from a minimum of chamfer breakthrough to a maximum of five thread pitches plus chamfer.

Torque shall be applied to the assembly in a manner that will ensure that all torque is transmitted to the mating element before axial load is applied.

5.1.2 Assembly torque. When specified in the specification, assembly torques shall be applied in a manner that will produce axial load in the fastener.

5.1.3 Maximum self-locking torque at installation. Maximum self-locking torque is the maximum torque encountered during assembly of the elements to the thread lock protrusion condition referenced above before axial load is applied.

5.1.4 Breakloose torque. Initiate removal cycle, stopping after axial load is relieved, when applicable. The torque encountered after disengagement is "breakloose torque."

5.1.5 Breakaway torque. Re-initiate removal cycle. Minimum or maximum breakaway torque is the torque necessary to initiate removal from the breakloose torque position.

5.1.6 Minimum self-locking torque. Minimum self-locking torque shall be recorded after breakaway torque is determined while the fastener is in motion and engaged with 100 percent of the locking feature.

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5.1.7 Multiple tests. When locking torque characteristics must be determined for more than one assembly and removal cycle, the procedure in 5.1.1 shall apply with the following exceptions when specified in the procurement specification.

a. Power tools adjusted to deliver the assembly torques and capable of installation/removal rates (rpm) as specified in the procurement specification shall be used for all cycles except the observation cycle. Speed shall not exceed 500 rpm.

b. The interval over which the torque observation cycle is monitored shall be as specified in the product specification.

c. The fastener elements shall be allowed to cool after installation and removal.

d. For lubricated fasteners, the amount or duration of cooling is not controlled.

e. For unlubricated fasteners whose torque has been applied by high speed (500 rpm max) equipment, compressed air shall be used to cool the fasteners after installation and removal for the following durations:

- (1) not less than 5 seconds for fastener diameters up to 5/16;
- (2) not less than 10 seconds for fastener diameters between 5/16 and 9/16;
- (3) not less than 15 seconds for fastener diameters above 9/16.

5.1.8 Wrench torque. The wrench torque test shall be conducted in a test fixture as shown in figure 1 using appropriate assembly tools to fit the wrenching configuration. Torque shall be applied to the test fastener at a uniform rate (20 in.-lb/sec max). Unless otherwise specified in the specification, no end load may be applied to the driving tool. The limit of torque transmission (wrench torque) shall be the maximum torque that can be obtained without fastener failure or damage to the wrenching tool or fastener wrenching configuration to the extent that they are no longer functional.

5.1.9 Torque-out. The torque-out test will determine the torsional stability of nuts designed for permanent attachment to the structure. The nuts shall be assembled in the specified test plate. Torque shall be applied at a uniform rate (20 in.-lb/sec max) so that no axial load is induced in the nut element.



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5.1.9.1 Test to specified proof torque. When specified test torques are to be verified, the internally threaded assembly shall be subjected to the specified values first in the clockwise direction, then in the counterclockwise direction. The procedure shall be reversed for left hand threads.

5.1.9.2 Ultimate torque test. The ultimate torque test shall determine maximum torque that can be developed without rupture or deformation sufficient to prevent normal use of the nut. Torque shall be applied in the counterclockwise direction using a screw or stud extraction tool applied to the top of the assembly. Caution must be exercised to prevent applying a load to the bearing surface of the nut.

5.2 Torque test for threaded inserts - internal threads only. Apparatus and test procedures defined herein shall be used to test the internal threads. Tests to determine the torsional stability of the external threads shall be performed as described in the procurement specification.

## 6. NOTES

6.1 Test report. The test report shall include the following data:

- a. Fastener description.
  1. Part number.
  2. Lot identification.
  3. Material.
  4. Heat treat.
  5. Grip length.
  6. Mating part.
  7. Lubrication or plating.
- b. Test machine.
  1. Model and serial number.
  2. Calibration date.

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- c. Torques.
  - 1. Max. self-locking torque at installation.
  - 2. Assembly torque.
  - 3. Breakloose torque.
  - 4. Breakaway torque.
  - 5. Min. self-locking torque at removal cycle.
- d. Test method.
- e. Test load.
- f. Type of failure.
- g. Results.
- h. Specimen preparation.

Custodians:

Army - AV  
Navy - AS  
Air Force - 11

Preparing activity:

Navy - AS

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Review activities:

Army - AV, AR  
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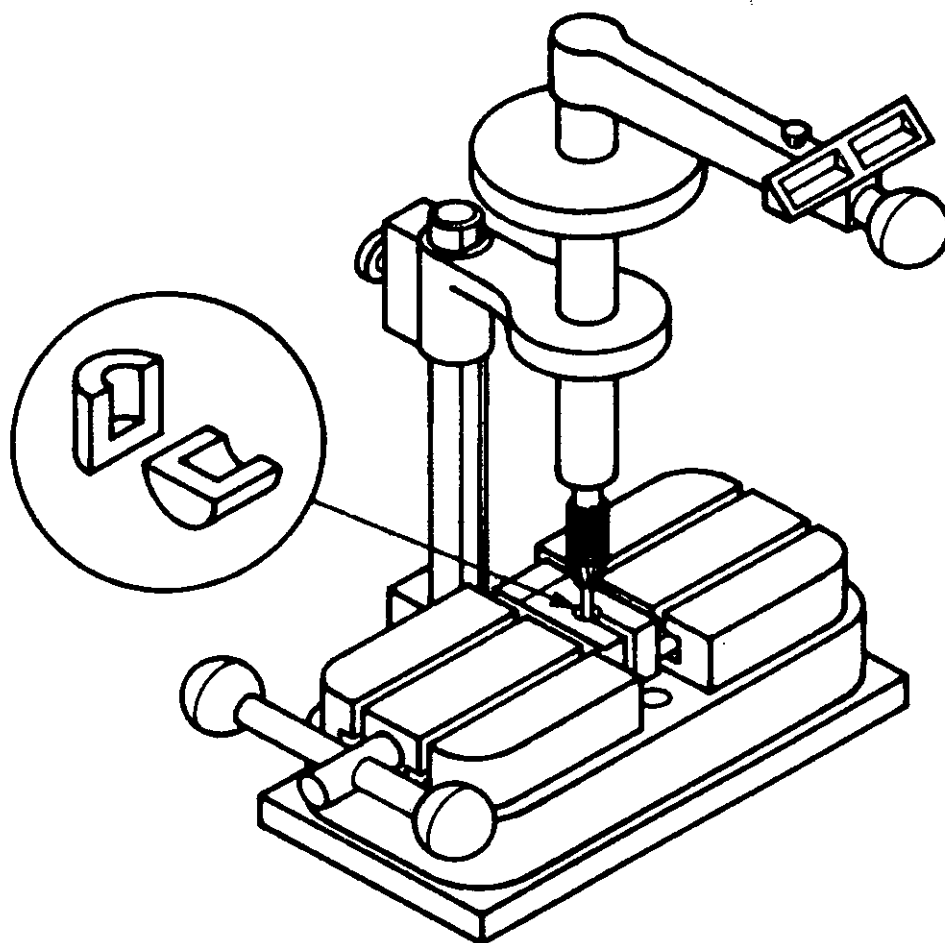


FIGURE 1. Test fixture.