SAE Aerospace
An SAE International Group

AEROSPACE RECOMMENDED PRACTICE

SAE ARP5483/1

Issued 2005-09

Rolling Element Bearing No-Load Torque Test

1. SCOPE:

This test method outlines the recommended procedure for performing the no-load rotational starting torque test on airframe rolling bearings. Bearings covered by this test method shall be antifriction ball bearings and spherical roller bearings.

2. REFERENCES:

2.1 Applicable Documents:

2.1.1 International Standards Organization (ISO) and National Conference of Standards Laboratories (NCSL) Standards: Available from American National Standards Institute (ANSI), 25 West 43rd Street, New York, NY 10036-8002.

ANSI-NCSL Z 540-1	Calbration Laboratories and Measuring and Test Equipment - General Requirements
ISO 10012-1	Quality Assurance requirments for Measuring Equipment

2.1.2 U.S. Government Publications: Available from DODSSP, Subscription Service Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

ISO 10012-1	Quality Assurance Requirements for Measuring Equipment
ANS/NCSL Z540-1	General Requirements for Calibration

3. DEFINITIONS:

Starting torque is defined as the rotational force required to initiate rotation of one bearings raceway relative to the other raceway.

TO PLACE A DOCUMENT ORDER:
Tel: 877-606-7323 (inside USA and Canada)
Tel: 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: custsvc@sae.org
SAE WEB ADDRESS: http://www.sae.org

SAE 100 Leading Our World In Motion

4. GENERAL REQUIREMENTS:

4.1 Test Apparatus:

4.1.1 Torque Tester: The testing device shall be capable of measuring the starting rotational torque within the bearing, without applying external radial or axial loads. The torque shall be applied either using electronically driven torque measuring device that starts from a static state and slowly increases torque until rotation occurs or applied manually using a torque watch. The gage should be accurate to within 10% of the measured value. A simple manual testing device is shown in Figure 1.

4.1.2 (Alternative Method) In the event that the torque apparatus described in 4.1.1 is unavailable, it is permissible to use a force gage and a string. (See Section 5.2) Torque values properly obtained from any of these methods are acceptable.

4.1.3 Calibration: Calibration of the torque tester shall be in accordance with ANSI-NCSL Z 5040-1 or ISO 10012-1, and the manufacturer's specifications. Calibration of the torque tester shall be within limits at the time of the test.

4.1.4 Bearing Adapter: The bearing holding adapter shall hold the inner ring of the bearing tightly enough to turn it without causing distortion. The inner bearing ring may be held by the wedging action of a relatively soft material, or clamping of its faces. The bearings adapter shall be directly attached to the torque tester. A simple adapter, which may be used for multiple bore sizes, is shown in Figure 1.

4.1.5 Equipment Variation: Variations in the apparatus to test and hold the bearing are permissible providing the procuring activity is provided with sufficient calibration data to verify the accuracy of the test conditions and results.

4.2 Test Specimen:

4.2.1 Disposition of Specimen: Bearings having acceptable torque levels and that remain otherwise undamaged after completion of this test are suitable for delivery into service as this test is considered to be nondestructive. If any other test should be required, then the suitability for delivery of specimen will be based on those other tests.

5. DETAILED REQUIREMENTS:

5.1 Procedure for No-Load Rotational Starting Torque:

5.1.1 Rotate one of the two bearing rings at least 4 revolutions in both directions to distribute the lubricant evenly.

5.1.2 Align bearing ring faces so they are perpendicular to the bearing adapter's axis and push lightly onto the adapter until wedging action just holds the bearing on the adapter. (See 5.2 for alternative method.)

5.1.3 Apply torque either using a power driven torque measuring device which gradually increases the torque from zero until rotation starts, or manually using a torque gauge with the bearing at room temperature. A start is registered when the rotating raceway member starts and maintains rotation through a minimum 60 degree arc.

5.1.4 Measure the torque a minimum of three times in both rotational directions. The highest value obtained is considered the starting torque of that bearing.

5.2 (Alternative technique, force gage with string) To use this technique, fasten one end of a string to the O.D. of the bearing with tape or a similar means. Wrap the string circumfrentially along the bearing O.D. for one or more complete revolutions. Attach the free end of the string to an appropiately sensitive force gage. The gage should be accurate to within 10% of the measured value. Lightly restrain the inner ring from rotating and slowly pull on the spring scale until the outer ring starts to rotate. Measure the force (oz. or lbf.) to rotate the outer ring a minimum of three times in both rotational directions and record the highest value. The torque is then calculated by multiplying the radius of the bearing (centerline to outside diameter) by the highest force to yield the torque (typical units: in.-oz., in-lbf or ft-lbf).

5.3 If a bearing fails to pass the specification limit, this test may be repeated twice, beginning with 5.1.1. If bearing still fails after three attempts, it must be reworked to conformance or rejected.

6. DOCUMENTATION:

6.1 Test Parameters:

The following parameters shall be specified in the individual specification or standard:

a. Failure criteria

6.2 Test Data:

The following information shall be recorded in report format:

6.2.1 Bearing Description:

a. Part Number

b. Lot Identification

c. Manufacturer

6.2.2 Test Equipment:

a. Equipment Name, Model number, and Serial Number

b. Calibration Data

c. Operator

d. Date tested

6.2.3 Results:

a. Requirements

b. Measured values

c. Measurement Units

6.2.4 Failures or Problems:

a. Description of failure

b. Corrective action taken

c. Description of any malfunction resulting in an invalid or interupted test.

7. NOTES:

7.1 Intended Uses:

This test method is intended to provide a standard method of evaluating the starting rotational torque of bearings without loading the bearings.

7.2 Method of Reference:

This test method is intended to be referenced in general and in detailed specifications, standards or drawings for airframe bearings. Specific test and data requirements are given in the applicable document. The following note shall be used to reference this test method:

NOTE: The bearings shall be tested in accordance with ARP 5483/1. The slash number refers to the specific test method.