



AEROSPACE RECOMMENDED PRACTICE

ARP5483™/8**REV. B**Issued 2002-12
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Superseding ARP5483/8A

Rolling Bearing Dynamic Radial Load Test

RATIONALE

ARP5483/8B is a Five-Year Review with only minor editorial changes.

1. SCOPE

This test method outlines the recommended machine function, fixtures, and procedures used to test airframe rolling element bearings for dynamic performance under steady unidirectional radial load and oscillatory motion. Bearings covered by this test method shall be ball, roller, or needle type in either annular or rod end configuration, used in airframe control applications.

2. APPLICABLE DOCUMENTS

There are no referenced publications specified herein.

3. GENERAL REQUIREMENTS

3.1 Dynamic Radial Load

3.1.1 Test Machine

The test machine shall be capable of applying a radial load as defined in the applicable bearing or drawing standard, and oscillatory motion to the bearing for the required angular arc and number of oscillatory cycles per the procurement standard. Instructions for operating and maintaining the test machine are required.

3.1.1.1 Design

The rod end or housed annular test bearing shall be held fixed by the test machine. The shaft passing through the inner ring of the test bearing shall be supported for oscillatory motion and loaded in double shear. The structural member of the test machine shall be suitably stiff so as to limit deflection from the applied load. For guidance purposes, the deflection in the plane of the support bearings should not exceed 0.004 inch per inch within the zone included by the support bearings. The structure, support bearings, drive, and linkages shall be designed for continuous operation and high reliability. Multiple test stations are permissible, providing that it can be shown that variables at each station remain within control limits regardless of individual test bearing performance.

3.1.1.2 Applied Radial Load

The test load applied through the rod end or bearing housing shall be steady and maintainable. Unless otherwise specified, the direction of loading shall be with the rod in tension.

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3.1.1.3 Oscillatory Motion

The oscillatory motion shall produce an angular velocity to the test bearing inner ring approximating a sine wave.

3.1.2 Test Fixture

3.1.2.1 Annular Bearings

Annular bearings shall be mounted in the bore of the housing with a resulting fit of 0.000 to 0.001 inch clearance over the outside diameter. Such housing may typically be a square plate or a circular disk, with a threaded shank extending from the edge of the square or disk. The thickness of the housing shall be equal to or greater than the width of the bearing outer ring. The minimum cross-sectional area of the housing shall be at least 10 times greater than the test bearing outer ring cross sectional area. The housing shall be made of steel, through hardened to 30 to 45 HRC. The bore of the housing shall meet a ground roughness of 16 $\mu\text{in Ra}$. The shank shall be threaded for rigid attachment to a load cell or loading mechanism (see Figure 1).

3.1.2.2 Rod End Bearings

Rod end bearings have an inherent structured provision and shall not require a separate housing.

3.1.2.3 Bearing Inner Ring Support

The shaft or pin to support the bearing inner ring shall be steel, mounted with a resulting fit of 0.000 to 0.001 inch clearance. The steel pin shall be through hardened to 50 to 55 HRC, and meet a ground roughness of 12 $\mu\text{in Ra}$.

3.1.3 Instrumentation

The test machine shall be provided with the following instrumentation (see Table 1).

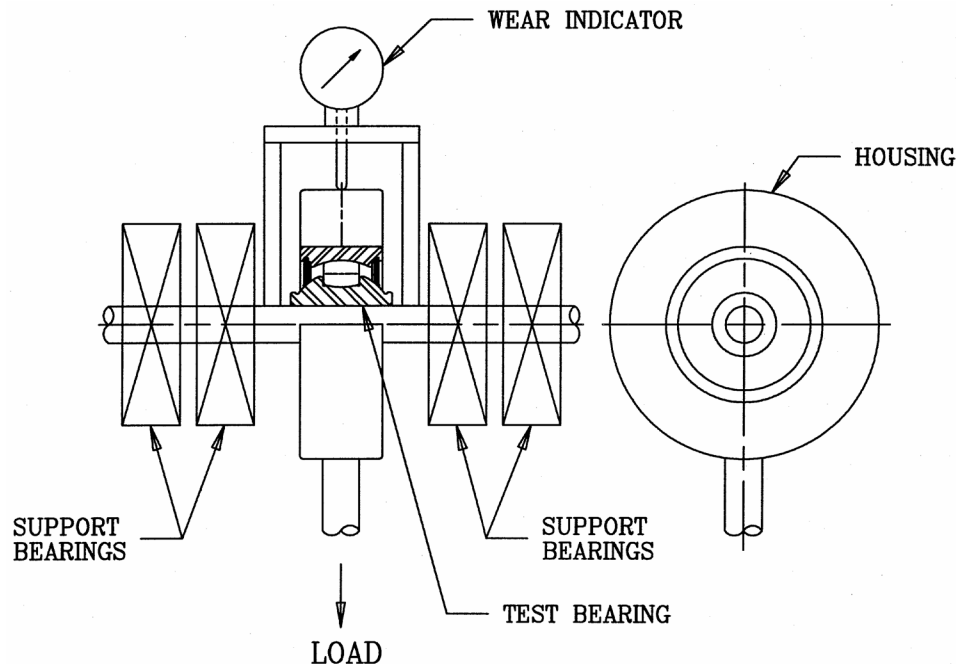


Figure 1 - Test fixture

Table 1 - Instrumentation requirements for test machine

Parameter	Tolerance
	Limits
Load	±2% of test requirement
Oscillation Angle	±1 degree of test requirement
Frequency of Oscillation	±2% of test requirement
	Measurement Accuracy
Housing Temperature	±5 °F
Cycles (Counter)	Not applicable
Wear	±0.0001 inch
Torque (if required)	±5% of peak torque

3.1.3.1 Load Cell

The load cell is to measure the applied test load, or calibrate the method employed to apply the test load.

3.1.3.2 Counter

A cycle counter and time clock shall be used.

3.1.3.3 Wear Indicator (Approach from Inner Ring to Outer Ring)

The preferred method is to use a dial indicator between the test bearing housing and the shaft or pin support system. If the indicator bridges between the support bearing structure and the test bearing housing, provisions shall be made to isolate the effects of support bearing wear.

3.1.3.4 Resistance Torque to Rotation Under Load

The preferred method is to measure the torsion reaction from the test bearing alone. If total drive torque is used, provisions shall be made to isolate the effects of the support bearings.

3.1.3.5 Temperature

Housing temperature shall be monitored using either thermocouples or using hand held contact probes.

3.1.3.6 Calibration

Calibration of the instrumentation shall be in accordance with the test machine's manufacturer's specifications and shall be within limits at the time of the test.

3.1.4 Safety Provisions

The test machine shall be configured to the extent necessary to provide maximum safety to personnel supporting the test. In particular, moving shafts, belts, chains, and linkages shall be shrouded or otherwise protected. Electrical controls shall be housed in consoles to avoid shock hazards. Automatic shut-off shall be provided for the test machine to detect mechanical, electrical, or hydraulic problems that endanger personnel or cause property damage due to fire, smoke, or explosion.

3.1.5 Maintenance

A visual inspection of the test machine shall be performed prior to the start of the test. A general maintenance schedule and procedure to check and replace worn parts before the start of each test is also required.