American National Standard

for Rolling Element Bearings – Aircraft Engine, Engine Gearbox, and Accessory Applications – Eddy Current Inspection

ANSI B3.1-1992

ANSI American National Standards Institute
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10036

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for Rolling Element Bearings – Aircraft Engine, Engine Gearbox, and Accessory Applications – Eddy Current Inspection

Secretariat

Anti-Friction Bearing Manufacturers Association, Inc.

Approved February 21, 1992

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Foreword (This foreword is not part of American National Standard B3.1-1992.)

This American National Standard was prepared by a task force consisting of representatives of companies which manufacture rolling element bearings and aircraft, or aircraft engines, or both, in the United States. This standard is issued by the Accredited Standards Committee B3 of the American National Standards Institute as an industrial standard that is intended to be used by aircraft manufacturers, or aircraft engine manufacturers, or both, for the procurement of rolling element bearings for aircraft engine and accessory applications.

Suggestions for improvement of this standard will be welcome. They should be sent to the Anti-Friction Bearing Manufacturers Association, Inc., 1101 Connecticut Avenue, NW, Suite 700, Washington, DC 20036.

This standard was processed and approved for submittal to ANSI by the Accredited Standards Committee on Ball and Roller Bearings, B3. Committee approval of this standard does not necessarily imply that all committee members voted for its approval. At the time it approved this standard, the B3 Committee had the following members:

Gene Looft, Chairman
Robert H. Feest, Vice-Chairman
Gary T. Satterfield, Secretary

Organization Represented	*Name of Representative*
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American National Standard for Rolling Element Bearings – Aircraft Engine, Engine Gearbox, and Accessory Applications – Eddy Current Inspection

1 Scope

This standard specifies a method for detection of discontinuities or nonhomogeneities in bearing components by means of eddy current interrogation. This standard is applicable to rolling element bearings used in aircraft engine, engine gearbox, and accessory applications.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this American National Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this American National Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below.

ASNT-TC-1A, 1988, *Personnel qualification and certification in nondestructive testing* [1)]

MIL-STD-410, Rev D, *Nondestructive testing personnel qualification and certification* [2)]

3 Definitions

3.1 signal-to-noise-ratio: The ratio of value of signal (response containing information) to that of noise (response containing no information).

3.2 residual magnetism: The amount of magnetism that a material retains after the magnetizing force is removed (also called *residual field*).

3.3 (probe) shielding: A conductive or magnetic material (or a combination of both) placed so as to decrease susceptibility to interference, or to increase resolution.

3.4 filtering: The removal from, or minimizing of, certain frequencies from the signal; it attenuates interfering signals and improves the signal-to-noise ratio.

3.5 load-bearing surface: Surfaces of the bearing that are in rolling contact (i.e., ball or roller outer diameter and ball or roller tracks or rings).

3.6 inspection speed: The relative speed in the direction of rotation between the probe and the surface of the part being inspected.

3.7 traverse rate: The relative linear speed, perpendicular to the direction of rotation, between the probe and the surface of the part being inspected.

3.8 ferrite diameter: The diameter of the ferrite core of the probe.

3.9 rejection criteria: The percentage of the reference level signal from calibration that is acceptable.

3.10 sensitivity: The response level for a given input.

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1) Available from the American Society for Nondestructive Testing, 1711 Arlingate Lane, Columbus, OH 43228.

2) Available from the Naval Publications and Forms Center, Attention NPFC-3064, 5801 Tabor Avenue, Philadelphia, PA 19120.

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4 Requirements

4.1 Certification

4.1.1 The bearing manufacturer's eddy current inspection procedure shall be approved by the purchaser.

4.1.2 Personnel making accept or reject decisions described in this standard shall be qualified to level II or better in accordance with MIL-STD-410 and ASNT-TC-1A with purchaser approval.

4.2 Audit

The inspection system shall be approved by the purchaser. No changes shall be made without purchaser approval.

4.3 Masters

4.3.1 Masters used to set sensitivity shall be representative of the hardware being inspected as to geometry, material, and hardness.

4.3.2 Simulated defects shall be 0.030 in ± 0.002 in (0.762 mm ± 0.051 mm) long, and a maximum of 0.004 in (0.102 mm) wide and 0.004 in (0.102 mm) deep. The defect shall have a rectangular cross-section with the bottom parallel to the surface.

4.4 Calibration

4.4.1 Probe, absolute

The probe, absolute shall be 1 to 2 MHz, 0.040 to 0.060 in (1 to 1.5 mm) diameter. Use of shielding is permissible.

4.4.2 Signal-to-noise level

The signal-to-noise level shall be 3 to 1 minimum.

4.4.3 Inspection speed

The inspection speed shall be 475 in (12 065 mm) per minute maximum. Surface speed is to be the same as that used with the master to adjust sensitivity. Select speed for compatibility with equipment response and signal-to-noise ratio.

4.4.4 Signal filtering

Signal filtering is permissible. Confirm detection of master defect for surface speed and signal-to-noise ratio.

4.4.5 Method

4.4.5.1 Parts other than balls

Orient defect so the relative path past the probe is perpendicular to the length of the defect. The maximum signal response is the reference level for setting the rejection limit for these parts.

4.4.5.2 Balls

Control the relative orientation or path of the simulated defect and the probe. The reference level for setting the rejection limit is the maximum signal obtained when the path of the probe over the defect is central to, and perpendicular to, the length of the defect.

4.5 Coverage

4.5.1 Interrogate 100% of the load-bearing surfaces accessible with the probe. In the presence of obstructing edges or flanges, all areas are to be covered to within 0.075 in (1.905 mm) of the edge.

4.5.2 In the case of balls manipulated under the probe by rotating equipment, a verification test shall be run using a marking pen, with a tip equal to the probe ferrite diameter on a ball, to ensure all surface areas will be covered.

4.5.3 In the case of races and rollers, calculations shall be made to ensure that the probe ferrite diameter and traverse rate, and the rate of rotation of the part, will provide complete coverage of the part surface.

4.6 Inspection requirements

4.6.1 Inspect all parts in the finished state.

4.6.2 Parts are to be demagnetized to levels where there is negligible effect on readings.

4.6.3 All equipment settings and speeds shall be the same as during calibration.

4.6.4 Inspection sensitivity shall be verified as follows:

– at the beginning and end of a lot, and at least every 4 hours;

– following interruptions such as personnel or equipment changes;

– if sensitivity is found to have changed more than ±10% since the last sensitivity

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check, *the equipment shall be recalibrated* and all parts examined since the last sensitivity check shall be reinspected.

4.6.5 Inspection level and rejection criteria (see 4.8) shall be as specified by the purchaser.

4.7 Procedure

The following procedure shall be used:

a) Set system to maximum response to the master simulated defect;

b) Select the reject level that represents the desired flaw detection threshold;

c) Lock in all inspection parameters;

d) Strip chart recorders, or alarm type devices, or both, may be used to aid inspection evaluations and dispositions.

4.8 Rejection criteria

There are two schedules that set this level:

– *Schedule A*: Limit of 100% of reference level signal;

– *Schedule B*: Limit of 40% of reference level signal.

4.9 Records and documentation

The supplier shall maintain, and make available on request, test reports detailing test results of the product.

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