American National Standard

for Rolling Element Bearings – Aircraft Engine, Engine Gearbox, and Accessory Applications – Surface Temper Etch

ANSI B3.3-1992

American National Standards Institute
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Secretariat

Anti-Friction Bearing Manufacturers Association, Inc.

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American National Standards Institute, Inc.

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Foreword (This foreword is not part of American National Standard B3.3-1992.)

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. (This document parallels MIL-STD-867A (USAF), *Military standard temper etch inspection.*)

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:

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Robert H. Feest, Vice-Chairman
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1 Scope

During the manufacture of bearing components, there are many grinding processes which must be carefully controlled. These grinding processes can cause excessive localized heating of the metal being worked and result in altering the metallurgical structure of the alloy. An inspection method of etching the ground surface of these alloys with acids permits detection of those altered structures. This specification for temper etch inspection details the methods and controls for performing etching of ground surfaces for the detection, qualification, and control of altered metallurgical structures of various metallic alloys subjected to grinding.

This specification presents two basic methods of etch, one of alcohol base and another of water base, in addition to use of a photographic gray scale to control bath immersion times and part etching levels. This standard parallels MIL-STD-867A (USAF), *Military standard temper etch inspection*.[1)]

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.

ANSI/SAE ARP 1923, *Qualification and certification of etch inspectors*

MIL-STD 867A-1979, *Military standard temper etch inspection*[1)]

3 Definitions

3.1 critical surfaces: Bearing critical surfaces are the surfaces of balls, rollers, and raceways.

3.2 tempering: Areas darker in color than the surrounding etched surfaces indicate lower surface hardness. The areas affected are recognized as dark gray to black in color. The burnt condition may be produced by abnormal tempering as a result of localized overheating due to abusive grinding.

3.3 rehardening: Areas white or very much lighter in color than the surrounding etched surfaces indicate higher surface hardness. The areas affected may be recognized as white islands surrounded by a border of tempered metal (black). The rehardened condition is produced by localized overheating that exceeds the critical temperature of the metal. The rehardening condition is the result of very severe abusive grinding.

3.4 decarburization: Areas lighter in color than the surrounding unburnt areas indicate a lower surface hardness. This discrepancy is unrelated to abusive grinding. These areas are deficient in carbon (*decarburization*) and are produced by certain heat treatment conditions.

3.5 false indications: Indications caused by smears, stains, certain wheel patterns, buffing wheel patterns, smutty finishes, fingerprints,

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