



Standard Test Method for Measurement of Lubricity of Aviation Turbine Fuels by the Ball-on-Cylinder Lubricity Evaluator (BOCLE)¹

This standard is issued under the fixed designation D5001; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope*

1.1 This test method covers assessment of the wear aspects of the boundary lubrication properties of aviation turbine fuels on rubbing steel surfaces.

1.1.1 This test method incorporates two procedures, one using a semi-automated instrument and the second a fully automated instrument. Either of the two instruments may be used to carry out the test.

1.2 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.3 *This standard does not purport to address the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:²

D4306 Practice for Aviation Fuel Sample Containers for Tests Affected by Trace Contamination

D6708 Practice for Statistical Assessment and Improvement of Expected Agreement Between Two Test Methods that Purport to Measure the Same Property of a Material

2.2 Military Specification:³

MIL-I-25017 Inhibitor, Corrosion/Lubricity Improver, Fuel Soluble

2.3 American Iron and Steel Institute Standard:⁴

AISI E-52100 Chromium Alloy Steel

2.4 ISO Standard:⁵

ISO 3290-1:2008 Rolling bearings -- Balls -- Part 1: Steel balls

2.5 Society of Automotive Engineers Standard:⁶

SAE 8720 Steel

3. Terminology

3.1 Definitions:

3.1.1 *lubricity*—qualitative term describing the ability of a fluid to minimize friction between, and damage to, surfaces in relative motion under load.

3.1.1.1 *Discussion*—In this test method, the lubricity of a fluid is defined in terms of a wear scar, in millimeters, produced on a loaded stationary ball from contact with a fluid-wetted rotating cylindrical test ring operating under closely defined and controlled conditions.

3.1.2 *wear scar*—in the liquid fuels industry, average diameter of a worn and abraded area, measured in two specified directions, produced on a test ball under defined conditions.

3.1.2.1 *Discussion*—The wear scar generated by Test Method D5001 is often referred to as the BOCLE wear scar.

3.2 Abbreviations:

3.2.1 **BOCLE**—Ball On Cylinder Lubricity Evaluator

3.2.2 **HRC**—Rockwell Hardness “C” scale.

3.2.3 **WSD**—Wear Scar Diameter

4. Summary of Test Method

4.1 The fluid under test is placed in a test reservoir in which atmospheric air is maintained at 10 % relative humidity. A non-rotating steel ball is held in a vertically mounted chuck and forced against the outside diameter of an axially mounted cylindrical steel ring with an applied load. The test ring is rotated at a fixed speed while being partially immersed in the fluid reservoir. This maintains the ring in a wet condition and continuously transports the test fluid to the ball/ring interface. The wear scar generated on the test ball is a measure of the lubricating property of the fluid. For wear scar diameter (WSD) calibration and standardization, see Section 10.

¹ This test method is under the jurisdiction of ASTM Committee D02 on Petroleum Products and Lubricants and is the direct responsibility of Subcommittee D02.J0.04 on Additives and Electrical Properties.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

³ Available from Standardization Documents Order Desk, DODSSP, Bldg. 4, Section D, 700 Robbins Ave., Philadelphia, PA 19111-5098, <http://www.dodssp.daps.mil>.

⁴ Available from American Iron and Steel Institute (AISI), 1140 Connecticut Ave., NW, Suite 705, Washington, DC 20036, <http://www.steel.org>.

⁵ Available from International Organization for Standardization (ISO), 1, ch. de la Voie-Creuse, Case postale 56, CH-1211, Geneva 20, Switzerland, <http://www.iso.ch>.

⁶ Available from Society of Automotive Engineers (SAE), 400 Commonwealth Dr., Warrendale, PA 15096-0001, <http://www.sae.org>.

*A Summary of Changes section appears at the end of this standard.