



Standard Test Method for Wear Preventive Characteristics of Lubricating Fluid (Four-Ball Method)¹

This standard is issued under the fixed designation D4172; 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.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope

1.1 This test method covers a procedure for making a preliminary evaluation of the anti-wear properties of fluid lubricants in sliding contact by means of the Four-Ball Wear Test Machine. Evaluation of lubricating grease using the same machine is detailed in Test Method [D2266](#).

1.2 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

1.3 *This standard does not purport to address all of 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

[D2266](#) Test Method for Wear Preventive Characteristics of Lubricating Grease (Four-Ball Method)

2.2 *ANSI Standard*:³

[B3.12](#) Specification for Metal Balls

3. Terminology

3.1 *Definitions*:

3.1.1 *lubricant, n*—any material interposed between two surfaces that reduces the friction or wear between them.

3.1.2 *wear, n*—damage to a solid surface, generally involving progressive loss of material due to relative motion between that surface and a contacting substance or surface.

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.L0.11](#) on Tribological Properties of Industrial Fluids and Lubricates.

Current edition approved May 1, 2010. Published May 2010. Originally approved in 1982. Last previous edition approved in 2004 as D4172 – 94 (2004)^{E1}. DOI: 10.1520/D4172-94R10.

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 American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.

4. Summary of Test Method

4.1 Three 12.7-mm [$\frac{1}{2}$ -in.] diameter steel balls are clamped together and covered with the lubricant to be evaluated. A fourth 12.7-mm diameter steel ball, referred to as the top ball, is pressed with a force of 147 or 392 N [15 or 40 kgf] into the cavity formed by the three clamped balls for three-point contact. The temperature of the test lubricant is regulated at 75°C [167°F] and then the top ball is rotated at 1200 rpm for 60 min. Lubricants are compared by using the average size of the scar diameters worn on the three lower clamped balls.

NOTE 1—Because of differences in the construction of the various machines on which the four-ball test can be made, the manufacturer's instructions should be consulted for proper machine set up and operation.

NOTE 2—Although the test can be run under other parameters, the precision noted in Section 10 may vary. No aqueous fluid was included in the round-robin to establish the precision limits.

5. Significance and Use

5.1 This test method can be used to determine the relative wear preventive properties of lubricating fluids in sliding contact under the prescribed test conditions. No attempt has been made to correlate this test with balls in rolling contact. The user of this test method should determine to his own satisfaction whether results of this test procedure correlate with field performance or other bench test machines.

6. Apparatus

6.1 *Four-Ball Wear Test Machine*⁴—See [Figs. 1-3](#).

NOTE 3—It is important to distinguish between the Four-Ball E.P. and the Four-Ball Wear Test Machines. The Four-Ball E.P. Test Machine is designed for testing under heavier loads and lacks the sensitivity necessary for wear tests.

⁴ The Four-Ball Wear Test Machine and the Falex Model #6, Multi-Specimen Friction and Wear Test Machine, both made by Falex Corp., 1020 Airpark Drive, Sugar Grove, IL 60554, have been found satisfactory for this purpose. This company can also furnish a microscope with a special base to measure the wear scars without removing the balls from the test-oil cup. Discontinued models of the Four-Ball Wear Test Machine made by Precision Scientific Co. and Roxana Machine Works are also satisfactory.