

Standard Test Method for Measurement of Extreme-Pressure Properties of Lubricating Fluids (Four-Ball Method)¹

This standard is issued under the fixed designation D 2783; 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 the determination of the load-carrying properties of lubricating fluids. The following two determinations are made:

1.1.1 Load-wear index (formerly Mean-Hertz load).

1.1.2 Weld point by means of the four-ball extreme-pressure (EP) tester.

1.2 For the determination of the load-carrying properties of lubricating greases, see Test Method D 2596.

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.*

1.4 The values stated in either inch-pound units or SI units are to be regarded separately as standard. Within the text, the SI units are shown in brackets. The values stated in each system are not exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in nonconformance with the standard.

2. Referenced Documents

2.1 *ASTM Standards:*

D 2596 Test Method for Measurement of Extreme-Pressure Properties of Lubricating Grease (Four-Ball Method)²

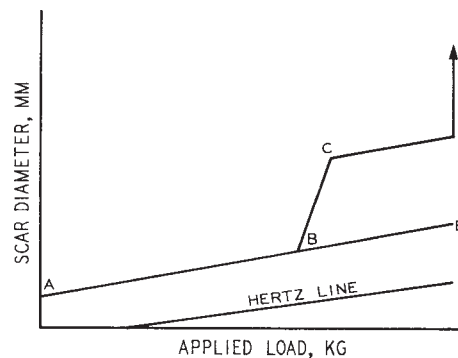
2.2 *ANSI Standard:*

B 3.12 Metal Balls³

3. Terminology

3.1 *Definitions:*

3.1.1 *compensation line*—a line of plot on logarithmic paper, as shown in Fig. 1, where the coordinates are scar diameter in millimetres and applied load in kilograms-force (or newtons), obtained under dynamic conditions.



ABE—Compensation line.

B—Point of last nonseizure load.

BC—Region of incipient seizure.

CD—Region of immediate seizure.

D—Weld point.

FIG. 1 Schematic Plot of Scar Diameter Versus Applied Load

3.1.1.1 *Discussion*—Coordinates for the compensation line are found in Table 1, Columns 1 and 3.

3.1.1.2 *Discussion*—Some lubricants give coordinates which are above the compensation line. Known examples of such fluids are methyl phenyl silicone, chlorinated methyl phenyl silicone, silphenylene, phenyl ether, and some mixtures of petroleum oil and chlorinated paraffins.

3.1.2 *compensation scar diameter*—the average diameter, in millimetres, of the wear scar on the stationary balls caused by the rotating ball under an applied load in the presence of a lubricant, but without causing either seizure or welding.

3.1.2.1 *Discussion*—The wear scar obtained shall be within 5 % of the values noted in Table 1, Column 3.

3.1.3 *corrected load*—the load in kilograms-force (or newtons) for each run obtained by multiplying the applied load by the ratio of the Hertz scar diameter to the measured scar diameter at that load.

3.1.4 *Hertz line*—a line of plot on logarithmic paper, as shown in Fig. 1, where the coordinates are scar diameter in millimetres and applied load in kilograms-force (or newtons), obtained under static conditions.

3.1.5 *Hertz scar diameter*—the average diameter, in millimetres, of an indentation caused by the deformation of the balls under static load (prior to test). It may be calculated from the equation

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 on Industrial Lubricants.

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² *Annual Book of ASTM Standards*, Vol 05.01.

³ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036.