



Standard Test Method for Measurement of Consistency of Lubricating Greases at High Temperatures¹

This standard is issued under the fixed designation D 3232; 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 measurement of the consistency of lubricating greases under high-temperature, low-shear conditions.

1.2 All values stated in inch-pound units are to be regarded as the standard. The unit of equivalent viscosity is poise.

1.3 *This standard may involve hazardous materials, operations, and equipment. This standard does not purport to address all of the safety problems 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:

D 341 Viscosity-Temperature Charts for Liquid Petroleum Products²

D 566 Test Method for Dropping Point of Lubricating Grease²

D 2265 Test Method for Dropping Point of Lubricating Grease Over Wide Temperature Range³

3. Terminology

3.1 Description of Term Specific to This Standard:

3.1.1 *equivalent viscosity*—a measure of consistency expressed in viscosity units. The data obtained by this test method are simply torque measurements expressed in units of viscosity which, while being useful expressions of consistency, are not literally viscosities.

4. Summary of Test Method

4.1 A grease sample is packed into an annular cylindrical space in an aluminum sample block. The packed block is then placed on a hot plate at room temperature, and a special trident probe spindle attached to a Brookfield viscometer is lowered into the grease sample. The hot plate is turned on, and the sample is heated at a rate of 10°F (5°C)/min. Simultaneously the spindle is caused to rotate at a constant speed of 20 rpm, and torque measurements are read from the viscometer every minute until the reading drops below 0.5

on the viscometer scale or the maximum sample temperature of interest is attained.

4.2 From these data, using an appropriate conversion factor determined by testing a reference fluid of known viscosity to translate torque into units of equivalent viscosity, a plot of equivalent viscosity *versus* temperature is prepared.

5. Significance and Use

5.1 The consistency of a grease is a critical parameter which defines the ability of a grease to perform in a particular operating environment. The ASTM dropping point methods (Test Method D 566 and Test Method D 2265) define whether the grease thickener melts or whether oil separates from the grease under high-temperature conditions, but neither gives an indication of the occurrence of less dramatic yet significant changes in consistency as a grease approaches a fixed temperature. The test herein described provides an indication of the consistency of a grease between room and elevated temperatures.

6. Apparatus

6.1 *Brookfield Viscometer*, Model RVF, or equivalent, equipped with Helipath stand chuck assembly, and having a 20-rpm spindle drive (see Fig. 1).⁴

6.2 *Brookfield Viscometer Stand*.^{4,5}

6.3 *Trident Probe Spindle and Sample Block* (see Fig. 2).⁵

6.4 *Heat Source*, capable of heating the sample block to temperatures in excess of 600°F (315°C) at a heating rate of 10 ± 2°F (5 ± 1°C)/min. A conventional laboratory hot plate has been found suitable for this function. The presence of insulation around the sample block is recommended since it leads to more uniform heating.

6.5 *Potentiometer and Thermocouple* for measuring sample block temperatures over the range from 70°F (22°C) to the upper test temperature of interest.

6.6 *Semilogarithmic Graph Paper* for data plotting.⁶

6.7 *Calibration Fluid*⁷—Cannon Instrument Co. Calibration Fluid No. S 2000 with a viscosity of approximately 51 P at 77°F (25°C) has been found suitable for this use.

¹ This test method is under the jurisdiction of ASTM Committee D-2 on Petroleum Products and Lubricants and is the direct responsibility of Subcommittee D02.03 on Elemental Analysis.

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

³ *Annual Book of ASTM Standards*, Vol 05.02.

⁴ Available from Brookfield Engineering Laboratories, Inc., 240 Cushing St., Stoughton, MA 02072.

⁵ The Trident Probe Spindle and Sample Block as well as the complete test apparatus are available from Falex Corp., 2055 Comprehensive Dr., Aurora, IL 60505.

⁶ Kueffel and Esser Paper No. 46 5493, available from stationary supply dealers, has been found suitable for this use.

⁷ Available from Cannon Instrument Co., P.O. Box 16, State College, PA 16801.