



Designation: D1092 – 18

Standard Test Method for Measuring Apparent Viscosity of Lubricating Greases¹

This standard is issued under the fixed designation D1092; 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 U.S. Department of Defense.

1. Scope*

1.1 This test method covers measurement, in poises, of the apparent viscosity of lubricating greases in the temperature range from -54°C to 38°C (-65°F to 100°F). Measurements are limited to the range from 25 P to 100 000 P at 0.1 s^{-1} and 1 P to 100 P at $15\,000\text{ s}^{-1}$.

NOTE 1—At very low temperatures the shear rate range may be reduced because of the great force required to force grease through the smaller capillaries. Precision has not been established below 10 s^{-1} .

1.2 This standard uses inch-pound units as well as SI (acceptable metric) units. The values stated first are to be regarded as standard. The values given in parentheses are for information only. The capillary dimensions in SI units in Fig. A1.1 and Fig. A1.2 are standard.

1.3 This test method uses mercury thermometers. **WARNING**—Mercury has been designated by many regulatory agencies as a hazardous substance that can cause serious medical issues. Mercury, or its vapor, has been demonstrated to be hazardous to health and corrosive to materials. Use caution when handling mercury and mercury-containing products. See the applicable product Safety Data Sheet (SDS) for additional information. The potential exists that selling mercury or mercury-containing products, or both, is prohibited by local or national law. Users must determine legality of sales in their location. The responsible subcommittee, D02.G0, continues to explore alternatives to eventually replace the mercury thermometers.

1.3.1 In addition, temperature measuring devices such as liquid-in-glass thermometers, thermocouples, thermistors, or platinum resistance thermometers that provide equivalent or better accuracy and precision, that cover the temperature range for ASTM thermometer 49C, may be used.

1.4 *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 appro-*

priate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*²

D88 Test Method for Saybolt Viscosity

D217 Test Methods for Cone Penetration of Lubricating Grease

D3244 Practice for Utilization of Test Data to Determine Conformance with Specifications

3. Terminology

3.1 *Definitions:*

3.1.1 *apparent viscosity, n* —of a lubricating grease is the ratio of shear stress to shear rate calculated from Poiseuille's equation, and is measured in poises (see 10.1).

3.1.2 *capillary, n* —For the purpose of this test method, a capillary is any right cylindrical tube having a length to diameter ratio of 40 to 1.

3.1.3 *shear rate, n* —the rate at which a series of adjacent layers of grease move with respect to each other; proportional to the linear velocity of flow divided by the capillary radius, and is thus expressed as reciprocal seconds.

4. Summary of Test Method

4.1 The sample is forced through a capillary by means of a floating piston actuated by the hydraulic system. From the predetermined flow rate and the force developed in the system, the apparent viscosity is calculated by means of Poiseuille's equation. A series of eight capillaries and two pump speeds are

¹ This test method is under the jurisdiction of ASTM Committee D02 on Petroleum Products, Liquid Fuels, and Lubricants and is the direct responsibility of Subcommittee D02.G0 on Lubricating Grease.

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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.

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