



Standard Test Method for Kinematic Viscosity of Volatile and Reactive Liquids¹

This standard is issued under the fixed designation D4486; 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 measurement of kinematic viscosity of transparent, Newtonian liquids which because of their reactivity, instability, or volatility cannot be used in conventional capillary kinematic viscometers. This test method is applicable up to 2×10^{-5} N/m² (2 atm) pressure and temperature range from -53 to $+135^{\circ}\text{C}$ (-65 to $+275^{\circ}\text{F}$).

1.1.1 For the measurement of the kinematic viscosity of other liquids, see Test Method [D445](#).

1.2 **WARNING**—Mercury has been designated by many regulatory agencies as a hazardous material that can cause central nervous system, kidney and liver damage. Mercury, or its vapor, may be hazardous to health and corrosive to materials. Caution should be taken when handling mercury and mercury containing products. See the applicable product Material Safety Data Sheet (MSDS) for details and EPA's website—<http://www.epa.gov/mercury/faq.htm>—for additional information. Users should be aware that selling mercury and/or mercury containing products into your state or country may be prohibited by law.

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.* For specific warning statements, see [7.2](#), [7.3](#), [7.4](#), and [Annex A1](#).

2. Referenced Documents

2.1 ASTM Standards:²

[D445](#) Test Method for Kinematic Viscosity of Transparent

and Opaque Liquids (and Calculation of Dynamic Viscosity)

[E1](#) Specification for ASTM Liquid-in-Glass Thermometers

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *density*—the mass per unit volume of the liquid.

3.1.1.1 *Discussion*—The cgs unit of density (ρ) has the dimensions of grams per cubic centimetre. The SI unit of density has the dimensions of kilograms per cubic metre.

3.1.2 *kinematic viscosity*—The ratio of the viscosity to the density of the liquid.

3.1.2.1 *Discussion*—For gravity flow under a given hydrostatic head, the pressure head of a liquid is proportional to its density ρ . For any particular viscometer, the time of flow of a fixed volume of liquid is directly proportional to η/ρ . This ratio is the kinematic viscosity coefficient (ν). The cgs unit of kinematic viscosity is the stoke and has the dimensions of centimetre squared per second; the centistoke (0.01 St) is frequently used. The SI unit of kinematic viscosity has the dimensions of metre²/second, and is equivalent to 10^4 St.

3.1.3 *viscosity*—the ratio between the applied shear stress and rate of shear.

3.1.3.1 *Discussion*—This ratio is called the coefficient of viscosity. The coefficient of viscosity (η) is thus a measure of the resistance to flow of the liquid. This is commonly called the viscosity of the liquid. The cgs unit of viscosity is the poise. P, which has the dimensions of dyne-seconds per square centimetre; the centipoise (0.01 poise) is frequently used. The SI unit of viscosity has the dimensions of newton second/metre², and is equivalent to 10 P.

3.1.4 *vulnerable liquid*—a liquid which by reason of its volatility, instability or reactivity in the presence of air or any other specific gaseous medium may undergo physical or chemical changes that may affect its viscosity.

4. Summary of Test Method

4.1 The time is measured, in seconds, for a fixed volume of liquid to flow under gravity through the capillary of the viscometer under a reproducible driving head and at a closely

¹ This test method is under the jurisdiction of Committee [D02](#) on Petroleum Products, Liquid Fuels, and Lubricants and is the direct responsibility of Subcommittee [D02.L0.07](#) on Engineering Sciences of High Performance Fluids and Solids (Formerly D02.1100).

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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.