



Standard Test Method for Viscosity of Paints and Related Materials by ISO Flow Cups¹

This standard is issued under the fixed designation D5125; 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 flow time (viscosity) of Newtonian and near-Newtonian paints, and related coatings and products using ISO capillary flow cups.

NOTE 1—If the liquid is non-Newtonian, that is shear-thinning or thixotropic, Test Methods [D2196](#) should be used.

1.2 The cup-orifice combination (ISO cup with orifice diameter of 3 mm, 4 mm, 5 mm, or 6 mm)² is selected to provide an efflux time with the range of 20 to 100 s and viscosities up to 700 cSt (700 mm²/s). The most commonly used cup is the one with the 4-mm orifice.

1.3 This test method is limited to testing materials for which the breakpoint of the flow from the orifice of the flow cup can be determined with certainty. This point is difficult to determine and reproduce for materials with flow times in excess of 100 s due to slowing-down effects.

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

1.5 *This standard does not purport to address 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.*

NOTE 2—The International Civil Aviation Organization (ICAO) and the International Maritime Organization (IMO) include in their regulations a similar test (ISO 2431) to determine the viscosity of hazardous viscous liquids. The viscosity is then used to place these liquids in a hazard packaging group depending on their viscosity/flashpoint relationship. The U. S. Department of Transportation permits the use of these regulations for transshipment of hazardous material within the U.S. when bound for foreign destinations.

¹ This test method is under the jurisdiction of ASTM Committee [D01](#) on Paint and Related Coatings, Materials, and Applications and is the direct responsibility of Subcommittee [D01.24](#) on Physical Properties of Liquid Paints and Paint Materials.

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² An ISO-type cup with an orifice diameter of 8 mm is available, but it is not listed in ISO 2431 and precision and accuracy are not known.

2. Referenced Documents

2.1 *ASTM Standards*:³

[D2196](#) Test Methods for Rheological Properties of Non-Newtonian Materials by Rotational (Brookfield type) Viscometer

[D3924](#) Specification for Environment for Conditioning and Testing Paint, Varnish, Lacquer, and Related Materials

[D3925](#) Practice for Sampling Liquid Paints and Related Pigmented Coatings

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

2.2 *ISO Documents*:

[ISO 2431](#) Paints and Varnishes: Determination of Flow Time by Use of a Flow Cup⁴

3. Terminology

3.1 *Definitions*:

3.1.1 *dynamic viscosity, n* —the ratio of the applied shear stress to shear rate.

3.1.1.1 *Discussion*—The SI unit for dynamic viscosity is the pascal second (Pas). The traditional unit is the centipoise (cP); 1 cP = 1 mPas.

3.1.2 *flow time, n* —the elapsed time from the moment when the material under test starts to flow from the orifice of the filled cup to the moment when the flow stream of material first breaks close to the orifice.

3.1.3 *kinematic viscosity, n* —the ratio of the dynamic viscosity to the density of the liquid.

3.1.3.1 *Discussion*—The SI unit for kinematic viscosity is the square metre per second (m²/s). The traditional unit is the centistokes (cSt); 1 cSt = 1 mm²/s.

3.1.4 *near-Newtonian liquid, n* —a liquid in which the variation of viscosity with shear rate is small and the effect on viscosity of mechanical disturbances such as stirring is negligible.

3.1.5 *Newtonian liquid, n* —a liquid in which the viscosity is independent of the shear stress or shear rate. Compare non-Newtonian liquid.

³ 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.

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