



Standard Test Method for Determination of Low Temperature Fluidity and Appearance of Hydraulic Fluids¹

This standard is issued under the fixed designation D 6351; 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 fluidity and appearance of hydraulic fluids after storage at low temperature.

1.2 *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 hazard statements, see Section 6.

2. Referenced Documents

2.1 ASTM Standards:²

- D 97 Test Method for Pour Point of Petroleum Products
- D 2500 Test Method for Cloud Point of Petroleum Products
- D 6080 Practice for Defining the Viscosity Characteristics of Hydraulic Fluids
- E 1 Specification for ASTM Liquid-in-Glass Thermometers

3. Summary of Test Method

3.1 After preliminary drying to remove trace amounts of water, the sample is cooled to a specified temperature. After seven consecutive days, the sample is examined for its ability to flow and observed for homogeneity.

4. Significance and Use

4.1 The temperature at which a lubricant remains fluid and homogeneous after seven days is an index of its ability to withstand prolonged exposure to cold temperature. With vegetable oils and some synthetic esters, it is necessary to do extended cold storage testing. Quick cool, short-term tests, such as Test Methods D 97 and D 2500, do not adequately predict the tendency to solidify over longer time spans at cold temperatures.

4.2 This test method is not intended to indicate cold temperature pumpability performance. A separate assessment of viscometric performance should be made in order to assess cold flow properties, which are important in order to avoid system damage in cold temperature applications. Suitable guidelines for such testing and test temperatures for various viscosity grades can be found in Practice D 6080.

4.3 No specific temperature of measurement is given in this test method because fluids with different viscosity grades have different cold temperature performance expectations. For guidance on temperature selection relative to an intended low temperature viscosity grade or ISO VG, consult Practice D 6080. As an example of using Practice D 6080, a L22 viscosity grade would be evaluated at the lowest temperature for that grade, namely -22.9°C . Alternatively, a fluid can be evaluated at the lowest temperature expected for field service.

5. Apparatus

5.1 *Test Jar*, cylindrical, of clear glass, flat bottom, 115 to 125 mm in height. The inside diameter of the jar can range from 30.0 to 32.4 mm, with a wall thickness of 1.6 mm maximum. The jar shall have a line to indicate a sample height 54 ± 3 mm above the inside bottom.

5.2 *Thermometers*, having ranges shown below and conforming to the requirements prescribed in Specification E 1.

| Thermometer | Temperature Range | Thermometer | Number |
|---------------------|--------------------------------|-------------|--------|
| | | ASTM | IP |
| High cloud and pour | -38 to $+50^{\circ}\text{C}$ | 5C | 1C |
| Low cloud and pour | -80 to $+20^{\circ}\text{C}$ | 6C | 2C |
| Melting Point | $+32$ to 127°C | 61C | 63C |

5.2.1 Since separation of liquid column thermometers occasionally occurs, thermometers should be checked visually immediately prior to the test.

5.3 *Cork*, to fit the test jar.

5.4 *Bath*, either an air or liquid bath maintained at the prescribed temperature with a firm support to hold the sample jars vertical. The required bath temperature shall be maintained by refrigeration to within $\pm 1^{\circ}\text{C}$ of the prescribed temperature.

¹ This guide is under the jurisdiction of ASTM Committee D-02 on Petroleum Products and Lubricants and is the direct responsibility of Subcommittee D02.N0 on Hydraulic Fluids.

Current edition approved June 10, 1999. Published August 1999.

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.