



Designation: D5133 – 20a

Standard Test Method for Low Temperature, Low Shear Rate, Viscosity/Temperature Dependence of Lubricating Oils Using a Temperature- Scanning Technique¹

This standard is issued under the fixed designation D5133; 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 the apparent viscosity of engine oil at low temperatures.

1.2 A shear rate of approximately 0.2 s^{-1} is produced at shear stresses below 100 Pa. Apparent viscosity is measured continuously as the sample is cooled at a rate of 1°C/h over the range -5°C to -40°C , or to the temperature at which the viscosity exceeds 40 000 mPa·s (cP).

1.3 The measurements resulting from this test method are viscosity, the maximum rate of viscosity increase (Gelation Index), and the temperature at which the Gelation Index occurs.

1.4 Applicability to petroleum products other than engine oils has not been determined in preparing this test method.

1.5 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.6 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.7 *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.*

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 D02.07 on Flow Properties.

Current edition approved June 1, 2020. Published June 2020. Originally approved in 1990. Last previous edition approved in 2020 as D5133 – 20. DOI: 10.1520/D5133-20A.

2. Referenced Documents

2.1 ASTM Standards:²

- D341 Practice for Viscosity-Temperature Equations and Charts for Liquid Petroleum or Hydrocarbon Products
- D3829 Test Method for Predicting the Borderline Pumping Temperature of Engine Oil
- D4684 Test Method for Determination of Yield Stress and Apparent Viscosity of Engine Oils at Low Temperature
- D6299 Practice for Applying Statistical Quality Assurance and Control Charting Techniques to Evaluate Analytical Measurement System Performance
- D7962 Practice for Determination of Minimum Immersion Depth and Assessment of Temperature Sensor Measurement Drift
- E644 Test Methods for Testing Industrial Resistance Thermometers

3. Terminology

3.1 Definitions:

3.1.1 *apparent viscosity, n* —the viscosity obtained by use of this test method.

3.1.1.1 *Discussion*—See 3.1.7 for definition of viscosity and units.

3.1.2 *digital contact thermometer (DCT), n* —an electronic device consisting of a digital display and associated temperature sensing probe.

3.1.2.1 *Discussion*—This device consists of a temperature sensor connected to a measuring instrument; this instrument measures the temperature-dependent quantity of the sensor, computes the temperature from the measured quantity, and provides a digital output. This digital output goes to a digital display or recording device, or both, that may be internal or external to the device.

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