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.

Designation: D6616 – 21

Standard Test Method for Measuring Viscosity at High Shear Rate by Tapered Bearing Simulator Viscometer at 100 °C[1]

This standard is issued under the fixed designation D6616; 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 laboratory determination of the viscosity of engine oils at 100 °C and $1 \cdot 10^6 s^{-1}$ using the Tapered Bearing Simulator (TBS) viscometer.[2]

NOTE 1—This test method is similar to Test Method D4683 which uses the same TBS viscometer to measure high shear viscosity at 150 °C.

1.2 The Newtonian calibration oils used to establish this test method range from approximately 5 mPa·s (cP) to 12 mPa·s (cP) at 100 °C and either the manual or automated protocol was used by each participant in developing the precision statement. The viscosity range of the test method at this temperature is from 1 mPa·s (cP) to above 25 mPa·s (cP), depending on the model of TBS.

1.3 The non-Newtonian reference oil used to establish the shear rate of $1 \cdot 10^6 s^{-1}$ for this test method has a viscosity of approximately 10 mPa·s at 100 °C.

1.4 Application to petroleum products other than engine oil has not been determined in preparing the viscometric information for 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. This test method uses the milliPascal second (mPa·s) as the unit of viscosity. This unit is equivalent to the centiPoise (cP), which is shown in parentheses.

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 to 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.*

2. Referenced Documents

2.1 *ASTM Standards:*[3]

D4683 Test Method for Measuring Viscosity of New and Used Engine Oils at High Shear Rate and High Temperature by Tapered Bearing Simulator Viscometer at 150 °C

D4741 Test Method for Measuring Viscosity at High Temperature and High Shear Rate by Tapered-Plug Viscometer

2.2 *Coordinating European Council (CEC) Standard:*[4,5]

CEC L-36-90 The Measurement of Lubricant Dynamic Viscosity under Conditions of High Shear

2.3 *Energy Institute Standard:*[6,5]

IP 370 Test Method for the Measurement of Lubricant Dynamic Viscosity Under Conditions of High Shear Using the Ravenfield Viscometer

3. Terminology

3.1 *Definitions:*

3.1.1 *density, n*—mass per unit volume.

3.1.2 *Newtonian oil or fluid, n*—an oil or fluid that at a given temperature exhibits a constant viscosity at all shear rates or shear stresses.

3.1.3 *non-Newtonian oil or fluid, n*—an oil or fluid that exhibits a viscosity that varies with changing shear stress or shear rate.

[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.

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[2] Available from Tannas Co., 4800 James Savage Rd., Midland, MI 48642. This viscometer and associated equipment as listed in the research report was used to develop the precision statement. To date, no other equipment has demonstrated, through ASTM International interlaboratory testing, the ability to meet the precision of this test. This is not an endorsement or certification by ASTM International.

[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 Coordinating European Council (CEC), Services provided by Kellen Europe, Avenue Jules Bordet 142 - 1140, Brussels, Belgium, http://www.cectests.org.

[5] This test equipment is identical to that described in CEC L-36-90 (under the jurisdiction of the CEC Engine Lubricants Technical Committee) and IP 370 references CEC L-36-90.

[6] Available from Energy Institute, 61 New Cavendish St., London, W1G 7AR, U.K., http://www.energyinst.org.

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

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