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: D446 – 12 (Reapproved 2017)

Designation: 71/2/95

Standard Specifications and Operating Instructions for Glass Capillary Kinematic Viscometers[1]

This standard is issued under the fixed designation D446; 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.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope

1.1 These specifications cover operating instructions for glass capillary kinematic viscometers of all the types described in detail in Annex A1, Annex A2, and Annex A3 as follows:

Modified Ostwald viscometers, Annex A1
Suspended-level viscometers, Annex A2
Reverse-flow viscometers, Annex A3

1.2 The calibration of the viscometers is described in Section 6.

1.3 This standard covers some widely used viscometers suitable for use in accordance with Test Method D445. Other viscometers of the glass capillary type which are capable of measuring kinematic viscosity within the limits of precision given in Test Method D445 may be used.

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

1.5 *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:*[2]

D445 Test Method for Kinematic Viscosity of Transparent and Opaque Liquids (and Calculation of Dynamic Viscosity)

D2162 Practice for Basic Calibration of Master Viscometers and Viscosity Oil Standards

2.2 *ISO Documents:*[3]

ISO 3104 Petroleum Products—Transparent and Opaque Liquids—Determination of Kinematic Viscosity and Calculation of Dynamic Viscosity

ISO 3105 Glass Capillary Kinematic Viscometers—Specifications and Operating Instructions

ISO 5725 Basic Methods for the Determination of Repeatability and Reproducibility of a Standard Measurement Method

ISO 17025 General Requirements for the Competence of Testing and Calibration Laboratories

ISO Guide 25 General Requirements for the Calibration and Testing Laboratories

2.3 *NIST Standards:*[4]

NIST 1297 Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results

3. Materials and Manufacture

3.1 Fully annealed, low-expansion borosilicate glass shall be used for the construction of all viscometers. The size number, serial number, and manufacturer's designation shall be permanently marked on each viscometer. All timing marks shall be etched and filled with an opaque color, or otherwise made a permanent part of the viscometer. See detailed description of each type of viscometer in Annex A1, Annex A2, and Annex A3.

3.2 With the exception of the FitzSimons and Atlantic viscometers, all viscometers are designed to fit through a 51-mm hole in the lid of a constant-temperature bath having a liquid depth of at least 280 mm; and it is assumed that the surface of the liquid will be not more than 45 mm from the top of the bath lid. For certain constant-temperature baths, especially at low or high temperatures, it may be necessary to construct the viscometers with the uppermost tubes longer than

[1] These specifications and operating instructions are under the jurisdiction of ASTM Committee D02 on Petroleum Products, Liquid Fuels, and Lubricants and are the direct responsibility of Subcommittee D02.07 on Flow Properties.

Current edition approved Dec. 1, 2017. Published December 2017. Originally approved in 1966 as D2515 – 66. Redesignated D446 in 1977. Last previous edition approved in 2012 as D446 – 12. DOI: 10.1520/D0446-12R17.

[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.

[3] Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036.

[4] Available from National Institute of Standards and Technology (NIST), 100 Bureau Dr., Stop 1070, Gaithersburg, MD 20899-1070, http://www.nist.gov.

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