Designation: D2161 – 10

# Standard Practice for Conversion of Kinematic Viscosity to Saybolt Universal Viscosity or to Saybolt Furol Viscosity[1]

This standard is issued under the fixed designation D2161; 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 Department of Defense.*

## 1. Scope*

1.1 This practice[2] covers the conversion tables and equations for converting kinematic viscosity in $mm^2/s$ at any temperature to Saybolt Universal viscosity in Saybolt Universal seconds (SUS) at the same temperature and for converting kinematic viscosity in $mm^2/s$ at 122 and 210°F (50 and 98.9°C) to Saybolt Furol viscosity in Saybolt Furol seconds (SFS) at the same temperatures. Kinematic viscosity values are based on water being 1.0034 $mm^2/s$ (cSt) at 68°F (20°C).

NOTE 1—A fundamental and preferred method for measuring kinematic viscosity is by use of kinematic viscometers as outlined in Test Method D445. It is recommended that kinematic viscosity be reported in millimetres squared per second, instead of Saybolt Universal Seconds (SUS) or Saybolt Furol Seconds (SFS). This method is being retained for the purpose of calculation of kinematic viscosities from SUS and SFS data that appear in past literature. One millimetre squared per second ($mm^2/s$) equals one centistoke (cSt), which is another unit commonly found in older literature.

1.2 The values stated in SI units are to be regarded as the standard. The values given in parentheses are provided for reference information purposes only. The SI unit of kinematic viscosity is $mm^2/s$.

1.2.1 *Exception*—Fahrenheit temperature units are used in this practice because they are accepted by industry for the type of legacy conversions described in this practice.

1.3 *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.*

## 2. Referenced Documents

2.1 *ASTM Standards:*[3]

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

D2270 Practice for Calculating Viscosity Index from Kinematic Viscosity at 40 and 100°C

2.2 *ASTM Adjunct:*[4]

ADJD2161 Viscosity Extrapolation Tables to Zero Degrees Fahrenheit (SSU)

## 3. Summary of Practice

3.1 The Saybolt Universal viscosity equivalent to a given kinematic viscosity varies with the temperature at which the determination is made. The basic conversion values are those given in Table 1 for 100°F. The Saybolt Universal viscosity equivalent to a given kinematic viscosity at any temperature may be calculated as described in 4.3. Equivalent values at 210°F are given in Table 1 for convenience.

3.2 The Saybolt Furol viscosity equivalents are tabulated in Table 3 for temperatures of 122°F and 210°F only.

3.3 Examples for using the tables are given in Appendix X1.

## 4. Significance and Use

4.1 At one time the petroleum industry relied on measuring kinematic viscosity by means of the Saybolt viscometer, and expressing kinematic viscosity in units of Saybolt Universal Seconds (SUS) and Saybolt Furol Seconds (SFS). This practice is now obsolete in the petroleum industry.

4.2 This practice establishes the official equations relating SUS and SFS to the SI kinematic viscosity units, $mm^2/s$.

[1] This practice is under the jurisdiction of ASTM Committee D02 on Petroleum Products and Lubricants and is the direct responsibility of Subcommittee D02.07 on Flow Properties.

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[2] This practice, together with Practice D2270, replaces Compilation of ASTM Viscosity Tables for Kinematic Viscosity Conversions.

[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 ASTM International Headquarters. Order Adjunct No. ADJD2161. Original adjunct produced in 1998.

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

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