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An American National Standard

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 D 2161; 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.

ϵ[1] NOTE—Tables 1 and 3 were corrected editorially in June 2000.
ϵ[2] NOTE—Table 1 headings and Eqs. 5 and 8 were corrected editorially in August 2000.

1. Scope

1.1 This practice[2] covers the conversion tables and equations for converting kinematic viscosity in centistokes (cSt) at any temperature to Saybolt Universal viscosity in Saybolt Universal seconds (SUS) at the same temperature and for converting kinematic viscosity in centistokes at 122 and 210°F to Saybolt Furol viscosity in Saybolt Furol seconds (SFS) at the same temperatures. Kinematic viscosity values are based on water being 1.0038 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 D 445. It is recommended that kinematic viscosity be reported in centistokes, instead of Saybolt Universal Seconds (SUS) or Saybolt Furol Seconds (SFS). Thus this method is being retained for the purpose of calculation of kinematic viscosities from SUS and SFS data which appear in past literature. One centistokes equals one millimetre squared per second (mm^2/s).

1.2 The SI unit of kinematic viscosity, mm^2/s, and temperature in degrees Fahrenheit are the standard in this practice.

2. Referenced Documents

2.1 *ASTM Standards:*

D 445 Test Method for Kinematic Viscosity of Transparent and Opague Liquids[3]

D 2270 Practice for Calculating Viscosity Index from Kinematic Viscosity at 40 and 100°C[3]

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 Appenix 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.

4.3 This practice allows for the conversion between SUS and SFS units and SI units of kinematic viscosity.

5. Procedure for Conversion to Saybolt Universal Viscosity

5.1 Convert kinematic viscosities between 1.81 and 500 mm^2/s (cSt) at 100°F, and between 1.77 and 139.8 mm^2/s (cSt) at 210°F, to equivalent Saybolt Universal seconds directly from Table 1 (see Appendix X1, Example 1).

NOTE 2—Obtain viscosities not listed, but which are within the range given in Table 1, by linear interpolation (see Appendix X1, Example 2).

5.2 Convert kinematic viscosities greater than the upper limits of Table 1 at temperatures of 100 and 210°F to Saybolt Universal viscosities as follows (see Appendix X1, Example 3):

$$\text{Saybolt Universal seconds} = \text{centistokes} \times B \quad (1)$$

where $B = 4.632$ at 100°F = 4.664 at 210°F.

[1] This practice is under the jurisdication 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 D 2270, replaces Compilation of ASTM Viscosity Tables for Kinematic Viscosity Conversions.

[3] *Annual Book of ASTM Standards*, Vol 05.01.

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5.3 At temperatures other than 100 or 210°F, convert kinematic viscosities to Saybolt Universal viscosities as follows[4] (see Appendix X1, Example 4):

$$U_t = U_{100°F}(1 + 0.000061(t - 100)) \quad (2)$$

where:

U_t = Saybolt Universal viscosity at t°F, and

$U_{100°F}$ = Saybolt Universal viscosity at 100°F in Saybolt Universal seconds equivalent to kinematic viscosity in centistokes at t°F, from Table 1.

NOTE 3—The multipliers for Saybolt Universal seconds in Eq 2 are given as Factor A in Table 2 for a range of temperatures.

5.4 Since the relationship between Saybolt and kinematic viscosities is linear above 75 mm^2/s (cSt), kinematic viscosities above this limit may be converted to Saybolt Universal viscosities at any temperature between 0 and 350°F by use of Eq 1 (4.2), selecting the proper factor for B from Table 2 (see Appendix X1, Example 5).

6. Procedure for Conversion to Saybolt Furol Viscosity

6.1 Convert kinematic viscosities between 48 to 1300 mm^2/s (cSt) at 122°F, and between 50 and 1300 mm^2/s (cSt) at 210°F, to equivalent Saybolt Furol seconds directly from Table 3 (see Appendix X1, Examples 6 and 7).

NOTE 4—Viscosities not listed, but which are within the range given in Table 3, may be obtained by linear interpolation (see Appendix X1, Example 8).

6.2 Convert kinematic viscosities above 1300 cSt to equivalent Saybolt Furol seconds by use of the following equations (see Appendix X1, Example 9):

$$\text{Saybolt Furol seconds at 122°F} = 0.4717 \times mm^2/s \text{ (cSt) at 122°F} \quad (3)$$

$$\text{Saybolt Furol seconds at 210°F} = 0.4792 \times mm^2/s \text{ (cSt) at 210°F} \quad (4)$$

7. Procedure for Computer Calculation

7.1 Table 1 and Table 3 were computed by fitting a smooth curve to the original experimental data points. The derived equations are given as follows for the convenience of those who wish to use a computer for conversion rather than refer to the tables:

$$U_{100°F} = 4.6324\nu + \frac{1.0 + 0.03264\nu}{(3930.2 + 262.7\nu + 23.97\nu^2 + 1.646\nu^3) \times 10^{-5}} \quad (5)$$

$$U_t = [1.0 + 0.000061(t - 100)] \cdot \left[4.6324\nu + \frac{1.0 + 0.03264\nu}{(3930.2 + 262.7\nu + 23.97\nu^2 + 1.646\nu^3) \times 10^{-5}}\right] \quad (6)$$

$$F_{122°F} = 0.4717\nu + \left[\frac{13924}{(\nu^2 - 72.59\nu + 6816)}\right] \quad (7)$$

$$F_{210°F} = 0.4792\nu + \left[\frac{5610}{(\nu^2 + 2130)}\right] \quad (8)$$

where:

ν = kinematic viscosity, mm^2/s (cSt) at t°F,

$F_{122°F}$ = Saybolt Furol viscosity at 122°F in Saybolt Furol seconds equivalent to kinematic viscosity, mm^2/s (cSt) at 122°F, and

$F_{210°F}$ = Saybolt Furol viscosity at 210°F in Saybolt Furol seconds equivalent to kinematic viscosity, mm^2/s (cSt) at 210°F.

7.2 (Eq 5) and (Eq 6) and Table 1 are limited to values of Saybolt Universal of 32.0 s and above.

7.3 (Eq 7) and (Eq 8) and Table 3 are limited to values of Saybolt Furol of 25.1 s and above.

8. Supplementary Conversion Equivalents

8.1 The following units and equivalents are frequently used in connection with viscosity conversions:

poise	=	cgs unit of absolute viscosity.
centipoise	=	0.01 poise.
stokes	=	cgs unit of kinematic viscosity.
centistokes	=	0.01 stokes.
centipoise	=	centistokes × density (at temperature under consideration).

9. Report

9.1 Saybolt Universal and Saybolt Furol viscosities should be reported to the nearest 0.1 s for values below 200 s and to the nearest whole second for values of 200 s and higher.

10. Keywords

10.1 kinematic viscosity; Saybolt furol; Saybolt universal

[4] "Viscosity Extrapolation Tables to Zero Degrees Fahrenheit (SSU)" are available at a nominal cost from ASTM Headquarters. Request Adjunct No. ADJD2161.

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TABLE 1 Kinematic Viscosity to Saybolt Universal Viscosity 1.77 to 500.0 mm²/s (cSt)

Kin Vis, mm²/s (cSt)	Equivalent Saybolt Universal Viscosity, SUS		Kin Vis, mm²/s (cSt)	Equivalent Saybolt Universal Viscosity, SUS		Kin Vis, mm²/s (cSt)	Equivalent Saybolt Universal Viscosity, SUS		Kin Vis, mm²/s (cSt)	Equivalent Saybolt Universal Viscosity, SUS	
	At 100°F	At 210°F		At 100°F	At 210°F		At 100°F	At 210°F		At 100°F	At 210°F
			2.25	33.5	33.7	**2.75**	35.1	35.4	**3.25**	36.8	37.0
			2.26	33.5	33.7	**2.76**	35.2	35.4	**3.26**	36.8	37.0
1.77	. .	32.0	**2.27**	33.5	33.7	**2.77**	35.2	35.4	**3.27**	36.8	37.1
1.78	. .	32.1	**2.28**	33.6	33.8	**2.78**	35.2	35.5	**3.28**	36.9	37.1
1.79	. .	32.1	**2.29**	33.6	33.8	**2.79**	35.3	35.5	**3.29**	36.9	37.1
1.80	. .	32.1	**2.30**	33.6	33.8	**2.80**	35.3	35.5	**3.30**	36.9	37.2
1.81	32.0	32.2	**2.31**	33.7	33.9	**2.81**	35.3	35.6	**3.31**	37.0	37.2
1.82	32.0	32.2	**2.32**	33.7	33.9	**2.81**	35.4	35.6	**3.32**	37.0	37.2
1.83	32.0	32.2	**2.33**	33.7	33.9	**2.83**	35.4	35.6	**3.33**	37.0	37.3
1.84	32.1	32.3	**2.34**	33.8	34.0	**2.84**	35.4	35.7	**3.34**	37.1	37.3
1.85	32.1	32.3	**2.35**	33.8	34.0	**2.85**	35.5	35.7	**3.35**	37.1	37.3
1.86	32.1	32.3	**2.36**	33.8	34.0	**2.86**	35.5	35.7	**3.36**	37.1	37.4
1.87	32.2	32.4	**2.37**	33.9	34.1	**2.87**	35.5	35.8	**3.37**	37.2	37.4
1.88	32.2	32.4	**2.38**	33.9	34.1	**2.88**	35.6	35.8	**3.38**	37.2	37.4
1.89	32.2	32.4	**2.39**	33.9	34.2	**2.89**	35.6	35.8	**3.39**	37.2	37.5
1.90	32.3	32.5	**2.40**	34.0	34.2	**2.90**	35.6	35.9	**3.40**	37.3	37.5
1.91	32.3	32.5	**2.41**	34.0	34.2	**2.91**	35.7	35.9	**3.41**	37.3	37.5
1.92	32.3	32.5	**2.42**	34.0	34.3	**2.92**	35.7	35.9	**3.42**	37.3	37.6
1.93	32.4	32.6	**2.43**	34.1	34.3	**2.93**	35.7	36.0	**3.43**	37.4	37.6
1.94	32.4	32.6	**2.44**	34.1	34.3	**2.94**	35.8	36.0	**3.44**	37.4	37.6
1.95	32.4	32.6	**2.45**	34.1	34.4	**2.95**	35.8	36.0	**3.45**	37.4	37.7
1.96	32.5	32.7	**2.46**	34.2	34.4	**2.96**	35.8	36.1	**3.46**	37.5	37.7
1.97	32.5	32.7	**2.47**	34.2	34.4	**2.97**	35.9	36.1	**3.47**	37.5	37.7
1.98	32.5	32.8	**2.48**	34.2	34.5	**2.98**	35.9	36.1	**3.48**	37.5	37.8
1.99	32.6	32.8	**2.49**	34.3	34.5	**2.99**	35.9	36.2	**3.49**	37.6	37.8
2.00	32.6	32.8	**2.50**	34.3	34.5	**3.00**	36.0	36.2	**3.50**	37.6	37.8
2.01	32.6	32.9	**2.51**	34.3	34.6	**3.01**	36.0	36.2	**3.51**	37.6	37.9
2.02	32.7	32.9	**2.52**	34.4	34.6	**3.02**	36.0	36.3	**3.52**	37.6	37.9
2.03	32.7	32.9	**2.53**	34.4	34.6	**3.03**	36.0	36.3	**3.53**	37.7	37.9
2.04	32.7	33.0	**2.54**	34.4	34.7	**3.04**	36.1	36.3	**3.54**	37.7	38.0
2.05	32.8	33.0	**2.55**	34.5	34.7	**3.05**	36.1	36.4	**3.55**	37.7	38.0
2.06	32.8	33.0	**2.56**	34.5	34.7	**3.06**	36.1	36.4	**3.56**	37.8	38.0
2.07	32.8	33.1	**2.57**	34.5	34.8	**3.07**	36.2	36.4	**3.57**	37.8	38.1
2.08	32.9	33.1	**2.58**	34.6	34.8	**3.08**	36.2	36.5	**3.58**	37.8	38.1
2.09	32.9	33.1	**2.59**	34.6	34.8	**3.09**	36.2	36.5	**3.59**	37.9	38.1
2.10	32.9	33.2	**2.60**	34.6	34.9	**3.10**	36.3	36.5	**3.60**	37.9	38.2
2.11	33.0	33.2	**2.61**	34.7	34.9	**3.11**	36.3	36.6	**3.61**	37.9	38.2
2.12	33.0	33.2	**2.62**	34.7	34.9	**3.12**	36.3	36.6	**3.62**	38.0	38.2
2.13	33.0	33.3	**2.63**	34.7	35.0	**3.13**	36.4	36.6	**3.63**	38.0	38.3
2.14	33.1	33.3	**2.64**	34.8	35.0	**3.14**	36.4	36.7	**3.64**	38.0	38.3
2.15	33.1	33.3	**2.65**	34.8	35.0	**3.15**	36.4	36.7	**3.65**	38.1	38.3
2.16	33.1	33.4	**2.66**	34.8	35.1	**3.16**	36.5	36.7	**3.66**	38.1	38.4
2.17	33.2	33.4	**2.67**	34.9	35.1	**3.17**	36.5	36.8	**3.67**	38.1	38.4
2.18	33.2	33.4	**2.68**	34.9	35.1	**3.18**	36.5	36.8	**3.68**	38.2	38.4
2.19	33.2	33.5	**2.69**	34.9	35.2	**3.19**	36.6	36.8	**3.69**	38.2	38.5
2.20	33.3	33.5	**2.70**	35.0	35.2	**3.20**	36.6	36.9	**3.70**	38.2	38.5
2.21	33.3	33.5	**2.71**	35.0	35.2	**3.21**	36.6	36.9	**3.71**	38.3	38.5
2.22	33.3	33.6	**2.72**	35.0	35.3	**3.22**	36.7	36.9	**3.72**	38.3	38.6
2.23	33.4	33.6	**2.73**	35.1	35.3	**3.23**	36.7	37.0	**3.73**	38.3	38.6
2.24	33.4	33.6	**2.74**	35.1	35.3	**3.24**	36.7	37.0	**3.74**	38.4	38.6

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TABLE 1 *Continued*

Kin Vis, mm^2/s (cSt)	Equivalent Saybolt Universal Viscosity, SUS		Kin Vis, mm^2/s (cSt)	Equivalent Saybolt Universal Viscosity, SUS		Kin Vis, mm^2/s (cSt)	Equivalent Saybolt Universal Viscosity, SUS		Kin Vis, mm^2/s (cSt)	Equivalent Saybolt Universal Viscosity, SUS	
	At 100°F	At 210°F		At 100°F	At 210°F		At 100°F	At 210°F		At 100°F	At 210°F
3.75	38.4	38.7	**4.25**	40.0	40.3	**4.75**	41.6	41.9	**5.25**	43.2	43.5
3.76	38.4	38.7	**4.26**	40.0	40.3	**4.76**	41.6	41.9	**5.26**	43.2	43.5
3.77	38.5	38.7	**4.27**	40.1	40.3	**4.77**	41.7	41.9	**5.27**	43.3	43.5
3.78	38.5	38.7	**4.28**	40.1	40.4	**4.78**	41.7	42.0	**5.28**	43.3	43.6
3.79	38.5	38.8	**4.29**	40.1	40.4	**4.79**	41.7	42.0	**5.29**	43.3	43.6
3.80	38.6	38.8	**4.30**	40.2	40.4	**4.80**	41.8	42.0	**5.30**	43.3	43.6
3.81	38.6	38.8	**4.31**	40.2	40.5	**4.81**	41.8	42.1	**5.31**	43.4	43.7
3.82	38.6	38.9	**4.32**	40.2	40.5	**4.82**	41.8	42.1	**5.32**	43.4	43.7
3.83	38.7	38.9	**4.33**	40.3	40.5	**4.83**	41.9	42.1	**5.33**	43.4	43.7
3.84	38.7	38.9	**4.34**	40.3	40.6	**4.84**	41.9	42.2	**5.34**	43.5	43.8
3.85	38.7	39.0	**4.35**	40.3	40.6	**4.85**	41.9	42.2	**5.35**	43.5	43.8
3.86	38.7	39.0	**4.36**	40.4	40.6	**4.86**	41.9	42.2	**5.36**	43.5	43.8
3.87	38.8	39.0	**4.37**	40.4	40.7	**4.87**	42.0	42.3	**5.37**	43.6	43.9
3.88	38.8	39.1	**4.38**	40.4	40.7	**4.88**	42.0	42.3	**5.38**	43.6	43.9
3.89	38.8	39.1	**4.39**	40.4	40.7	**4.89**	42.0	42.3	**5.39**	43.6	43.9
3.90	38.9	39.1	**4.40**	40.5	40.8	**4.90**	42.1	42.4	**5.40**	43.7	44.0
3.91	38.9	39.2	**4.41**	40.5	40.8	**4.91**	42.1	42.4	**5.41**	43.7	44.0
3.92	38.9	39.2	**4.42**	40.5	40.8	**4.92**	42.1	42.4	**5.42**	43.7	44.0
3.93	39.0	39.2	**4.43**	40.6	40.8	**4.93**	42.2	42.5	**5.43**	43.8	44.1
3.94	39.0	39.3	**4.44**	40.6	40.9	**4.94**	42.2	42.5	**5.44**	43.8	44.1
3.95	39.0	39.3	**4.45**	40.6	40.9	**4.95**	42.2	42.5	**5.45**	43.8	44.1
3.96	39.1	39.3	**4.46**	40.7	40.9	**4.96**	42.3	42.5	**5.46**	43.9	44.2
3.97	39.1	39.4	**4.47**	40.7	41.0	**4.97**	42.3	42.6	**5.47**	43.9	44.2
3.98	39.1	39.4	**4.48**	40.7	41.0	**4.98**	42.3	42.6	**5.48**	43.9	44.2
3.99	39.2	39.4	**4.49**	40.8	41.0	**4.99**	42.4	42.6	**5.49**	44.0	44.2
4.00	39.2	39.5	**4.50**	40.8	41.1	**5.00**	42.4	42.7	**5.50**	44.0	44.3
4.01	39.2	39.5	**4.51**	40.8	41.1	**5.01**	42.4	42.7	**5.51**	44.0	44.3
4.02	39.3	39.5	**4.52**	40.9	41.1	**5.02**	42.5	42.7	**5.52**	44.0	44.3
4.03	39.3	39.6	**4.53**	40.9	41.2	**5.03**	42.5	42.8	**5.53**	44.1	44.4
4.04	39.3	39.6	**4.54**	40.9	41.2	**5.04**	42.5	42.8	**5.54**	44.1	44.4
4.05	39.4	39.6	**4.55**	41.0	41.2	**5.05**	42.6	42.8	**5.55**	44.1	44.4
4.06	39.4	39.7	**4.56**	41.0	41.3	**5.06**	42.6	42.9	**5.56**	44.2	44.5
4.07	39.4	39.7	**4.57**	41.0	41.3	**5.07**	42.6	42.9	**5.57**	44.2	44.5
4.08	39.5	39.7	**4.58**	41.1	41.3	**5.08**	42.6	42.9	**5.58**	44.2	44.5
4.09	39.5	39.8	**4.59**	41.1	41.4	**5.09**	42.7	43.0	**5.59**	44.3	44.6
4.10	39.5	39.8	**4.60**	41.1	41.4	**5.10**	42.7	43.0	**5.60**	44.3	44.6
4.11	39.6	39.8	**4.61**	41.2	41.4	**5.11**	42.7	43.0	**5.61**	44.3	44.6
4.12	39.6	39.8	**4.62**	41.2	41.5	**5.12**	42.8	43.1	**5.62**	44.4	44.7
4.13	39.6	39.9	**4.63**	41.2	41.5	**5.13**	42.8	43.1	**5.63**	44.4	44.7
4.14	39.6	39.9	**4.64**	41.2	41.5	**5.14**	42.8	43.1	**5.64**	44.4	44.7
4.15	39.7	39.9	**4.65**	41.3	41.6	**5.15**	42.9	43.2	**5.65**	44.5	44.8
4.16	39.7	40.0	**4.66**	41.3	41.6	**5.16**	42.9	43.2	**5.66**	44.5	44.8
4.17	39.7	40.0	**4.67**	41.3	41.6	**5.17**	42.9	43.2	**5.67**	44.5	44.8
4.18	39.8	40.0	**4.68**	41.4	41.7	**5.18**	43.0	43.3	**5.68**	44.6	44.9
4.19	39.8	40.1	**4.69**	41.4	41.7	**5.19**	43.0	43.3	**5.69**	44.6	44.9
4.20	39.8	40.1	**4.70**	41.4	41.7	**5.20**	43.0	43.3	**5.70**	44.6	44.9
4.21	39.9	40.1	**4.71**	41.5	41.7	**5.21**	43.1	43.3	**5.71**	44.7	45.0
4.22	39.9	40.2	**4.72**	41.5	41.8	**5.22**	43.1	43.4	**5.72**	44.7	45.0
4.23	39.9	40.2	**4.73**	41.5	41.8	**5.23**	43.1	43.4	**5.73**	44.7	45.0
4.24	40.0	40.2	**4.74**	41.6	41.8	**5.24**	43.2	43.4	**5.74**	44.7	45.0

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TABLE 1 *Continued*

Kin Vis, mm^2/s (cSt)	Equivalent Saybolt Universal Viscosity, SUS		Kin Vis, mm^2/s (cSt)	Equivalent Saybolt Universal Viscosity, SUS		Kin Vis, mm^2/s (cSt)	Equivalent Saybolt Universal Viscosity, SUS		Kin Vis, mm^2/s (cSt)	Equivalent Saybolt Universal Viscosity, SUS	
	At 100°F	At 210°F		At 100°F	At 210°F		At 100°F	At 210°F		At 100°F	At 210°F
5.75	44.8	45.1	**6.25**	46.4	46.7	**6.75**	48.0	48.3	**7.25**	49.6	49.9
5.76	44.8	45.1	**6.26**	46.4	46.7	**6.76**	48.0	48.3	**7.26**	49.6	50.0
5.77	44.8	45.1	**6.27**	46.4	46.8	**6.77**	48.0	48.4	**7.27**	49.7	50.0
5.78	44.9	45.2	**6.28**	46.5	46.8	**6.78**	48.1	48.4	**7.28**	49.7	50.0
5.79	44.9	45.2	**6.29**	46.5	46.8	**6.79**	48.1	48.4	**7.29**	49.7	50.1
5.80	44.9	45.2	**6.30**	46.5	46.8	**6.80**	48.1	48.5	**7.30**	49.8	50.1
5.81	45.0	45.3	**6.31**	46.6	46.9	**6.81**	48.2	48.5	**7.31**	49.8	50.1
5.82	45.0	45.3	**6.32**	46.6	46.9	**6.82**	48.2	48.5	**7.32**	49.8	50.2
5.83	45.0	45.3	**6.33**	46.6	46.9	**6.83**	48.2	48.6	**7.33**	49.9	50.2
5.84	45.1	45.4	**6.34**	46.7	47.0	**6.84**	48.3	48.6	**7.34**	49.9	50.2
5.85	45.1	45.4	**6.35**	46.7	47.0	**6.85**	48.3	48.6	**7.35**	49.9	50.3
5.86	45.1	45.4	**6.36**	46.7	47.0	**6.86**	48.3	48.7	**7.36**	50.0	50.3
5.87	45.2	45.5	**6.37**	46.8	47.1	**6.87**	48.4	48.7	**7.37**	50.0	50.3
5.88	45.2	45.5	**6.38**	46.8	47.1	**6.88**	48.4	48.7	**7.38**	50.0	50.4
5.89	45.2	45.5	**6.39**	46.8	47.1	**6.89**	48.4	48.8	**7.39**	50.1	50.4
5.90	45.3	45.6	**6.40**	46.9	47.2	**6.90**	48.5	48.8	**7.40**	50.1	50.4
5.91	45.3	45.6	**6.41**	46.9	47.2	**6.91**	48.5	48.8	**7.41**	50.1	50.5
5.92	45.3	45.6	**6.42**	46.9	47.2	**6.92**	48.5	48.9	**7.42**	50.2	50.5
5.93	45.4	45.7	**6.43**	47.0	47.3	**6.93**	48.6	48.9	**7.43**	50.2	50.5
5.94	45.4	45.7	**6.44**	47.0	47.3	**6.94**	48.6	48.9	**7.44**	50.2	50.6
5.95	45.4	45.7	**6.45**	47.0	47.3	**6.95**	48.6	49.0	**7.45**	50.3	50.6
5.96	45.4	45.8	**6.46**	47.0	47.4	**6.96**	48.7	49.0	**7.46**	50.3	50.6
5.97	45.5	45.8	**6.47**	47.1	47.4	**6.97**	48.7	49.0	**7.47**	50.3	50.7
5.98	45.5	45.8	**6.48**	47.1	47.4	**6.98**	48.7	49.1	**7.48**	50.3	50.7
5.99	45.5	45.9	**6.49**	47.1	47.5	**6.99**	48.8	49.1	**7.49**	50.4	50.7
6.00	45.6	45.9	**6.50**	47.2	47.5	**7.00**	48.8	49.1	**7.50**	50.4	50.8
6.01	45.6	45.9	**6.51**	47.2	47.5	**7.01**	48.8	49.1	**7.51**	50.4	50.8
6.02	45.6	45.9	**6.52**	47.2	47.6	**7.02**	48.9	49.2	**7.52**	50.5	50.8
6.03	45.7	46.0	**6.53**	47.3	47.6	**7.03**	48.9	49.2	**7.53**	50.5	50.9
6.04	45.7	46.0	**6.54**	47.3	47.6	**7.04**	48.9	49.2	**7.54**	50.5	50.9
6.05	45.7	46.0	**6.55**	47.3	47.7	**7.05**	49.0	49.3	**7.55**	50.6	50.9
6.06	45.8	46.1	**6.56**	47.4	47.7	**7.06**	49.0	49.3	**7.56**	50.6	51.0
6.07	45.8	46.1	**6.57**	47.4	47.7	**7.07**	49.0	49.3	**7.57**	50.6	51.0
6.08	45.8	46.1	**6.58**	47.4	47.8	**7.08**	49.0	49.4	**7.58**	50.7	51.0
6.09	45.9	46.2	**6.59**	47.5	47.8	**7.09**	49.1	49.4	**7.59**	50.7	51.0
6.10	45.9	46.2	**6.60**	47.5	47.8	**7.10**	49.1	49.4	**7.60**	50.7	51.1
6.11	45.9	46.2	**6.61**	47.5	47.8	**7.11**	49.1	49.5	**7.61**	50.8	51.1
6.12	46.0	46.3	**6.62**	47.6	47.9	**7.12**	49.2	49.5	**7.62**	50.8	51.1
6.13	46.0	46.3	**6.63**	47.6	47.9	**7.13**	49.2	49.5	**7.63**	50.8	51.2
6.14	46.0	46.3	**6.64**	47.6	47.9	**7.14**	49.2	49.6	**7.64**	50.9	51.2
6.15	46.1	46.4	**6.65**	47.7	48.0	**7.15**	49.3	49.6	**7.65**	50.9	51.2
6.16	46.1	46.4	**6.66**	47.7	48.0	**7.16**	49.3	49.6	**7.66**	50.9	51.3
6.17	46.1	46.4	**6.67**	47.7	48.0	**7.17**	49.3	49.7	**7.67**	51.0	51.3
6.18	46.2	46.5	**6.68**	47.8	48.1	**7.18**	49.4	49.7	**7.68**	51.0	51.3
6.19	46.2	46.5	**6.69**	47.8	48.1	**7.19**	49.4	49.7	**7.69**	51.0	51.4
6.20	46.2	46.5	**6.70**	47.8	48.1	**7.20**	49.4	49.8	**7.70**	51.1	51.4
6.21	46.2	46.6	**6.71**	47.9	48.2	**7.21**	49.5	49.8	**7.71**	51.1	51.4
6.22	46.3	46.6	**6.72**	47.9	48.2	**7.22**	49.5	49.8	**7.72**	51.1	51.5
6.23	46.3	46.6	**6.73**	47.9	48.2	**7.23**	49.5	49.9	**7.73**	51.2	51.5
6.24	46.3	46.7	**6.74**	47.9	48.3	**7.24**	49.6	49.9	**7.74**	51.2	51.5

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TABLE 1 *Continued*

Kin Vis, mm²/s (cSt)	Equivalent Saybolt Universal Viscosity, SUS		Kin Vis, mm²/s (cSt)	Equivalent Saybolt Universal Viscosity, SUS		Kin Vis, mm²/s (cSt)	Equivalent Saybolt Universal Viscosity, SUS		Kin Vis, mm²/s (cSt)	Equivalent Saybolt Universal Viscosity, SUS	
	At 100°F	At 210°F		At 100°F	At 210°F		At 100°F	At 210°F		At 100°F	At 210°F
7.75	51.2	51.6	**8.25**	52.9	53.2	**8.75**	54.6	54.9	**9.25**	56.3	56.6
7.76	51.3	51.6	**8.26**	52.9	53.3	**8.76**	54.6	55.0	**9.26**	56.3	56.7
7.77	51.3	51.6	**8.27**	53.0	53.3	**8.77**	54.6	55.0	**9.27**	56.3	56.7
7.78	51.3	51.7	**8.28**	53.0	53.3	**8.78**	54.7	55.0	**9.28**	56.4	56.7
7.79	51.4	51.7	**8.29**	53.0	53.4	**8.79**	54.7	55.1	**9.29**	56.4	56.8
7.80	51.4	51.7	**8.30**	53.1	53.4	**8.80**	54.7	55.1	**9.30**	56.4	56.8
7.81	51.4	51.8	**8.31**	53.1	53.4	**8.81**	54.8	55.1	**9.31**	56.5	56.8
7.82	51.5	51.8	**8.32**	53.1	53.5	**8.82**	54.8	55.2	**9.32**	56.5	56.9
7.83	51.5	51.8	**8.33**	53.2	53.5	**8.83**	54.8	55.2	**9.33**	56.5	56.9
7.84	51.5	51.9	**8.34**	53.2	53.5	**8.84**	54.9	55.2	**9.34**	56.6	56.9
7.85	51.6	51.9	**8.35**	53.2	53.6	**8.85**	54.9	55.3	**9.35**	56.6	57.0
7.86	51.6	51.9	**8.36**	53.3	53.6	**8.86**	54.9	55.3	**9.36**	56.6	57.0
7.87	51.6	52.0	**8.37**	53.3	53.6	**8.87**	55.0	55.3	**9.37**	56.7	57.0
7.88	51.7	52.0	**8.38**	53.3	53.7	**8.88**	55.0	55.4	**9.38**	56.7	57.1
7.89	51.7	52.0	**8.39**	53.4	53.7	**8.89**	55.0	55.4	**9.39**	56.7	57.1
7.90	51.7	52.1	**8.40**	53.4	53.7	**8.90**	55.1	55.4	**9.40**	56.8	57.1
7.91	51.8	52.1	**8.41**	53.4	53.8	**8.91**	55.1	55.5	**9.41**	56.8	57.2
7.92	51.8	52.1	**8.42**	53.5	53.8	**8.92**	55.1	55.5	**9.42**	56.8	57.2
7.93	51.8	52.2	**8.43**	53.5	53.8	**8.93**	55.2	55.5	**9.43**	56.9	57.2
7.94	51.9	52.2	**8.44**	53.5	53.9	**8.94**	55.2	55.6	**9.44**	56.9	57.3
7.95	51.9	52.2	**8.45**	53.6	53.9	**8.95**	55.2	55.6	**9.45**	56.9	57.3
7.96	51.9	52.3	**8.46**	53.6	53.9	**8.96**	55.3	55.6	**9.46**	57.0	57.4
7.97	52.0	52.3	**8.47**	53.6	54.0	**8.97**	55.3	55.7	**9.47**	57.0	57.4
7.98	52.0	52.3	**8.48**	53.7	54.0	**8.98**	55.3	55.7	**9.48**	57.0	57.4
7.99	52.0	52.4	**8.49**	53.7	54.0	**8.99**	55.4	55.7	**9.49**	57.1	57.5
8.00	52.1	52.4	**8.50**	53.7	54.1	**9.00**	55.4	55.8	**9.50**	57.1	57.5
8.01	52.1	52.4	**8.51**	53.8	54.1	**9.01**	55.4	55.8	**9.52**	57.2	57.6
8.02	52.1	52.5	**8.52**	53.8	54.1	**9.02**	55.5	55.8	**9.54**	57.2	57.6
8.03	52.2	52.5	**8.53**	53.8	54.2	**9.03**	55.5	55.9	**9.56**	57.3	57.7
8.04	52.2	52.5	**8.54**	53.9	54.2	**9.04**	55.5	55.9	**9.58**	57.4	57.8
8.05	52.2	52.6	**8.55**	53.9	54.2	**9.05**	55.6	55.9	**9.60**	57.5	57.8
8.06	52.3	52.6	**8.56**	53.9	54.3	**9.06**	55.6	56.0	**9.62**	57.5	57.9
8.07	52.3	52.6	**8.57**	54.0	54.3	**9.07**	55.6	56.0	**9.64**	57.6	58.0
8.08	52.3	52.7	**8.58**	54.0	54.3	**9.08**	55.7	56.0	**9.66**	57.7	58.0
8.09	52.4	52.7	**8.59**	54.0	54.4	**9.09**	55.7	56.1	**9.68**	57.7	58.1
8.10	52.4	52.7	**8.60**	54.1	54.4	**9.10**	55.7	56.1	**9.70**	57.8	58.2
8.11	52.4	52.8	**8.61**	54.1	54.5	**9.11**	55.8	56.1	**9.72**	57.9	58.3
8.12	52.5	52.8	**8.62**	54.1	54.5	**9.12**	55.8	56.2	**9.74**	57.9	58.3
8.13	52.5	52.8	**8.63**	54.2	54.5	**9.13**	55.8	56.2	**9.76**	58.0	58.4
8.14	52.5	52.9	**8.64**	54.2	54.6	**9.14**	55.9	56.3	**9.78**	58.1	58.5
8.15	52.6	52.9	**8.65**	54.2	54.6	**9.15**	55.9	56.3	**9.80**	58.1	58.5
8.16	52.6	52.9	**8.66**	54.3	54.6	**9.16**	55.9	56.3	**9.82**	58.2	58.6
8.17	52.6	53.0	**8.67**	54.3	54.7	**9.17**	56.0	56.4	**9.84**	58.3	58.7
8.18	52.7	53.0	**8.68**	54.3	54.7	**9.18**	56.0	56.4	**9.86**	58.4	58.7
8.19	52.7	53.0	**8.69**	54.4	54.7	**9.19**	56.0	56.4	**9.88**	58.4	58.8
8.20	52.7	53.1	**8.70**	54.4	54.8	**9.20**	56.1	56.5	**9.90**	58.5	58.9
8.21	52.8	53.1	**8.71**	54.4	54.8	**9.21**	56.1	56.5	**9.92**	58.6	59.0
8.22	52.8	53.1	**8.72**	54.5	54.8	**9.22**	56.2	56.5	**9.94**	58.6	59.0
8.23	52.8	53.2	**8.73**	54.5	54.9	**9.23**	56.2	56.6	**9.96**	58.7	59.1
8.24	52.9	53.2	**8.74**	54.5	54.9	**9.24**	56.2	56.6	**9.98**	58.8	59.2

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TABLE 1 *Continued*

Kin Vis, mm²/s (cSt)	Equivalent Saybolt Universal Viscosity, SUS		Kin Vis, mm²/s (cSt)	Equivalent Saybolt Universal Viscosity, SUS		Kin Vis, mm²/s (cSt)	Equivalent Saybolt Universal Viscosity, SUS		Kin Vis, mm²/s (cSt)	Equivalent Saybolt Universal Viscosity, SUS	
	At 100°F	At 210°F		At 100°F	At 210°F		At 100°F	At 210°F		At 100°F	At 210°F
10.00	58.8	59.2	**11.00**	62.4	62.8	**12.00**	66.0	66.4	**13.00**	69.7	70.2
10.02	58.9	59.3	**11.02**	62.4	62.9	**12.02**	66.1	66.5	**13.02**	69.8	70.3
10.04	59.0	59.4	**11.04**	62.5	62.9	**12.04**	66.1	66.6	**13.04**	69.9	70.3
10.06	59.0	59.4	**11.06**	62.6	63.0	**12.06**	66.2	66.7	**13.06**	69.9	70.4
10.08	59.1	59.5	**11.08**	62.7	63.1	**12.08**	66.3	66.7	**13.08**	70.0	70.5
10.10	59.2	59.6	**11.10**	62.7	63.1	**12.10**	66.4	66.8	**13.10**	70.1	70.6
10.12	59.3	59.7	**11.12**	62.8	63.2	**12.12**	66.4	66.9	**13.12**	70.2	70.6
10.14	59.3	59.7	**11.14**	62.9	63.3	**12.14**	66.5	67.0	**13.14**	70.2	70.7
10.16	59.4	59.8	**11.16**	62.9	63.4	**12.16**	66.6	67.0	**13.16**	70.3	70.8
10.18	59.5	59.9	**11.18**	63.0	63.4	**12.18**	66.7	67.1	**13.18**	70.4	70.9
10.20	59.5	59.9	**11.20**	63.1	63.5	**12.20**	66.7	67.2	**13.20**	70.5	70.9
10.22	59.6	60.0	**11.22**	63.2	63.6	**12.22**	66.8	67.2	**13.22**	70.5	71.0
10.24	59.7	60.1	**11.24**	63.2	63.7	**12.24**	66.9	67.3	**13.24**	70.6	71.1
10.26	59.7	60.1	**11.26**	63.3	63.7	**12.26**	66.9	67.4	**13.26**	70.7	71.2
10.28	59.8	60.2	**11.28**	63.4	63.8	**12.28**	67.0	67.5	**13.28**	70.8	71.2
10.30	59.9	60.3	**11.30**	63.4	63.9	**12.30**	67.1	67.5	**13.30**	70.8	71.3
10.32	60.0	60.4	**11.32**	63.5	63.9	**12.32**	67.2	67.6	**13.32**	70.9	71.4
10.34	60.0	60.4	**11.34**	63.6	64.0	**12.34**	67.2	67.7	**13.34**	71.0	71.5
10.36	60.1	60.5	**11.36**	63.7	64.1	**12.36**	67.3	67.8	**13.36**	71.1	71.5
10.38	60.2	60.6	**11.38**	63.7	64.2	**12.38**	67.4	67.8	**13.38**	71.1	71.6
10.40	60.2	60.6	**11.40**	63.8	64.2	**12.40**	67.5	67.9	**13.40**	71.2	71.7
10.42	60.3	60.7	**11.42**	63.9	64.3	**12.42**	67.5	68.0	**13.42**	71.3	71.8
10.44	60.4	60.8	**11.44**	63.9	64.4	**12.44**	67.6	68.1	**13.44**	71.4	71.9
10.46	60.4	60.9	**11.46**	64.0	64.5	**12.46**	67.7	68.1	**13.46**	71.4	71.9
10.48	60.5	60.9	**11.48**	64.1	64.5	**12.48**	67.8	68.2	**13.48**	71.5	72.0
10.50	60.6	61.0	**11.50**	64.2	64.6	**12.50**	67.8	68.3	**13.50**	71.6	72.1
10.52	60.7	61.1	**11.52**	64.2	64.7	**12.52**	67.9	68.4	**13.52**	71.7	72.2
10.54	60.7	61.1	**11.54**	64.3	64.7	**12.54**	68.0	68.4	**13.54**	71.8	72.2
10.56	60.8	61.2	**11.56**	64.4	64.8	**12.56**	68.1	68.5	**13.56**	71.8	72.3
10.58	60.9	61.3	**11.58**	64.5	64.9	**12.58**	68.1	68.6	**13.58**	71.9	72.4
10.60	60.9	61.4	**11.60**	64.5	65.0	**12.60**	68.2	68.7	**13.60**	72.0	72.5
10.62	61.0	61.4	**11.62**	64.6	65.0	**12.62**	68.3	68.7	**13.62**	72.1	72.5
10.64	61.1	61.5	**11.64**	64.7	65.1	**12.64**	68.4	68.8	**13.64**	72.1	72.6
10.66	61.2	61.6	**11.66**	64.7	65.2	**12.66**	68.4	68.9	**13.66**	72.2	72.7
10.68	61.2	61.6	**11.68**	64.8	65.3	**12.68**	68.5	69.0	**13.68**	72.3	72.8
10.70	61.3	61.7	**11.70**	64.9	65.3	**12.70**	68.6	69.0	**13.70**	72.4	72.8
10.72	61.4	61.8	**11.72**	65.0	65.4	**12.72**	68.7	69.1	**13.72**	72.4	72.9
10.74	61.4	61.9	**11.74**	65.0	65.5	**12.74**	68.7	69.2	**13.74**	72.5	73.0
10.76	61.5	61.9	**11.76**	65.1	65.5	**12.76**	68.8	69.3	**13.76**	72.6	73.1
10.78	61.6	62.0	**11.78**	65.2	65.6	**12.78**	68.9	69.3	**13.78**	72.7	73.2
10.80	61.7	62.1	**11.80**	65.3	65.7	**12.80**	69.0	69.4	**13.80**	72.7	73.2
10.82	61.7	62.1	**11.82**	65.3	65.8	**12.82**	69.0	69.5	**13.82**	72.8	73.3
10.84	61.8	62.2	**11.84**	65.4	65.8	**12.84**	69.1	69.6	**13.84**	72.9	73.4
10.86	61.9	62.3	**11.86**	65.5	65.9	**12.86**	69.2	69.6	**13.86**	73.0	73.5
10.88	61.9	62.4	**11.88**	65.6	66.0	**12.88**	69.3	69.7	**13.88**	73.1	73.5
10.90	62.0	62.4	**11.90**	65.6	66.1	**12.90**	69.3	69.8	**13.90**	73.1	73.6
10.92	62.1	62.5	**11.92**	65.7	66.1	**12.92**	69.4	69.9	**13.92**	73.2	73.7
10.94	62.2	62.6	**11.94**	65.8	66.2	**12.94**	69.5	69.9	**13.94**	73.3	73.8
10.96	62.2	62.6	**11.96**	65.8	66.3	**12.96**	69.6	70.0	**13.96**	73.4	73.9
10.98	62.3	62.7	**11.98**	65.9	66.4	**12.98**	69.6	70.1	**13.98**	73.4	73.9

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TABLE 1 *Continued*

Kin Vis, mm²/s (cSt)	Equivalent Saybolt Universal Viscosity, SUS		Kin Vis, mm²/s (cSt)	Equivalent Saybolt Universal Viscosity, SUS		Kin Vis, mm²/s (cSt)	Equivalent Saybolt Universal Viscosity, SUS		Kin Vis, mm²/s (cSt)	Equivalent Saybolt Universal Viscosity, SUS	
	At 100°F	At 210°F		At 100°F	At 210°F		At 100°F	At 210°F		At 100°F	At 210°F
14.00	73.5	74.0	**15.00**	77.4	77.9	**16.00**	81.4	81.9	**17.00**	85.4	86.0
14.02	73.6	74.1	**15.02**	77.5	78.0	**16.02**	81.4	82.0	**17.02**	85.5	86.0
14.04	73.7	74.2	**15.04**	77.6	78.1	**16.04**	81.5	82.1	**17.04**	85.6	86.1
14.06	73.7	74.2	**15.06**	77.6	78.2	**16.06**	81.6	82.2	**17.06**	85.6	86.2
14.08	73.8	74.3	**15.08**	77.7	78.2	**16.08**	81.7	82.2	**17.08**	85.7	86.3
14.10	73.9	74.4	**15.10**	77.8	78.3	**16.10**	81.8	82.3	**17.10**	85.8	86.4
14.12	74.0	74.5	**15.12**	77.9	78.4	**16.12**	81.8	82.4	**17.12**	85.9	86.5
14.14	74.1	74.6	**15.14**	78.0	78.5	**16.14**	81.9	82.5	**17.14**	86.0	86.5
14.16	74.1	74.6	**15.16**	78.0	78.6	**16.16**	82.0	82.6	**17.16**	86.0	86.6
14.18	74.2	74.7	**15.18**	78.1	78.6	**16.18**	82.1	82.6	**17.18**	86.1	86.7
14.20	74.3	74.8	**15.20**	78.2	78.7	**16.20**	82.2	82.7	**17.20**	86.2	86.8
14.22	74.4	74.9	**15.22**	78.3	78.8	**16.22**	82.2	82.8	**17.22**	86.3	86.9
14.24	74.4	74.9	**15.24**	78.3	78.9	**16.24**	82.3	82.9	**17.24**	86.4	86.9
14.26	74.5	75.0	**15.26**	78.4	79.0	**16.26**	82.4	83.0	**17.26**	86.5	87.0
14.28	74.6	75.1	**15.28**	78.5	79.0	**16.28**	82.5	83.0	**17.28**	86.5	87.1
14.30	74.7	75.2	**15.30**	78.6	79.1	**16.30**	82.6	83.1	**17.30**	86.6	87.2
14.32	74.7	75.3	**15.32**	78.7	79.2	**16.32**	82.6	83.2	**17.32**	86.7	87.3
14.34	74.8	75.3	**15.34**	78.7	79.3	**16.34**	82.7	83.3	**17.34**	86.8	87.4
14.36	74.9	75.4	**15.36**	78.8	79.3	**16.36**	82.8	83.4	**17.36**	86.9	87.4
14.38	75.0	75.5	**15.38**	78.9	79.4	**16.38**	82.9	83.4	**17.38**	86.9	87.5
14.40	75.1	75.6	**15.40**	79.0	79.5	**16.40**	83.0	83.5	**17.40**	87.0	87.6
14.42	75.1	75.6	**15.42**	79.1	79.6	**16.42**	83.0	83.6	**17.42**	87.1	87.7
14.44	75.2	75.7	**15.44**	79.1	79.7	**16.44**	83.1	83.7	**17.44**	87.2	87.8
14.46	75.3	75.8	**15.46**	79.2	79.7	**16.46**	83.2	83.8	**17.46**	87.3	87.9
14.48	75.4	75.9	**15.48**	79.3	79.8	**16.48**	83.3	83.8	**17.48**	87.3	87.9
14.50	75.4	76.0	**15.50**	79.4	79.9	**16.50**	83.4	83.9	**17.50**	87.4	88.0
14.52	75.5	76.0	**15.52**	79.5	80.0	**16.52**	83.5	84.0	**17.52**	87.5	88.1
14.54	75.6	76.1	**15.54**	79.5	80.1	**16.54**	83.5	84.1	**17.54**	87.6	88.2
14.56	75.7	76.2	**15.56**	79.6	80.1	**16.56**	83.6	84.2	**17.56**	87.7	88.3
14.58	75.8	76.3	**15.58**	79.7	80.2	**16.58**	83.7	84.3	**17.58**	87.8	88.3
14.60	75.8	76.3	**15.60**	79.8	80.3	**16.60**	83.8	84.3	**17.60**	87.8	88.4
14.62	75.9	76.4	**15.62**	79.8	80.4	**16.62**	83.9	84.4	**17.62**	87.9	88.5
14.64	76.0	76.5	**15.64**	79.9	80.5	**16.64**	83.9	84.5	**17.64**	88.0	88.6
14.66	76.1	76.6	**15.66**	80.0	80.5	**16.66**	84.0	84.6	**17.66**	88.1	88.7
14.68	76.1	76.7	**15.68**	80.1	80.6	**16.68**	84.1	84.7	**17.68**	88.2	88.8
14.70	76.2	76.7	**15.70**	80.2	80.7	**16.70**	84.2	84.7	**17.70**	88.3	88.8
14.72	76.3	76.8	**15.72**	80.2	80.8	**16.72**	84.3	84.8	**17.72**	88.3	88.9
14.74	76.4	76.9	**15.74**	80.3	80.9	**16.74**	84.3	84.9	**17.74**	88.4	89.0
14.76	76.5	77.0	**15.76**	80.4	80.9	**16.76**	84.4	85.0	**17.76**	88.5	89.1
14.78	76.5	77.1	**15.78**	80.5	81.0	**16.78**	84.5	85.1	**17.78**	88.6	89.2
14.80	76.6	77.1	**15.80**	80.6	81.1	**16.80**	84.6	85.1	**17.80**	88.7	89.3
14.82	76.7	77.2	**15.82**	80.6	81.2	**16.82**	84.7	85.2	**17.82**	88.7	89.3
14.84	76.8	77.3	**15.84**	80.7	81.3	**16.84**	84.7	85.3	**17.84**	88.8	89.4
14.86	76.9	77.4	**15.86**	80.8	81.3	**16.86**	84.8	85.4	**17.86**	88.9	89.5
14.88	76.9	77.4	**15.88**	80.9	81.4	**16.88**	84.9	85.5	**17.88**	89.0	89.6
14.90	77.0	77.5	**15.90**	81.0	81.5	**16.90**	85.0	85.6	**17.90**	89.1	89.7
14.92	77.1	77.6	**15.92**	81.0	81.6	**16.92**	85.1	85.6	**17.92**	89.2	89.8
14.94	77.2	77.7	**15.94**	81.1	81.7	**16.94**	85.1	85.7	**17.94**	89.2	89.8
14.96	77.2	77.8	**15.96**	81.2	81.7	**16.96**	85.2	85.8	**17.96**	89.3	89.9
14.98	77.3	77.8	**15.98**	81.3	81.8	**16.98**	85.3	85.9	**17.98**	89.4	90.0

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