

APPENDIX I

Viscosity Conversion Equations

It is anticipated that the need for conversions between kinematic viscosity and other empirical viscosity units such as Saybolt, Redwood, and Engler will exist for some time. It has been difficult to locate official conversion equations in most instances. The reader is referred to the paper "Equations for Converting Different Viscosity Units," R. J. O'Donnell, *Materials Research and Standards*, May 1969, pp. 25-27. O'Donnell derived equations for conversions in each direction. These equations were based on existing conversion tables which were in common use in the country of origin for each particular viscosity unit. The derived equations for conversions between Saybolt Universal, Saybolt Furol, and kinematic viscosities are those on which ASTM D 2161 is based. Those given in that paper for Redwood and Engler have no official standing but are offered for whatever aid they may give.

APPENDIX II

Viscosity-Related Conversion Factors

The following conversion factors are taken from the ASTM Standard Metric Practice Guide (E 380-70).

<i>To convert from</i>	<i>to</i>	<i>multiply by</i>
	Force	
dyne	newton	1.000 000*E-05
pound-force (1 bf avoirdupois)	newton	4.448 222 E+00
poundal	newton	1.382 550 E-01

Pressure or Stress (Force/Area)

dyne/centimeter ²	newton/meter ²	1.000 000*E-01
gram-force/centimeter ²	newton/meter ²	9.806 650*E+01
poundal/foot ²	newton/meter ²	1.488 164 E+00
pound-force/foot ²	newton/meter ²	4.788 026 E+01

Viscosity

centipoise	newton-second/meter ²	1.000 000*E-03
centistoke	newton-second/meter ²	1.000 000*E-06
foot ² /second	newton-second/meter ²	9.290 304*E-02
poise	newton-second/meter ²	1.000 000*E-01
poundal-second/foot ²	newton-second/meter ²	1.488 164 E+00
pound-mass/foot-second	newton-second/meter ²	1.488 164 E+00
pound-force-second/foot ²	newton-second/meter ²	4.788 026 E+01
rhe	meter ² /newton-second	1.000 000*E+01
stoke	meter ² /second	1.000 000*E-04

Temperature

degree Celsius	kelvin	$t_K = t_C + 273.15$
degree Fahrenheit	kelvin	$t_K = (t_F + 459.67)/1.8$
degree Rankine	kelvin	$t_K = t_R/1.8$
degree Fahrenheit	degree Celsius	$t_C = (t_F - 32)/1.8$
kelvin	degree Celsius	$t_C = t_K - 273.15$

* The asterisk indicates that the conversion factor is exact. The absence of an asterisk indicates the factor has been rounded.