

Approximate Viscosities of Common Liquids

The viscosity of a fluid is the measure of its resistance to a shearing force. This condition is found when initiating and sustaining flow. As an example, higher viscosity fluids require a greater force to flow than do lower viscosity fluids. Some fluids display differing viscosity characteristics. Newtonian (N) fluids have constant viscosity at a given temperature regardless of fluid flow rate. Water and most oils are Newtonian. Thixotropic (T) fluids decrease in viscosity as the rate of shear increases. Initiating flow is difficult with thixotropic fluids but eases once flow commences. Liquids such as adhesives, greases, waxes, and latex are thixotropic.

LiquidType	Specific Gravity at 60°F	Absolute Viscosity cp	Temperature °F	Viscosity Type
Dairy Products				
Butter Fat	1.0	42	110	N
Butter Fat	1.0	20	150	N
Butter Deodorized	1.0	45	120	N
Cottage Cheese	—	30,000	65	T
Cocoa Butter	0.92	50	140	N
Cocoa Butter	0.87	0.5	210	N
Condensed Milk	—	40-80	100-120	N
Condensed Milk, 75% Solids	1.3	2160	70	T
Cream 30% Fat	1.0	14	60	N
Cream 40% Fat	0.99	48	60	N
Cream 50% Fat	0.98	112	60	N
Cream 50% Fat	—	55	90	N
Milk	1.02-1.05	2.0	65	N
Milk	1.02-1.05	1.0	120	N
Milk Whey 48% Sugar	—	800-1500	100	T
Process Cheese	—	6500	175	T
Process Cheese	—	30,000	65	T
Whole Egg	0.5	150	40	T
Yoghurt	1.15	152	105	T
Food Products				
Batter	1.0	29,500	85	T
Baby Food	—	1400	200	T
Beer	1.0	1.1	40	N
Beet Sauce	—	1950	170	T
Brewers Yeast	—	368	65	T
Brewers Yeast, 80% Solids	16,000	40	T	
Broth Mix	—	430	65	T
Cake Frosting	1.0	10,000	70	T
Caramel	1.2	400	140	—
Carob Bean Sauce	—	1500	85	T
Chocolate	1.1	17,000	120	T
Chocolate Milk	—	280	120	T
Citrus Fruit Pulp	1.27	600	70	T
Coffee 30-40% Liquor	—	10-100	70	T
Condensed Milk, 77% Sweetened	1.3	10,000	70	N
Cookie Cream Premix	—	29,200	65	T
Corn Starch	1.2	300	85	T
Corn Syrup	1.5	12,000	130	—
Cream Style Corn	—	130	190	T

LiquidType	Specific Gravity at 60°F	Absolute Viscosity cp	Temperature °F	Viscosity Type
Food Products Continued				
Custard	1.6	1500	185-195	T
Edible Oil	0.9	65	70	N
Emulsifier	—	20	70	T
Gelatin 37% Solids	—	1190	110	T
Glucose	1.3	4300-8600	75-85	T
Gravy Slurry	1.0	11	175	T
Fruit Juice	1.04	55-75	65	N
Honey	1.5	1500	100	—
Hot Fudge	1.1	36,000	120	T
Jam Garnish	—	8440	60	T
Malt Extract 80%	—	9500	65	T
Malt Extract	1.4	3000	140	T
Mashed Potato	1.0	20,000	100	T
Mayonnaise	1.0	20,000	70	T
Mince meat	—	100,000	85	T
Molasses	1.5	1400-13,000	100	—
Mousse Mix	—	1200	40	T
Pablum	—	4,500	100	T
Pear Pulp	—	4,000	160	T
Pectin	—	300	100	N
Pectin	—	345	80	N
Pet Food	1.0	11,000	40	T
Prune Juice	1.0	60	120	T
Orange Juice Concentrate (30 Brix)	—	630	70	N
Orange Juice Concentrate (30 Brix)	—	91	175	N
Orange Juice Concentrate (50 Brix)	—	2410	70	N
Orange Juice Concentrate (30 Brix)	—	330	175	N
Rice Pudding	—	10,000	210	T
Salad Cream	—	1300-2600	65	T
Sauce-Apple	1.1	500	175	T
Sorbitol	1.29	200	70	N
Soybean Slurry	—	5000-10,000	120-195	T
Tapioca Pudding	0.7	1000	235	T
Toffee	1.2	87,000	100	T
Tomato Catsup	1.2	1000	85	T
Tomato Paste 30%	1.1	195	65	T
Vinegar	—	12-15	70	N
Yeast Slurry	—	20	65	T

Approximate Viscosities of Common Liquids

Liquid Type	Specific Gravity at 60°F	Absolute Viscosity cp	Temperature °F	Viscosity Type
Vegetable Oils				
Castor Oil	0.96	580	80	N
Castor Oil	—	36	175	N
Chinawood Oil	0.94	300	70	N
Coconut Oil	0.93	55	75	N
Coconut Oil	—	30	100	N
Corn Oil	0.92	28	135	N
Cotton Seed Oil	0.88	62	75	N
Cotton Seed Oil	0.93	24	125	N
Linseed Oil Raw	0.93-0.94	29	100	N
Olive Oil	0.91	40	100	N
Palm Oil	0.92	43	100	N
Peanut Oil	0.92	38	100	N
Soybean Oil	0.93	60	75	N
Soybean Oil	—	12	175	N
Turpentine	0.86	2.0	60	N

Pharmaceuticals

Cough Syrup	1.0	190	85	N
Detergents	—	1470	160	T
Face Cream	—	10,000	70	T
Hair Cream	1.4	5000	70	T
Hand Cleaner	—	2000	70	T
Hand Cream	—	780	65	T
Latex Emulsion	1.0	200	75	T
Latex Emulsion	—	48	150	T
Paraffin Emulsion	1.2	3000	65	T
Pill Pastes	—	5000	—	—
Shampoo	—	3000	95	T
Soap Aryan	1.0 @ 105°F	630	140	T
Soap Solution	1.03 @ 40°F	82	140	T
Toothpaste	—	70,000-100,000	65	T
Wax	0.9	500	200	T

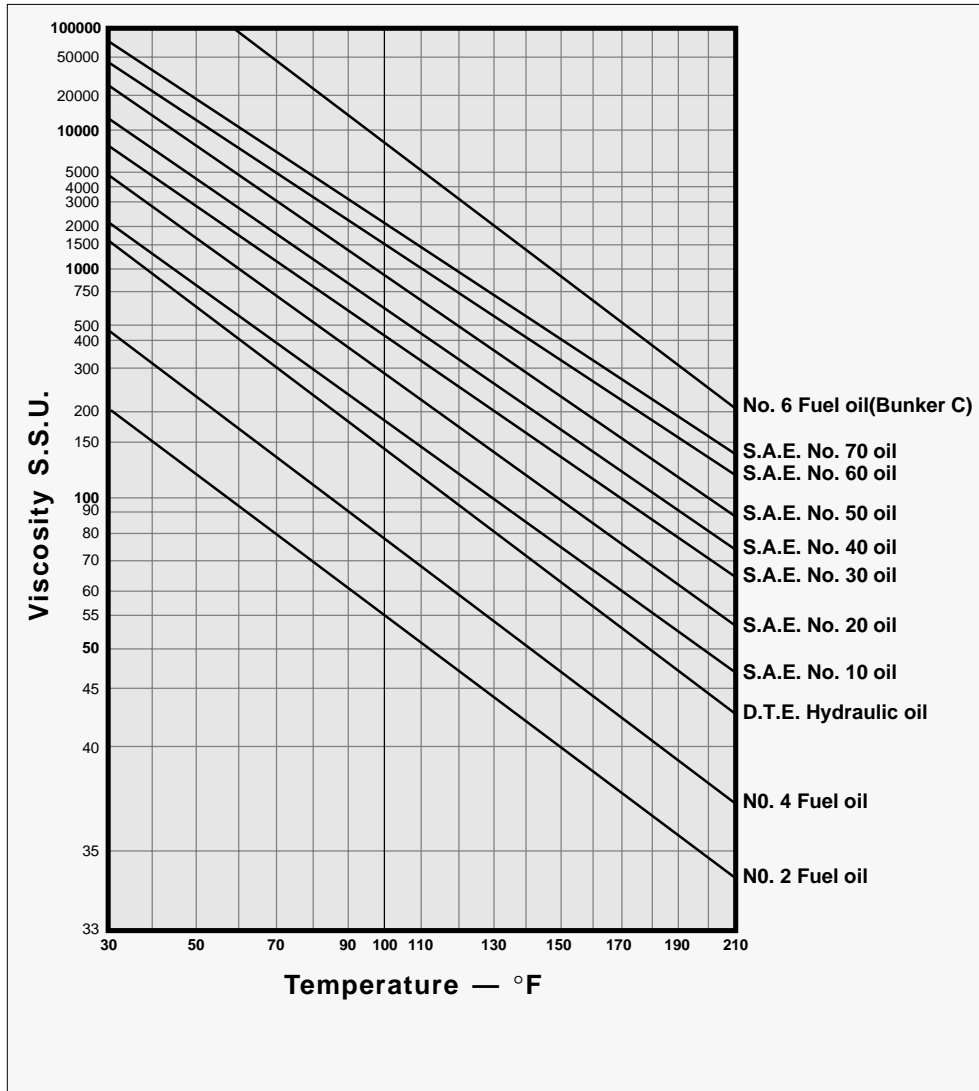
Fish and Animal Oils

Bone oil	0.92	48	130	N
Cod Oil	0.93	32	100	N
Ground Beef Fat	0.9	11,000	60	T
Lard	0.96	62	100	N
Lard Oil	0.91-0.93	40-47	100	N
Meat Emulsion	1.0	22,000	40	T
Melted Animal Fat	0.9	43	110	N
Pork Fat Slurry	1.0	650	40	T
Sperm Oil	0.88	24	100	N
Whale Oil	0.93	25-39	100	N

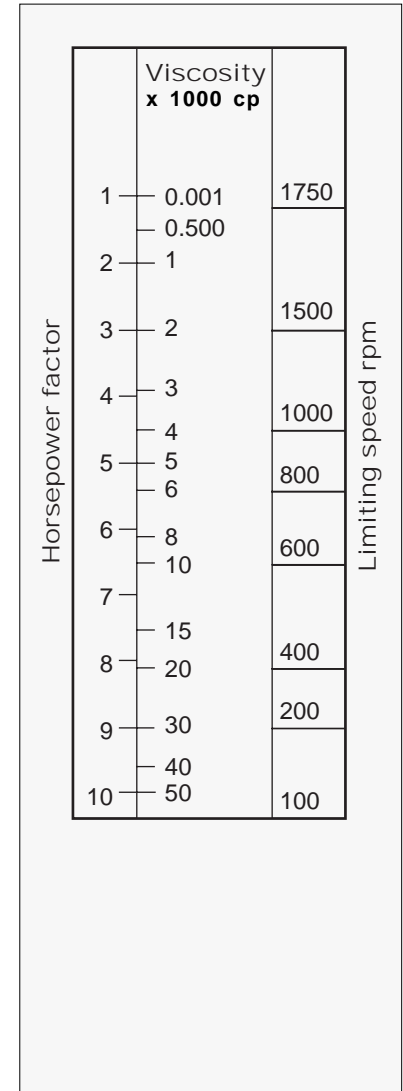
Liquid Type	Specific Gravity at 60°F	Absolute Viscosity cp	Temperature °F	Viscosity Type
Industrial Products				
Acetate Glue	—	1200-14	—	70 T
Asphalt	1.3	500-2500	—	—
Auto Lube Oil SAE 40	0.9	200	100	N
Auto Trans. Oil SAE 90	0.9	320	100	N
Black Liquor	1.3	1100	122	—
Black Liquor Soap	—	7000	122	—
Black Liquor Tar	—	2000	300	—
Box Glues	1.0	3000	70	T
Clarified Sewage Sludge	1.1	2000 Range	—	—
Cresol Crystals	—	10	65	T
Diethylene Glycol	1.12	32	70	N
Dye	1.1	10	70	N
Ethylene Glycol	1.12	18	70	N
Fuel Oil #6	0.9	660	122	N
Glycerine 100%	126 @ 70°F	648	70	N
Glycerine 100%	—	176	100	N
Gum	—	5000	100	T
Isopropyl Alcohol	1.11	1.9	185	N
Kerosene	0.8	3	68	N
Lacquer 25% Solids	—	3000	65	T
Metallic Auto Paint	—	200	80	T
Paint Solvents	0.9	0.5-10	70	N
Paper Coating 35%	—	400	—	—
Polyester	1.1 at 85°F	3000	85	T
Polyester Resin	1.4	3000	70	—
Polyisobutylene	1.09 at 185°F	12,500	185	T
Polypropylene	—	240,000	120	T
Polyvinyl Acetate Resin	1.3	65,000	70	—
Plastisol	2.5	28,000	65	T
Printers Ink	1.38	550-2200	100	T
Printers Ink	1.38	238-660	130	T
Propylene Glycol	1.04	52	70	N
Resin Solution	—	880	75	T
Resin Solution	—	7140	65	T
Rubber Cement	1.0	15,000	70	N
& Solvents				
NaOH 20%	1.22	1.0	65	N
NaOH 30%	1.33	10	65	N
NaOH 40%	1.43	20	65	N
Sulfide 6%	— 1600 —	—	—	—
Sulfuric Acid	1.04	125	85	T
Titanium Dioxide Slurry	—	10,000	—	T
Triacetate Dope	—	48,000/60,000	105	T
Triethylene Glycol	1.12	40	70	N
Varnish	1.1	140	100	—

Charts

Viscosity of Oils (S.S.U.)



Flexible Impeller Pump Speed and Horsepower Corrections for Viscosity



Vacuum

The terms vacuum or suction are commonly used to indicate a pressure below normal atmospheric pressure (14.7 psia). Vacuum is often expressed as the difference in measured system pressure and atmospheric pressure.

	Inches Hg vacuum	mm Hg vacuum	"Suction lift" feet of water	Feet of water absolute	mm Hg absolute	Inches Hg absolute	Pressure absolute
Zero Gauge					760	29.9	14.7 psia
	10	200	10	30	500	20	10
	20	400	20	20	400	10	5
		600		10	200		
Zero Absolute	29.9	760	33.9	0	0	0	0

Viscosity Conversion Data

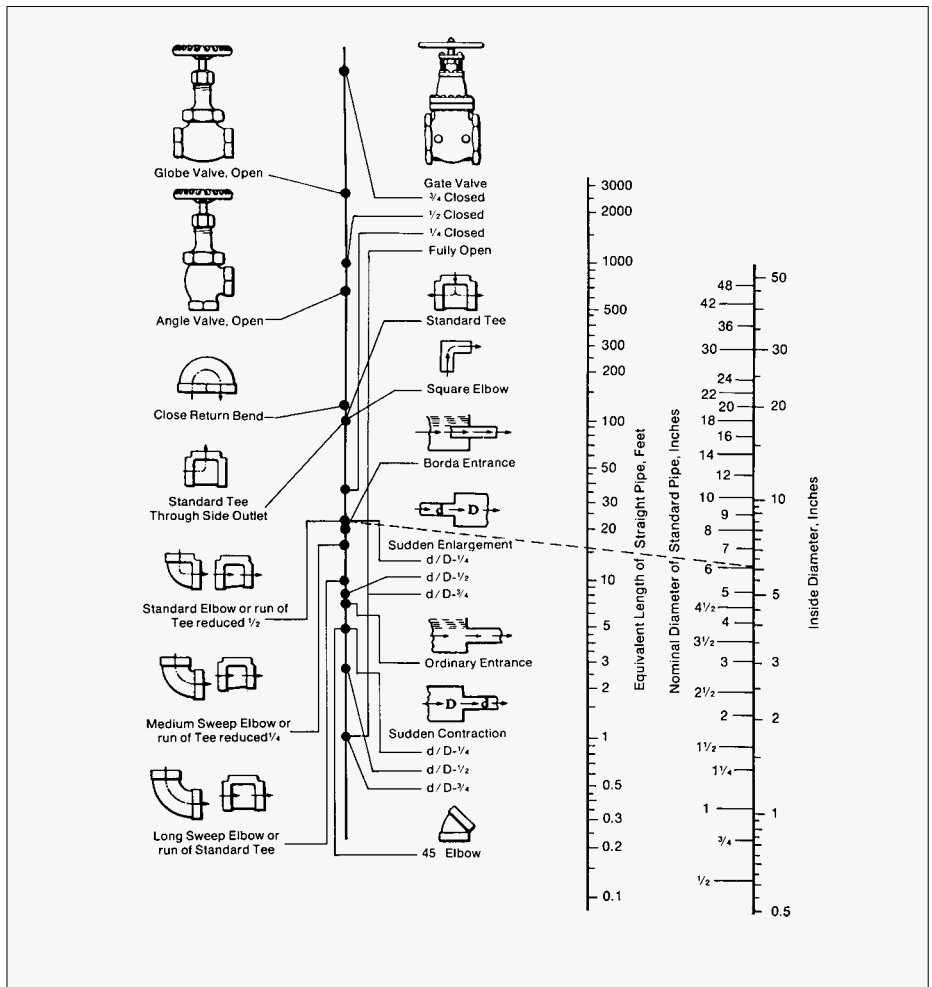
Saybolt Universal SSU	Stokes	Centi Stokes	Poises	Centi Poises	Engler Seconds	Redwood No.1 Seconds	Typical Liquids at Room Temperature
31	.010	1.00	.008	.8	54	29	Water
35	.025	2.56	.020	2.05	59	32.1	Kerosene
50	.074	7.40	.059	5.92	80	44.3	No. 2 Fuel Oil
80	.157	15.7	.126	12.6	125	69.2	No. 4 Fuel Oil
100	.202	20.2	.162	16.2	150	85.6	Transformer Oil
200	.432	43.2	.346	34.6	295	170	Hydraulic Oil
300	.654	65.4	.522	52.2	470	254	SAE 10W Oil
500	1.10	110	.88	88.0	760	423	SAE 10 Oil
1,000	2.16	220	1.73	173	1,500	896	SAE 20 Oil
2,000	4.40	440	3.52	352	3,000	1,690	SAE 30 Oil
5,000	10.8	1,080	8.80	880	7,500	4,230	SAE 50 Oil
10,000	21.6	2,160	17.0	1,760	15,000	8,460	SAE 60-70 Oil
50,000	108	10,800	88	8,800	75,000	43,660	Molasses B
100,000	216	21,600	173	17,300	150,000	88,160	Molasses C

Friction Loss for Flow Through Valves and Fittings

Example:

The dotted line shows that the resistance of a 6-inch Standard Elbow is equivalent to approximately 16 feet of 6-inch Standard Pipe.

Note: For sudden enlargements or sudden contractions, use the smaller diameter, d , on the pipe size scale. This scale is based on the flow of water.



Friction Loss For Flow Through Pipes

Loss In feet of Liquid Flowing in 100' of New Schedule 40 Steel Pipe

U.S. GPM	Pipe Size	Kinematic Viscosity—Seconds Saybolt Universal														
		Water	100	200	300	400	500	1000	2000	3000	4000	5000	6000	8000	10,000	15,000
3	1/2	10.0	25.4	53.2	81.1	111.0	139.0	278.0	556.0	822.0	1100.0	1390.0	1670.0	2220.0		
	3/4	2.5	8.6	17.8	25.0	36.6	45.2	90.2	181.0	271.0	371.0	452.0	549.0	722.0	903.0	1352.0
	1	1.1	3.2	6.9	10.4	13.8	17.1	34.7	69.4	108.0	139.0	174.0	208.0	278.0	347.0	521.0
5	3/4	6.3	14.4	30.1	46.2	61.1	76.2	152.0	305.0	457.0	610.0	761.0	915.0	1220.0	1520.0	2280.0
	1	2.1	5.3	11.6	17.1	23.1	28.9	57.8	115.0	171.0	231.0	289.0	346.0	462.0	578.0	865.0
	1-1/4	1.8	3.9	5.8	7.6	9.7	18.2	28.3	57.7	78.5	97.0	217.0	152.0	191.0	288.0	
7	3/4	11.8	20.1	41.6	64.0	86.0	106.0	212.0	425.0	645.0	855.0	1060.0	1275.0	1700.0	2120.0	
	1	3.2	7.6	15.9	24.2	32.3	40.4	82.0	164.0	245.0	328.0	411.0	493.0	655.0	820.0	1230.0
	1-1/4	2.5	5.3	8.1	10.8	13.4	26.6	53.1	80.9	109.0	138.0	162.0	214.0	265.0	400.0	
10	1	6.9	11.6	23.1	34.6	46.2	57.8	118.0	235.0	353.0	470.0	589.0	707.0	942.0	1178.0	1760.0
	1-1/4	1.8	3.7	7.6	11.6	15.5	19.2	38.5	77.3	115.0	157.0	194.0	231.0	310.0	386.0	516.0
	1-1/2	1.9	4.2	6.3	8.3	10.4	20.8	41.5	62.3	83.1	104.0	124.0	166.0	206.0	312.0	
15	1	15.0	25.3	34.6	50.8	69.2	86.5	175.0	350.0	527.0	700.0	878.0	1055.0	1400.0	1758.0	
	1-1/4	3.8	6.3	11.3	17.5	23.1	27.8	57.7	116.0	173.0	231.0	289.0	347.0	462.0	578.0	865.0
	1-1/2	1.7	2.8	6.3	9.2	12.5	15.7	31.2	62.2	94.8	124.0	157.0	187.0	249.0	312.0	470.0
20	1	25.1	46.2	48.2	69.3	92.4	116.0	231.0	462.0	693.0	924.0	1160.0	1380.0	1840.0		
	1-1/2	2.9	5.3	8.3	12.5	16.6	20.8	41.5	83.0	124.0	166.0	207.0	249.0	332.0	415.0	622.0
	2	1.5	3.0	4.6	6.2	7.6	15.5	31.2	46.2	62.6	78.5	94.6	127.0	155.0	231.0	
25	1-1/2	4.5	8.1	10.4	15.5	20.8	26.5	53.0	106.0	157.0	207.0	265.0	318.0	425.0	531.0	796.0
	2	1.3	2.3	3.8	5.8	7.6	9.7	19.4	38.1	57.7	76.2	97.0	118.0	157.0	194.0	291.0
	2-1/2	0.5	0.97	1.74	2.8	3.7	4.6	9.2	18.4	27.7	36.9	46.2	55.5	73.9	92.5	140.0
30	1-1/2	6.3	11.6	12.4	18.5	25.4	31.2	62.2	124.0	187.0	249.0	312.0	374.0	500.0	621.0	935.0
	2	1.8	3.2	4.6	6.9	9.2	11.6	23.1	46.2	69.3	92.4	115.5	138.5	185.0	231.0	347.0
	2-1/2	0.8	1.38	2.19	3.5	4.4	5.5	11.3	22.6	33.5	43.9	55.5	67.0	88.0	111.0	166.0
40	1-1/2	10.8	20.7	20.7	25.4	33.5	41.5	85.5	168.0	256.0	341.0	428.0	512.0	682.0	855.0	1280.0
	2	3.1	6.0	6.2	9.0	12.2	15.4	31.2	62.4	92.5	124.0	157.0	189.0	250.0	311.0	470.0
	2-1/2	1.3	2.5	3.0	4.6	6.0	7.6	15.0	30.0	43.9	58.9	73.8	87.7	120.0	150.0	226.0
50	1-1/2	16.4	32.0	32.0	32.0	42.0	53.0	106.0	208.0	318.0	424.0	531.0	638.0	850.0	1030.0	1590.0
	2	4.7	8.7	9.2	11.5	15.5	19.4	39.3	78.5	118.0	157.0	196.0	235.0	314.0	393.0	588.0
	2-1/2	1.9	3.7	3.8	5.6	7.4	9.2	18.4	36.8	55.5	74.0	92.5	114.0	148.0	184.0	277.0
60	2	6.6	12.2	13.4	13.6	18.4	23.1	46.2	94.8	141.0	184.0	231.0	277.0	369.0	462.0	693.0
	2-1/2	2.7	5.3	5.6	6.7	8.8	11.1	22.2	45.0	67.0	87.8	113.0	134.0	178.0	222.0	332.0
	3	0.9	1.84	1.84	2.77	3.93	4.85	9.45	19.2	28.9	38.1	47.4	56.6	76.2	94.7	143.0
70	2-1/2	3.6	6.69	7.38	7.85	10.4	13.2	25.3	53.1	78.5	102.0	127.0	152.0	203.0	253.0	380.0
	3	1.2	2.31	2.54	3.23	4.39	5.55	11.1	22.3	33.5	43.8	55.5	67.0	87.7	111.0	166.0
	4	0.62	0.74	1.13	1.50	1.84	3.68	7.39	11.3	15.2	18.6	23.1	30.0	36.9	55.4	
80	2-1/2	4.7	8.55	9.95	9.95	12.0	15.0	30.0	60.0	90.0	120.0	150.0	180.0	240.0	300.0	450.0
	3	1.6	3.0	3.23	3.93	5.08	6.47	12.7	25.4	34.6	50.8	63.5	76.2	102.0	127.0	191.0
	4	0.83	0.83	1.24	1.71	2.12	4.15	8.55	12.9	17.3	21.4	26.5	30.9	41.5	62.2	
100	2-1/2	7.1	12.7	15.5	15.5	15.5	18.4	38.0	75.0	111.0	148.0	185.0	222.0	295.0	370.0	555.0
	3	2.4	4.89	5.1	5.1	6.7	8.1	15.7	32.3	48.5	63.5	78.5	94.5	125.0	157.0	235.0
	4	1.22	1.31	1.57	2.12	2.77	3.0	10.4	16.2	21.4	26.5	32.3	42.7	53.0	78.5	

Above 250 SSU approximate conversion to centipoise: Centipoise=(SSU x Specific Gravity)/4.62



Units Conversion Table

Multiply	By	To Obtain	Multiply	By	To Obtain
CENTIMETERS	0.3937	Inches	Grams	10^3	Milligrams
Centimeters	0.03280	Feet	Grams	0.03527	Ounces
Centimeters	0.01	Meters	Grams	0.03215	Ounces (troy)
Centimeters	10	Millimeters	Grams	2.205×10^{-3}	Pounds
CUBIC CENTIMETERS	3.531×10^{-5}	Cubic Feet	HORSE-POWER	42.44	B.T.Units/min.
Cubic Centimeters	6.102×10^{-2}	Cubic inches	Horse-power	33,000	Foot-lbs./min.
Cubic Centimeters	10^{-6}	Cubic meters	Horse-power	550	Foot-lbs./sec.
Cubic Centimeters	1.308×10^{-6}	Cubic Cubic yards	Horse-power	1,014	Horse-power (metric)
Cubic Centimeters	2.642×10^{-4}	Gallons	Horse-power	10.70	Kg-calories./min.
Cubic Centimeters	10^{-3}	Liters	Horse-power	0.7457	Kilowatts
Cubic Centimeters	2.113×10^{-3}	Pints (liq.)	Horse-power	745.7	Watts
Cubic Centimeters	1.057×10^{-3}	Quarts (liq.)	INCHES	2.540	Centimeters
CUBIC FEET	2.832×10^4	Cubic centimeters	Inches	25.4	Millimeters
Cubic Feet	1728	Cubic inches	Inches	0.0254	Meters
Cubic Feet	0.02832	Cubic meters	Inches	0.0833	Feet
Cubic Feet	0.03704	Cubic yards	INCHES OF MERCURY	0.03453	Kgs./sq. cm.
Cubic Feet	7.48052	Gallons U.S.	Inches of Mercury	70.73	Lbs./sq. ft.
Cubic Feet	6.23	Imper. Gallons	Inches of Mercury	0.4912	Lb./sq. inch
Cubic Feet	28.32	Liters	INCHES OF WATER	0.002458	Atmospheres
Cubic Feet	59.84	Pints (liq.)	Inches of Water	0.07355	Inches of mercury
Cubic Feet	29.92	Quarts (liq.)	Inches of Water	0.002450	Kgs./sq. cm.
CUBIC FOOT WATER	62.4	Pounds	Inches of Water	0.5781	Ounces/sq. inch
Cubic Foot Water	998.8	Ounces	Inches of Water	5.202	Lb./sq. ft.
Cubic Foot Water	28.315	Kilograms	Inches of Water	0.03613	Lb./sq. inch
CUBIC INCHES	16.39	Cubic centimeters	KILOGRAMS	2.205	Pounds
Cubic Inches	5.787×10^{-4}	Cubic feet	Kilograms	1.102×10^{-3}	Tons (short)
Cubic Inches	1.639×10^{-5}	Cubic meters	Kilograms	10^3	Grams
Cubic Inches	2.143×10^{-5}	Cubic yards	LITERS	10^3	Cubic centimeters
Cubic Inches	4.329×10^{-3}	Gallons	Liters	0.03531	Cubic feet
Cubic Inches	1.639×10^{-2}	Liters	Liters	61.02	Cubic inches
Cubic Inches	0.03463	Pints (liq.)	Liters	10^{-2}	Cubic meters
Cubic Inches	0.01732	Quarts (liq.)	Liters	1.308×10^{-3}	Cubic uards
FEET	30.48	CENTIMETERS	Liters	0.2642	Gallons
Feet	12	Inches	Liters	2.113	Pints (liq.)
Feet	0.3048	Meters	Liters	1.057	Quarts (liq.)
Feet	1/3	Yards	METERS	100	Centimeters
FEET OF WATER	0.02950	Atmospheres	Meters	3.281	Feet
Feet of Water	0.8826	Inches of mercury	Meters	39.37	Inches
Feet of Water	0.03048	Kgs. sq. cm.	Meters	10^3	Kilometers
Feet of Water	62.43	Lbs. sq. ft.	Meters	10^3	Millimeters
Feet of Water	0.4335	Lbs. sq. inch	Meters	1.094	Yards
GALLONS, U.S.	3785	Cubic centimeters	MILLIMETERS	0.1	Centimeters
Gallons, U.S.	0.1337	Cubic feet	Millimeters	0.03937	Inches
Gallons, U.S.	231	Cubic inches	POUNDS (AVOIR.)	16	Ounces
Gallons, U.S.	3.785×10^{-3}	Cubic meters	Pounds (avoir.)	256	Drams
Gallons, U.S.	4.951×10^{-3}	Cubic yards	Pounds (avoir.)	7000	Grains
Gallons, U.S.	128	Fluid ounces	Pounds (avoir.)	0.0005	Tons (short)
Gallons, U.S.	3.785	Liters	Pounds (avoir.)	453.5924	Grams
Gallons, U.S.	8	Pints (liq.)	Pounds (avoir.)	1.21528	Pounds (troy)
Gallons, U.S.	4	Quarts (liq.)	Pounds (avoir.)	14.5833	Ounces (troy)
Gallons, U.S.	0.83267	Imperial gallons	Pounds (avoir.)	0.454	Kilograms
GALLONS, IMPERIAL	1.20095	U.S. gallons	POUNDS OF WATER	0.01602	Cubic feet
GALLONS, WATER(U.S.)	8.3453	Pounds of water	Pounds of Water	27.68	Cubic inches
Gallons, Water (U.S.)	3.785	Kilograms	Pounds of Water	0.1198	Gallons
GALLONS/MIN	2.228×10^{-3}	Cubic feet/sec.	Pounds of Water	0.10	Imperial galon
Gallons/Min	0.06308	Liters/sec.	POUNDS/SQ. INCH	0.06804	Atmospheres
Gallons/Min	8.0208	Cu.ft./hr.	Pounds/Sq. Inch	2.307	Feet of water
GRAMS	980.7	Dynes	Pounds/Sq. Inch	2.036	Inches of mercury
Grams	15.43	Grains	Pounds/Sq. Inch	0.07031	Kgs. sq. cm.
Grams	10^{-3}	Kilograms			