OAKTON® TECH TIPS

Conversion Factors

Tech Tip #30 ©2000

Mass

Multiply →		to get
to get	←	Divide
Apoth dram	60	grains
Apoth dram	0.1371	Avdp oz
Apoth dram	0.008571	Avdp lb
Apoth dram	3.88794	grams
Apoth lb	5760	grains
Apoth lb	13.1657	Avdp oz
Apoth lb	0.822857	Avdp lb
Apoth lb	373.242	grams
Apoth oz	480	grains
Apoth oz	1.09714	Avdp oz
Apoth oz	0.068571	Avdp lb
Apoth oz	31.1035	grams
Avdp drams	27.344	grains
Avdp drams	0.0625	Avdp oz
Avdp drams	0.003906	Avdp lb
Avdp drams	1.77185	grams
Avdp lb	7000	grains
Avdp lb	16	Avdp oz
Avdp lb	453.592	grams
Avdp oz	437.5	grains
Avdp oz	0.0625	Avdp lb
Avdp oz	28.3495	grams
carats	3.0865	grains
carats	0.2	grams
grams	15.432	grains
grams	0.0353	oz
lb	0.4536	kg
oz	28.35	grams

Pressure/Vacuum

Multiply →		to get
to get	←	Divide
atm	33.9	ft H_2O
atm	760	mm Hg
atm	1033.2	g/cm^2
atm	14.70	psi
atm	1.013	bar
atm	101.3	kPa
bar	14.5	psi
bar	0.9869	atm
bar	100	kPa
ft H_2O	0.4335	psi
kPa	0.01	dyne/cm^2
kPa	0.1450	psi
kPa	7.5	mm Hg
psi	0.0703	kg/cm^2

Miscellaneous

Multiply →		to get
to get	←	Divide
hp	0.746	kW
hp	42.44	Btu/min
hp	396,000	lb in/min
hp	1.014	metric hp
watts	0.7376	lb ft/sec
watts	44.25	lb ft/min
lb-ft	0.1368	kg-m
oz-in	0.072	kg-cm
oz-in	70,600	dyne-cm
oz-in	0.00706	Nm
gauss	0.0001	tesla

Length

Multiply →		to get
to get	←	Divide
inch	2.54	cm
ft	12	inch
ft	0.305	meter
yard	1.094	meter
Angstrom	10^{10}	meter

Flowrate

Multiply →		to get
to get	←	Divide
cc/min	1	mL/min
cfm (ft^3/min)	28.31	L/min
cfm (ft^3/min)	1.699	m^3/hr
cfh (ft^3/hr)	472	mL/min
cfh (ft^3/hr)	0.125	GPM
GPH	63.1	mL/min
GPH	0.134	cfh
GPM	0.227	m^3/hr
GPM	3.785	L/min
oz/min	29.57	mL/min

Volume

Multiply →		to get
to get	←	Divide
cubic cm (cc)	1	mL
oz (fluid)	29.57	mL
cubic ft (ft^3)	7.48	gal
cubic ft (ft^3)	0.0283	m^3
gal	128	oz (fluid)
gal	3.785	liters
gal	0.8333	imp gal
cubic meters	1000	liters

Equations

Centrifugal Force

Relative centrifugal force

rcf = (11.18 x 10-6) RN

R = rotating radius in cm

N = rotation speed in rpm

Concentration

Molar (M) =

$$\frac{\text{Moles of solute}}{\text{Liters of solution}}$$

Weight % =

$$\frac{\text{Grams of solute x 100\%}}{\text{Grams of solute + grams of solvent}}$$

Volume % =

$$\frac{\text{Liters of solute x 100\%}}{\text{Liters of solution}}$$

ppm =

$$\frac{\text{mg of solute}}{\text{kg of solution}} = \frac{\text{mg}}{\text{Liters of water}}$$

Flow

C_V factor

$$Q = \frac{C_v}{(G/\Delta P)^{1/2}}$$

Q = flow rate (GPM)

CV = flow coefficient

G = specific gravity

ΔP = pressure drop (psi)

Density Conversions

Specific Gravity x 1 = g/L

g/L x 8.345404 = lb/gal

lb/gal x 0.119826 = g/mL

Temperature

°F = (1.8 x °C) + 32

°C = (°F – 32) x 0.555

°Kelvin = °C + 273.2

Heating and Cooling

Cooling capacity of chillers

Btu/hr =

$$\frac{\Delta T\ (°F) \times \text{Specific heat of fluid}}{\text{flow rate (GPM)}}$$

Specific heat of water = 500 Btu/hr/GPM/°F

Specific heat of oil = 350 Btu/hr/GPM/°F

Heating water in tanks

kW =

$$\frac{\text{Volume (gallons)} \times \Delta T\ (°F)}{325 \times \text{Heat-up time (hours)}}$$

Heating oil in tanks

kW =

$$\frac{\text{Volume (gallons)} \times \Delta T\ (°F)}{800 \times \text{Heat-up time (hours)}}$$

Heating flowing water

kW = Flow (GPM) x ΔT (°F) x 0.16

Humidity

Absolute humidity (as g/m3)

$$D = \frac{804}{1 + 0.00633t} \times \frac{e}{PO}$$

$$= \frac{H}{100} \times \frac{804}{1 + 0.00366t} \times \frac{e}{PO}$$

H = relative humidity (% RH)
PO = standard air pressure (mm Hg)
D = absolute humidity (g/m^3)
e = water steam pressure (mm Hg)
DS = absolute humidity in saturation (g/m^3)
eS = saturated water steam pressure (mm Hg)
t = temperature (°C)
T = dew point temperature

Dew point temperature (as °C)

$$T = \frac{237.3/7.5}{\log e - 0.786} - 1$$

$$e = \frac{H}{100} \times e_S$$

$$eS = 6.1078 \times 10^{7.5t/(237.3 + t)}$$

Relative humidity (as % RH)

$$RH = \frac{e}{eS} \times 100 = \frac{D}{DS} \times 100$$

Ohm's law

Volts

Volts = $\sqrt{\text{Watts} \times \text{Ohms}}$

Volts = $\frac{\text{Watts}}{\text{Amperes}}$

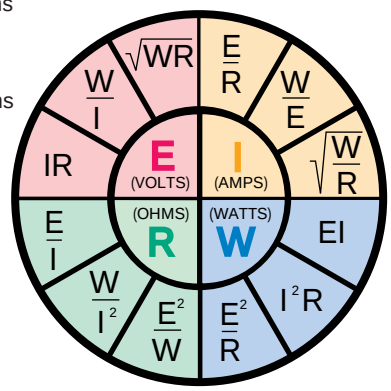
Volts = Amperes x Ohms

Ohms

Ohms = $\frac{\text{Volts}}{\text{Amperes}}$

Ohms = $\frac{\text{Volts}^2}{\text{Watts}}$

Ohms = $\frac{\text{Watts}}{\text{Amperes}^2}$



Amperes

Amperes = $\frac{\text{Volts}}{\text{Ohms}}$

Amperes = $\frac{\text{Watts}}{\text{Volts}}$

Amperes = $\sqrt{\frac{\text{Watts}}{\text{Ohms}}}$

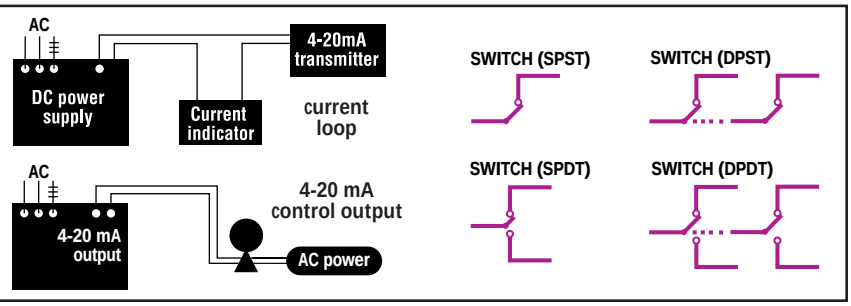
Watts

Watts = Volts x Amperes

Watts = Amperes^2 x Ohms

Watts = $\frac{\text{Volts}^2}{\text{Ohms}}$

Electrical Diagrams



Conversion Tables

Important Metric Prefixes

Prefix	Abbreviation	Meaning
tera- giga-* mega-	T G M	x 10^{12} x 10^{9} x 10^{6}
kilo- deci- centi- milli-	k d c m	x 10^{3} x 10^{-1} x 10^{-2} x 10^{-3}
micro- nano-* pico-*	µ n p	x 10^{-6} x 10^{-9} x 10^{-12}

*In older literature, certain double prefixes are used: kilomega (kM) for 10^9; millimicro (mµ) for 10^{-9}; micromicro (µµ) for 10^{-12}.

Brix Scale (sucrose)

% Brix	RI
0.0 5.0 10.0	1.3330 1.3403 1.3479
15.0 20.0 25.0	1.3557 1.3639 1.3723
30.0 35.0 40.0	1.3811 1.3902 1.3997
45.0 50.0 55.0	1.4096 1.4200 1.4307
60.0 65.0 70.0	1.4418 1.4532 1.4651
75.0 80.0 85.0	1.4774 1.4901 1.5003

Conductivity Values µΩ/cm at 77°F (25°C)

% Weight	ppm mg/l	NaCl	NaOH	HCl	Acetic acid
0.0001 0.0003 0.001	1 3 10	2.2 6.5 21.4	6.2 18.4 61.1	11.7 35.0 116	4.2 7.4 15.5
0.003 0.01 0.03	30 100 300	64 210 617	182 603 1780	340 1140 3390	30.6 63 114
0.1 0.3 1.0	1000 3000 10,000	1990 5690 17,600	5820 16,900 53,200	11,100 32,200 103,000	209 368 640
3.0 5.0 10.0	— — —	48,600 78,300 140,000	144,000 223,000 358,000	283,000 432,000 709,000	1120 1230 1530
20.0 30.0 40.0	— — —	226,000 Saturated Saturated	414,000 292,000 191,000	850,000 732,000 Saturated	1600 1405 1080
50.0 75.0 100.0	— — —	Saturated Saturated Saturated	150,000 Saturated Saturated	Saturated Saturated Saturated	740 168 <1

Nominal Dimensions of Standard Sieves

Sieve opening (mm)	USA standard ASTM E 11-61	Mesh number Tyler (mesh/in.)	British standard (mesh/in.)
0.037	400	400	—
0.044	325	325	—
0.045	—	—	350
0.053	270	270	300
0.063	230	250	240
0.074	200	200	—
0.075	—	—	200
0.088	170	170	—
0.090	—	—	170
0.105	140	150	150
0.125	120	115	120
0.149	100	100	—
0.150	—	—	100
0.177	80	80	—
0.180	—	—	85
0.210	70	65	72
0.250	60	60	60
0.297	50	48	—
0.300	—	—	52
0.354	45	42	—
0.355	—	—	44
0.420	40	35	35
0.500	35	32	30
0.595	30	28	—
0.600	—	—	25
0.707	25	24	—
0.710	—	—	22
0.841	20	20	—
1.00	18	16	16
1.19	16	14	—
1.20	—	—	14
1.41	14	12	—
1.68	12	10	10
2.00	10	9	8

Wire Gauge Sizes

AWG	Diameter (inches)	Diameter (mm)
6	0.1620	4.115
8	0.1285	3.264
10	0.1019	2.588
12	0.0808	2.053
14	0.0641	1.628
16	0.0508	1.291
18	0.0403	1.024
20	0.0338	0.8118
22	0.0253	0.6438
24	0.0207	0.5106
26	0.0159	0.4049
28	0.0126	0.3211
30	0.0100	0.2546
32	0.0080	0.2019
34	0.00630	0.152
36	0.00500	0.127
38	0.00397	0.1007
40	0.00314	0.07987

Viscosity Values

Centipoise* (cp)	Centistokes (cSt)	Saybolt Second Universal (SSU)	Typical liquid
1	1	31	Water
3.2	4	40	Milk
12.6	15.7	80	No. 4 fuel oil
16.5	20.6	100	Cream
34.6	43.2	200	Vegetable oil
88	110	500	SAE 10 oil
176	220	1000	Tomato juice
352	440	2000	SAE 30 oil
880	1100	5000	Glycerine
1561	1735	8000	SAE 50 oil
1760	2200	10,000	Honey
3000	4500	20,000	Glue
5000	6250	28,000	Mayonnaise
8640	10,800	50,000	Molasses B
15,200	19,000	86,000	Sour cream
17,640	19,600	90,000	SAE 70 oil

*Centipoise = centistokes x specific gravity where specific gravity is assumed to be 0.8 (except for water). To find the exact cp of your fluid: **cp = cSt x (weight per gallon x 0.120)**.