



# Western Power Products

MECHANICAL • FLUID POWER SYSTEMS • ELECTRICAL

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## CONVERSIONS

To Convert	INTO	Multiply By:
Bar	PSI	14.5
cc	Cu. In.	0.06102
°C	°F	$(°C \times \frac{9}{5}) + 32$
Kg	lbs.	2.205
KW	HP	1.341
Liters	Gallons	0.2642
mm	inches	0.03937
Nm	Lb.-ft.	0.7375
N	Lbs.	0.22481
Cu. In.	cc	16.39
°F	°C	$(°F - 32) \div 1.8$
Gallons	Liters	3.785
HP	KW	0.7457
Inches	mm	25.4
Lbs.	Kg	0.4535
Lb.ft.	Nm	1.356
PSI	Bar	0.06896
In. of HG	PSI	0.4912
In. of H <sub>2</sub> O	PSI	0.03613
Lbs.	Nm	4.4482

## FORMULAS

### CYLINDERS

$$\text{Cylinder Area} = \text{diameter}^2 \times .7854$$

$$\text{Cylinder Force} = \text{pressure} \times \text{area}$$

$$\text{Cylinder Time (in seconds)} = \frac{\text{area} \times \text{stroke} \times .26}{\text{GPM}}$$

$$\text{Pneumatic HP} = \frac{\text{compressed CFM} \times \text{PSI} \times 144}{33,000}$$

$$\text{Cylinder HP} = \frac{\text{cyl speed} \times \text{cyl force}}{33,000}$$

$$\text{Tube Area} = \frac{\text{GPM} \times 0.3208}{\text{oil velocity}}$$

$$\text{Adjust GPM on Return} = \frac{\text{cyl area} \times \text{GPM}}{\text{area}}$$

$$\text{Cylinder Speed (Ft/Min)} = \frac{\text{stroke} \times 5}{\text{time (in secs)}}$$

$$\text{Cylinder Speed (Ft/Min)} = \frac{\text{GPM} \times 9.25}{\text{area}}$$

$$\text{Comp CFM} = \frac{\text{area} \times \text{stroke} \times 60}{\text{time (in secs)} \times 1728}$$

### PUMPS & MOTORS

$$\text{HP Out} = \frac{\text{HP IN} \times \text{Overall Eff.}}{100}$$

$$\text{Actual Torque} = \frac{\text{theo. torque} \times \text{mech. eff.}}{100}$$

$$\text{Actual Motor RPM} = \frac{\text{theo. RPM} \times \text{Vol. Eff.}}{100}$$

$$\text{Overall Efficiency} = \frac{\text{Mech. Eff.} \times \text{Vol. Eff.}}{100}$$

$$\text{Actual Pump GPM} = \frac{\text{theo. GPM} \times \text{Vol. Eff.}}{100}$$

$$\text{GPM} = \frac{\text{RPM} \times \text{Disp (In Inches}^3\text{)}}{231}$$

$$\text{Hyd. HP} = \frac{\text{GPM} \times \text{PSI}}{1714}$$

$$\text{Torque (in lbs.)} = \frac{\text{PSI} \times \text{Disp. (In Inches}^3\text{)}}{6.28}$$

$$\text{Torque (in lbs.)} = \frac{\text{HP} \times 63025}{\text{RPM}}$$

Don't understand a formula or conversion?  
Call Cliff Eddie at 541.954.8846

### VEHICLE SIZING

$$\text{RPM} = \frac{\text{MPH} \times 168}{\text{LR}}$$

$$\text{Torque} = \text{TE} \times \text{LR}$$

$$\text{Wheel Slip Torque} = \text{WD} \times \text{ADC} \times \text{LR}$$

$$\text{TE} = \text{RR} + \text{GR} + \text{DP}$$

$$\text{RR} = \frac{\text{GVQ} \times \text{R}}{1000}$$

$$\text{GR} = \frac{\% \text{ Grade} \times \text{GVW}}{100}$$

### LEGEND

G = Gear Reduction Ratio

LR = Load Radius

TE = Tractive Effort

WD = Weight on Drive Wheels

ADC = Adhesion Coefficient

RR = Rolling Resistance

GR = Grade Resistance

DP = Draw Bar Pull Desired

TE = RR + GR + DP

R = Rolling Resistance Coefficient

GVW = Gross Vehicle Weight

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