Technical Reference

Drive System Mechanical Formulas

	NEED TO FIND:	FORMULA:
Mechanical	**CIRCUMFERENCE** OF A CIRCLE	3.1416 X DIAMETER
	DIAMETER OF A CIRCLE	CIRCUMFERENCE / (3.1416)
	VELOCITY IN FEET PER MINUTE	FPM = .262 X DIAMETER X RPM
	RPM REVOLUTIONS PER MINUTE	FEET PER MINUTE / (.262 X DIAMETER)
	TORQUE IN/LBS	HP X 63,025 / RPM
	TORQUE IN/LBS	FORCE (LBS) X RADIUS (IN)
	HORSEPOWER	TORQUE (IN LBS) X RPM / 63,025
	HORSEPOWER	FORCE X FPM / 33,000
	BELT LENGTH	[1.57 X (DIA + DIA)] +(2 X CENTER DIST)
	MOTOR RPM SYNCHRONOUS	120 X 60 (HZ) / NUMBER OF MOTOR POLES
	PUMP MOTOR HP	GPM X HEAD IN FEET X SPEC GRAVITY / 3960 X EFFICIENCY OF PUMP
	FAN MOTOR HP	CFM X PRESSURE (LB/SQ FT) / 33000 X EFFICIENCY

Formulas and Constants

1 hp = 33,000 / Foot-pounds of work per minute.

1 hp = .746 K.W. = K.W. ÷ 1.341.

1 hp= 2,547 B.T.U. per hour.

1 B.T.U. = Heat required to raise 1 lb. water 1 °F.

1 B.T.U. = 777.6 / Foot-pounds work.

1 Kilowatt Hour = 3,415 B.T.U.

Heat Value of Carbon = 14,600 B.T.U. per pound.

Latent Heat of Fusion of Ice = 143.15 B.T.U per pound.

Latent Heat of Evaporation of Water at 212 °F.
= 970.4 B.T.U. per pound.

Total Heat of Saturated Steam at Atmospheric Pressure
= 1,150.4 B.T.U. per pound.

1 Ton of Refrigeration = 288,000 B.T.U. per 24 hours.

g = Acceleration of Gravity
(commonly taken as 32.16 feet per second per second).

1 Radian = 57.296 degrees.

1 Meter = 100 cm. = 39.37 inches.

1 Kilometer = .62137 miles.

1 Gallon = 231 cubic inches.

1 Barrel = 42 gallons.

Atmospheric Pressure = 14.7 pounds per sq. in.
= 29.92 inches mercury at 32 °F.

1 Lb. Per Sq. In. Pressure = 2.3095 feet fresh water at 62 °F.
= 2.0355 inches mercury at 32 °F.
= 2.0416 inches mercury at 62 °F.

Water Pressure (pounds per sq. in.)
= .433 X height of water in feet (Fresh water at 62 °F).

Weight of 1 cu. ft. Fresh Water
= 62.355 lbs. at 62 °F. = 59.76 lbs. at 212 °F.

Weight of 1 cu. ft. Air at 14.7 lbs. per sq. in. Pressure
= .07608 lbs. at 62 °F = .08073 lbs. at 32 °F.

Drive System Electrical Formulas

ELECTRICAL	NEED TO FIND	FORMULA
	HORSEPOWER – DC	$\frac{\text{VOLTS X AMPS X EFFICIENCY}}{\text{746}}$
	HORSEPOWER – AC	$\frac{\text{VOLTS X AMPS X 1.732 X EFF X PF}}{\text{746}}$
	WATTS-DC	VOLTS X AMPS
	WATTS-AC	VOLTS X AMPS X PF X 1.732
	KILOWATTS	$\frac{\text{VOLTS X AMPS X PF X 1.732}}{\text{1000}}$
	AMPERES (DC)	$\frac{\text{WATTS}}{\text{VOLTS}}$
	AMPERES (AC)	$\frac{\text{746 X HORSEPOWER}}{\text{VOLTS X EFF X PF X 1.732}}$
	KVA	$\frac{\text{VOLTS X AMPS X 1.732}}{\text{1000}}$
	PUMP MOTOR HP	$\frac{\text{GPM X HEAD IN FEET X SPEC GRAVITY}}{\text{3960 X EFFICIENCY OF PUMP}}$
	FAN MOTOR HP	$\frac{\text{CFM X PRESSURE (LB/SQ FT)}}{\text{33000 X EFFICIENCY}}$

To Find	Alternating Current		
	Single-Phase	Three-Phase	Direct Current
Amperes when horsepower is known	$\frac{\text{hp X 754}}{\text{E X Eff X pf}}$	$\frac{\text{hp X 746}}{\text{1.73 X E X Eff = pf}}$	$\frac{\text{hp X 746}}{\text{E X Eff}}$
Amperes when kilowatts are known	$\frac{\text{Kw X 1000}}{\text{E X pf}}$	$\frac{\text{Kw X 1000}}{\text{1.73 X E X pf}}$	$\frac{\text{Kw X 1000}}{\text{E}}$
Amperes when Kva are known	$\frac{\text{Kva X 1000}}{\text{E}}$	$\frac{\text{Kva X 1000}}{\text{1.73 X E}}$	-
Kilowatts	$\frac{\text{I X E X pf}}{\text{1000}}$	$\frac{\text{1.73 X I X E X pf}}{\text{1000}}$	$\frac{\text{I X E}}{\text{1000}}$
Kva	$\frac{\text{I X E}}{\text{1000}}$	$\frac{\text{1.73 X I X E}}{\text{1000}}$	-
Horsepower = (Output)	$\frac{\text{I X E X Eff X pf}}{\text{746}}$	$\frac{\text{1.73 X I X E X Eff X pf}}{\text{746}}$	$\frac{\text{I X E X Eff}}{\text{746}}$

I = Amperes; E = Volts; Eff = Efficiency; pf = power factor;
Kva = Kilovolt Amperes; Kw = Kilowatts; R = Ohms.

To Find	Alternating or Direct Current
Amperes when voltage and resistance are known	$\frac{E}{R}$
Voltage when resistance and current are known	I R
Resistance when voltage and current are known	$\frac{E}{I}$

RULES OF THUMB

All Values At 100 % Load

1 hp = 746 Watts or (.746 Kilowatts)

At 3,600 rpm, a motor develops 18 lb.-in. per hp
At 1,800 rpm, a motor develops 36 lb.-in. per hp
At 1,200 rpm, a motor develops 54 lb.-in. per hp

At 575 volts, a 3-phase motor draws 1 amp per hp
At 460 volts, a 3-phase motor draws 1.25 amp per hp
At 230 volts, a 3-phase motor draws 2.5 amp per hp
At 230 volts, a single-phase motor draws 5 amp per hp
At 115 volts, a single-phase motor draws 10 amp per hp

Technical Reference

Technical Reference

Identifying Overall Assembly Length

Unless otherwise specified, the assembly's overall length is measured from the extreme end of one fitting to the extreme of the other; except for the O-ring face seal fittings which shall be measured from the sealing face. Where elbow fittings are used, measurement shall be to the centerline of the sealing surface of the elbow end.

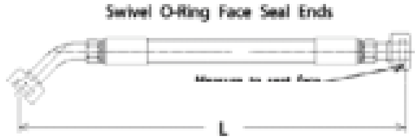
Assembly Length Measurements

Overall Assembly Length

Bent Stem Swivel Female Ends

Flange Ends

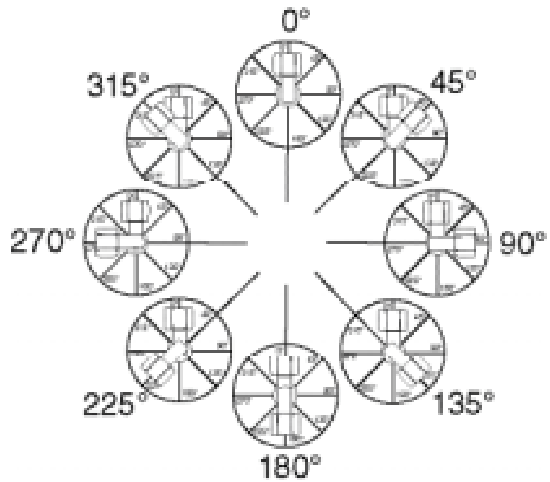
Swivel O-Ring Face Seal Ends



Measuring the Offset Angle

The offset angle between two fittings is the number of degrees measured in a clockwise direction, between the fitting nearest the viewer and the farthest end fitting. Tolerance on the offset angle is +/- 3 degrees for assemblies up to 24 inches long and +/- 5 degrees for assemblies 24 inches and longer.

The following illustration shows the clockwise angle separation between a "close" fitting and a "far" fitting. The "close" fitting would be defined as the fitting closest when looking at an assembly end to end. The "far" fitting would be defined as the fitting on the far of the assembly when looking at an assembly end to end. The far end is used as the reference point and the "close" end establishes the angular difference.



Far End Reference Measuring Clockwise

Clockwise Measurement (Degrees)