Miscellaneous Data

Abbreviated Terms

C	=	Celsius	min	=	minute
cm	=	centimeter	mm	=	millimeter
F	=	Fahrenheit	m	=	meter
ft	=	foot	nm	=	nanometer
g	=	gravity or gram (note context)	N	=	newton
			oz_m	=	ounce mass
in	=	inch	rad	=	radian
kg	=	kilogram	rpm	=	revs per minute
kW	=	kilowatt	rps	=	revs per second
lb_f	=	pound force	s	=	seconds
lb_m	=	pound mass	µm	=	micron (micrometer)

Metric Prefixes

NAME	ABBREVIATION		MULTIPLE
Giga	G	10^9	1,000,000,000
Mega	M	10^6	1,000,000
Kilo	k	10^3	1,000
Hecto	h	10^2	100
deka	da	10^1	10
—	—	10^0	1
deci	d	10^{-1}	.1
centi	c	10^{-2}	.01
milli	m	10^{-3}	.001
micro	µ	10^{-6}	.000001
nano	n	10^{-9}	.000000001

Material Densities

	oz/in^3	lb/in^3	g/cm^3
aluminum	1.57	0.098	2.72
brass	4.96	0.31	8.6
bronze	4.72	0.295	8.17
copper	5.15	0.322	8.91
plastic	0.64	0.04	1.11
steel	4.48	0.28	7.75

Mechanism Efficiencies

ball screw	0.9
lead screw	0.4
spur gear	0.6
timing belt/pulley	0.9

Friction Coefficients

linear bearings	0.002
air bearings	0.0

Miscellaneous

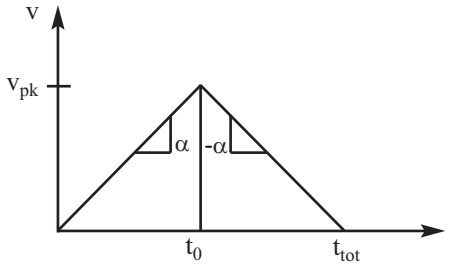
°F = (1.8 x °C) + 32 °C = .555 (°F - 32)

acceleration constant (g) = 386 in/s^2 = 32.2 ft/s^2 = 9.8 m/s^2

1 psi = 14.5 bar

Miscellaneous Data CONTINUED

Useful Formulae



From t = 0 to t = t_0:

$$x = \frac{1}{2}at^2 \qquad a = \frac{2x}{t^2} \qquad x = \frac{1}{2}(t_0)(v_{pk})$$

From t = t_0 to t = t_{tot}:

$$x = -\frac{1}{2}at^2 \qquad a = \frac{-2x}{t^2} \qquad x = \frac{1}{2}(t_{tot} - t_0)(v_{pk})$$

where:

x = distance
a = acceleration
v_{pk} = peak velocity

Inertia Calculations

$$J_{screw} = 7.57 \times 10^{-13}\ D^4\ L \quad kg-m^2$$

where:

D = screw diameter in mm
L = screw length in mm

Load inertia reflected through a screw

$$J_{load\ screw} = 2.55 \times 10^{-8}\ \frac{m}{p^2} \quad kg-m^2$$

where:

m = payload in kg
p = screw pitch in rev/mm

$$J_{disk} = 1.6 \times 10^{-6}\ L\ \rho\ R^4$$

where:

L = length of disk in mm
r = density of disk in kg/mm^3
R = radius of disk in mm

Load inertia reflected through a gearpass

$$J_{load\ geared} = \frac{J_{load}}{N^2}$$

where:

N = gear ratio R_2/R_1 (motor/load)