General Information

Conversion Charts

Fig. A
Inertia Chart
I = WR² of Steel (per inch of length)

DIA. (IN.)	WR² (LB. - IN.²)	DIA. (IN.)	WR² (LB. - IN.²)	DIA. (IN.)	WR² (LB. - IN.²)
1/4	.00011	8 3/4	162.72	29	19589.76
5/16	.00027	9	182.88	30	22452.48
3/8	.00055	9 1/4	203.04	31	25598.88
7/16	.00102	9 1/2	233.20	32	29059.2
1/2	.00173	9 3/4	252.00	33	32860.8
9/16	.00279	10	277.92	34	37036.8
5/8	.00425	10 1/4	306.72	35	41587.2
11/16	.00623	10 1/2	338.40	36	46540.8
3/4	.00864	10 3/4	371.52	37	51940.8
13/16	.01215	11	407.52	38	57787.2
7/8	.01634	11 1/4	444.96	39	64123.2
15/16	.02154	11 1/2	486.72	40	70963.2
1	.0288	11 3/4	592.92	41	78321.6
1 1/4	.0720	12	576.00	42	86227.2
1 1/2	.144	12 1/4	626.10	43	94766.4
1 3/4	.288	12 1/2	679.88	44	103881.6
2	.432	12 3/4	735.84	45	113659.2
2 1/4	.720	13	803.52	46	124099.2
2 1/2	1.152	13 1/4	858.24	47	135259.2
2 3/4	1.584	13 1/2	924.48	48	147139.2
3	2.304	13 3/4	995.04	49	159782.4
3 1/2	4.176	14	1068.48	50	173246.4
3 3/4	5.472	14 1/4	1147.68	51	187516.8
4	7.056	14 1/2	1229.76	52	202665.6
4 1/4	9.072	14 3/4	1317.60	53	218707.2
4 1/2	11.376	15	1404.00	54	235684.8
5	17.280	16	1815.84	55	253641.6
5 1/2	25.488	17	2314.08	56	272606.4
6	36.000	18	2910.24	57	292593.6
6 1/4	42.624	19	3611.52	58	313675.2
6 1/2	49.680	20	4433.76	59	335880.0
6 3/4	57.888	21	5389.92	60	359238.8
7	66.816	22	6492.96	66	525960.0
7 1/4	77.040	23	7757.28	72	744768.0
7 1/2	87.984	24	9195.84	78	1026000.0
7 3/4	100.656	25	10827.36	84	1380096.0
8	113.904	26	12666.24	90	1818576.0
8 1/4	128.880	27	14731.20	96	2354256.0
8 1/2	144.00	28	17036.64	102	3000384.0

NOTES:
1. To determine WR² of a given shaft, multiply the WR² given above by the length of the shaft or the thickness of the disc in inches.
2. For hollow shafts, subtract WR² of I.D. from WR² of O.D. and multiply by length.

Full Load Running
Torque of Motors in Lb.–In.

HP	3450 RPM	1750 RPM	1150 RPM	870 RPM
1/50	.365	0.720	1.096	1.448
1/20	.913	1.800	2.739	3.621
1/12	1.521	3.000	4.563	6.032
1/8	2.283	4.500	6.848	9.051
1/6	3.044	6.000	9.148	12.09
1/4	4.565	9.000	13.70	18.10
1/3	6.081	12.00	18.24	24.11
1/2	9.130	18.00	27.39	36.21
3/4	13.70	27.00	41.09	54.31
1	18.26	36.00	54.78	72.41
1 1/2	27.39	54.00	82.17	108.6
2	36.52	72.00	109.56	144.8
3	54.78	108.00	164.3	217.2
5	91.30	180.00	273.96	362.0
7 1/2	137.0	270.00	410.8	543.1

Inertia Conversion Chart

To determine the inertia of a rotating member of a material other than steel, multiply the inertia of the steel diameter from Fig. A at right by:

MATERIAL	MULTIPLIER
Bronze	1.05
Steel	1.00
Iron	.92
Powdered Bronze	.79
Powdered Metal Iron	.88
Aluminum	.35
Nylon	.17

Conversion Charts

INERTIA		
TO CONVERT FROM	TO	MULTIPLY BY
g – cm^2	lb.–$in.^2$	3.417×10^{-4}
g – cm^2	lb.–$ft.^2$	2.373×10^{-6}
kg – cm^2	lb.–in^2	3.417×10^{-1}
kg – cm – sec^2	lb.–$in.^2$	335.1
N – m – sec^2	lb.–$in.^2$	3417
kg – m^2	lb.–$in.^2$	3417
N – m^2	lb. – $in.^2$	348.47
lb. – $in.^2$	kg – cm^2	2.926
lb. – $in.^2$	kg – m^2	2.9265×10^{-4}
lb. – $in.^2$	N – m^2	2.870×10^{-3}
lb. – $in.^2$	lb. – in. – $sec.^2$	2.590×10^{-3}
lb. – $in.^2$	lb. – $ft.^2$	6.944×10^{-3}
lb. – $in.^2$	oz. – $in.^2$	16
lb. – $ft.^2$	lb. – $in.^2$	144
lb. – $ft.^2$	oz. – $in.^2$	2304
lb. – $ft.^2$	oz. – in. – $sec.^2$	5.969
oz. – $in.^2$	oz. – in. – $sec.^2$	2.590×10^{-3}
oz. – $in.^2$	lb. – $in.^2$	6.25×10^{-2}
oz. – in. – $sec.^2$	oz. – $in.^2$	3.8609×10^{-2}
oz. – in. – $sec.^2$	lb. – $in.^2$	24.125

MISCELLANEOUS		
TO CONVERT FROM	TO	MULTIPLY BY
horsepower	ft.–lb./min.	33,000
kilograms	pounds	2.2
meters	millimeters	1000
millimeters	inches	3.937×10^{-2}
Newtons	pounds	.225
radians	degrees	57.30
revolutions	radians	6.283
revolutions/min.	degrees/sec.	6
square–inches	square–millimeters	645.2
temp. (°C) + 17.78	temp. (°F)	1.8
temp. (°F) – 32	temp. (°C)	5/9

TORQUE		
TO CONVERT FROM	TO	MULTIPLY BY
kg–m	lb.–in.	.6026
N–m	lb.–in.	8.850
N–m	oz.–in.	141.69
lb.–in.	g–cm	1152
lb.–in.	kg–cm	1.152
lb.–in.	kg–m	1.6596
lb.–in.	N–m	.1130
lb.–in.	oz.–in.	16.0
lb.–in.	lb.–ft.	.083
lb.–ft.	lb.–in.	12.0

Glossary – General Terms

Acceleration Time – The amount of time required to change the speed of an inertial load, from the instant an electrical signal is applied to the time the system is at full speed.

Air Gap – The space between the armature and field when the clutch or brake is disengaged.

Brake-Power Off – Unit used to stop a load when turned off electrically.

Brake-Power On – Unit used to stop a load when turned on electrically.

Build Up Time – The time required to build up 90% of the flux which yields 80% of the rated torque.

Burnishing – A "wearing in" process of the mating friction surfaces for maximum torque.

Clutch – Unit used to couple two parallel shafts via pulleys, gears, or sprockets.

Clutch Coupling – Unit used to couple two in-line shafts.

Decay Time – The time required to decay to 10% of the flux which yields 10% of the rated torque.

Deceleration Time – The amount of time required to stop an inertial load, from the instant an electrical signal is applied to the time the system is at rest.

Dynamic Torque – Torque measured at instant of clutch or brake engagement when one friction member is rotating and the other is stationary or rotating at a different speed. Approximately 80% of static torque.

Field – Coil and housing assembly which forms part of the electromagnet.

Flange – Mounting plate located on brake magnets and clutch fields.

Frictional Torque – The torque required to overcome static friction in the system.

Friction Material – Composition material (nonasbestos) inserted between poles of clutch or brake magnet, used to retard wear rate of iron poles and armature.

Inertia – The property of matter that causes an object to remain at rest or in motion until acted on by an outside force.

Inertial Torque – The torque generated by accelerating or decelerating a load.

Moment of Inertia – WR^2 = Weight of an object times its radius of gyration squared.

Overexcitation – Applying a high voltage for a brief time period to shorten the engagement time. Sometimes referred to as "spiking."

Positive Engagement – An engagement with no slip.

Radial Bearing Load – The maximum load that can be applied to a clutch at maximum speed without causing premature wear.

Residual Magnetism – A condition in magnets where low levels of magnetism remain after electric current is removed.

Rotor – The rotating component of a stationary field clutch that carries the friction material.

Spline Drive – Heavy duty clutch or brake drive comprised of mating armature and hub splines.

Static Torque – Torque measured at instant of breakaway when both friction members are locked in at the same speed or at rest.

Thermal Capacity – Brake rating that takes into consideration number of stops/minute, total inertia, and brake rotational speed.

Time to Speed – The amount of time required to change the speed of an inertial load, from the instant an electrical signal is applied to the time the system is at full speed.

Time to Zero Speed – The amount of time required to stop an inertial load, from the instant an electrical signal is removed to the time the system is at rest.

Torque – The action of a force producing rotation. Torque is comprised of a force (lb.) acting upon a lever arm of length (in.). The product of the force and lever arm is pound–inches (lb.–in.) used to express torque. See "static" and "dynamic" torque.

UL – Underwriters Laboratories – An organization which tests electrical equipment for product safety.

Zero Backlash Armature – A spring mounted armature used to eliminate backlash and dragging of the armature against the field magnet.