

Motor/Drive Selection

Based on peak torque requirements

Servo-based motor/drives have two speed/torque curves: one for continuous duty operation and another for intermittent duty. A servo system can be selected according to the total torque and maximum velocity indicated by the continuous duty curve. However, by calculating the root mean square (RMS) torque based on your duty cycle, you may be able to take advantage of the higher peak torque available in the intermittent duty range.

$$T_{RMS} = \sqrt{\frac{\sum Ti^2}{\sum ti}}$$

Where:

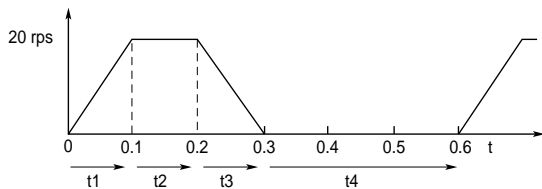
- T_i is the torque required over the time interval t_i
- \sum means "the sum of"

Example

Assume the following results from your load calculations.

T_F = 25 oz-in	Friction Torque
T_A = 775 oz-in	Acceleration Torque
T_T = 800 oz-in	Total Torque
V_{max} = 20 rps	Maximum Velocity

Motion Profile



Duty Cycle

Index 4 revs in 0.3 seconds, dwell 0.3 seconds then repeat.

If you look at the Zeta106-178 speed/torque curve, you'll see that the requirements fall outside the curve.

T_1 = Torque required to accelerate the load from zero speed to maximum speed ($T_F + T_A$)

T_2 = Torque required to keep the motor moving once it reaches max speed (T_F)

T_3 = Torque required to decelerate from max speed to a stop ($T_A - T_F$)

T_4 = Torque required while motor is sitting still at zero speed (\emptyset)

t_1 = Time spent accelerating the load

t_2 = Time spent while motor is turning at constant speed

t_3 = Time spent decelerating the load

t_4 = Time spent while motor is at rest

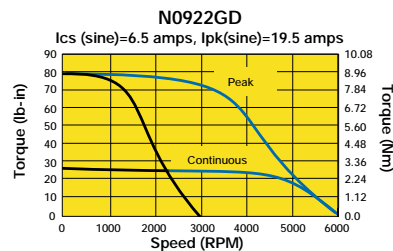
$$T_{RMS} = \sqrt{\frac{T_1^2 t_1 + T_2^2 t_2 + T_3^2 t_3 + T_4^2 t_4}{t_1 + t_2 + t_3 + t_4}}$$

$$= \sqrt{\frac{(800)^2(.1) + (25)^2(.1) + (750)^2(.1) + (0)^2(.3)}{(.1) + (.1) + (.1) + (.3)}}$$

$T_{RMS} = 447$ oz. in.

Now plot T_{RMS} and T_T vs. T_{max} on the speed/torque curve.

The drawing below resembles the speed/torque curve for the NeoMetric 922 motor.



The NeoMetric 922 motor will meet the requirements. RMS torque falls within the continuous duty cycle and total torque vs. velocity falls within the intermittent range.

How to Use a Step Motor Horsepower Curve

Horsepower (HP) gives an indication of the motor's top usable speed. The peak or "hump" in a horsepower curve indicates a speed that gives maximum power. Choosing a speed beyond the peak of the HP curve results in no more power: the power attained at higher speeds is also attainable at a lower speed. Unless the speed is required for the application, there is little benefit to going beyond the peak as motor wear is faster at higher speeds.

Applications requiring the most power the motor can generate, not the most torque, should use a motor speed that is *just* below the peak of the HP curve.

