

Sizing IDC Actuators and Electric Cylinders

1. Max Thrust = F (applied) + F (gravity) + F (accel.) + F (friction)

$$F (\text{accel.}) = m \cdot a = (\text{weight (lb)} / 386 \text{ in/s}^2) \cdot a$$

$$a = 4.5 \cdot d / T^2 \quad \text{for } \mathbf{\text{trapezoidal}} \text{ motion profile.}$$

$$a = 4.0 \cdot d / T^2 \quad \text{for } \mathbf{\text{triangular}} \text{ motion profile.}$$

Safety Factor (Thrust):

Brushed DC	1.2 (20%)
Step Motor	1.3 (30%)
Brushless Servo	1.2 (20%)

2. Duty Cycle: ON time / TOTAL time

3. Max Speed:

$$V = V_{\text{avg}} \cdot 1.5 \quad \text{for } \mathbf{\text{trapezoidal}} \text{ motion profile.}$$

$$V = V_{\text{avg}} \cdot 2.0 \quad \text{for } \mathbf{\text{triangular}} \text{ motion profile.}$$

$$V_{\text{avg}} = \text{Distance} / \text{Total Time}$$

4. Select Speed-Thrust curve.

5. Critical Speed and Column Loading limits.

6. Increase stroke length for **EOT limits**.

$$X = m (\text{lb} / 386 \text{ in/s}^2) \cdot V_{\text{max}}^2 / [2 \cdot F(\text{from curve})]$$

Add 2 * X to the stroke length.

7. Stroke Length: Use only **90-95% of stroke length** when using a pivot mount and a pivot rod end.

8. Thrust Tube Capacity: Torque and **Side Load**.

9. Carriage Loading: Normal, Side, Pitch, Roll, and Yaw.