

ACTUATOR SELECTION

5 Step Guide



Initial Actuator Selection

1. Five Step Guide to Initial Actuator Selection

The following selection procedure is applicable for machine screw and ball screw actuators.

Calculate Power and Torque Requirements

Select an actuator from the tables with adequate load carrying capacity and note the actuator static and dynamic efficiency for required input speed.

Step 1 - Actuator Input Speed

$$P_{in}(\text{kW}) = \frac{\text{Raise Rate (mm/min)} * \text{Gear Ratio}}{\text{Pitch (mm)} * N^{\circ} \text{ of Starts on Lifting Screw}} \quad \eta_{ad} = \text{Dynamic Actuator Efficiency}$$

Step 2 - Operating Input Power (kW), P_{in}

$$N \text{ (rpm)} = \frac{\text{Load (kN)} * \text{Raise Rate (mm/min)}}{60000 * \eta_{ad}} \quad \text{Note Actuator Input speed should not exceed 1800 rpm.}$$

Step 3 - Operating Input Torque

$$T_{ino} \text{ (Nm)} = \frac{P_{in} \text{ (kW)} * 9550}{N \text{ (rpm)}}$$

Step 4 - Actuator Start-Up Torque

$$T_{ins} = \frac{\text{Load (kN)} * \text{Pitch (mm)} * N^{\circ} \text{ of Starts on Lifting Screw}}{2 * \pi * \eta_{as} * \text{Gear Ratio}} \quad \eta_{as} = \text{Static Actuator Efficiency}$$

Step 5 - Mechanical Power and Torque Check

Check whether the actuator power and torque required for the application is not greater than the maximum allowable mechanical input power ($P_{mechanical}$) and Start-Up Torque at Full Load (T_s) values specified in the actuator performance tables.

If $P_{mechanical} > P_{in}$ & $T_s > T_{ins}$ then the actuator selected is acceptable for power requirements.

Example Initial Actuator Selection

2. Example Selection

Application Constraints

- Load on Actuator = 15 kN in Tension
- Raise Rate required = 100 mm/min

Consider all application constraints then choose an actuator that looks suitable for the application with an actuator load rating equal to or greater than the maximum working load. For this example say a 25 kN Sym-metric Actuator (refer 1.2.1.) with translating screw, 6:1 gear ratio, single start lifting screw (6 mm lead).

Calculate Power and Torque Requirements

Step 1 - Actuator Input Speed

$$N \text{ (rpm)} = \frac{100 \text{ (mm/min)} * 6 \text{ (Gear Ratio)}}{6 \text{ (mm)} * 1 \text{ (N}^\circ \text{ of starts on Lifting Screw)}}$$

$$N = 100 \text{ rpm}$$

Note Actuator Input Speed should not exceed 1800 rpm.

Step 2 - Operating Input Power (kW), P_{in}

$$P_{in} \text{ (kW)} = \frac{15 \text{ (kN)} * 100 \text{ (mm/min)}}{60000 * 0.275}$$

$$P_{in} = 0.091 \text{ kW}$$

Step 3 - Operating Input Torque

$$T_{ino} \text{ (Nm)} = \frac{0.091 \text{ (kW)} * 9550}{100 \text{ (rpm)}}$$

$$T_{ino} = 8.7 \text{ Nm}$$

Step 4 - Actuator Start-Up Torque

$$T_{ins} = \frac{15 \text{ (kN)} * 6 \text{ (mm)} * 1 \text{ (N}^\circ \text{ of starts on Lifting Screw)}}{2 * \pi * 0.208 * 6 \text{ (Gear Ratio)}}$$

$$T_{ins} = 11.5 \text{ Nm}$$

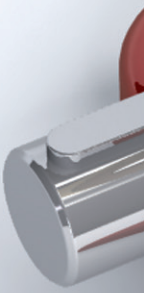
$$\eta_{as} = 0.208 \text{ (refer 1.2.1.1)}$$

Step 5 - Mechanical Power and Torque Check

Find the actuators mechanical power and torque rating from the performance data tables (refer 1.2.1.1.)

$$P_{mechanical} = 1.5 \text{ kW} > P_{in} \text{ and } T_s = 19 \text{ Nm} > T_{ins}$$

Therefore the actuator selected is suitable for application for initial constraints tested, further analysis may be required to ensure the actuator is suitable for all application conditions (refer 1.1.3.1. or consult Power Jacks Ltd).



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