WHITE PAPER

Size counts in Rod Screw Actuators

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Electrically powered rod-screw actuators provide low-cost linear motion systems for a diverse range of applications. For example, in medical equipment they can precisely inject contrast and saline solutions into a human heart during critical cardiac catherization procedures. In an industrial application, a series of three rod-screw actuators position and attach double-sided tape to Styrofoam sheet rolls.

Most rod-screw actuators carry a load, but some only force and guide it. When planning an electric motion system, the size of the rod-screw actuator and its thrust speed are typically specified along with the motor, driver and controller. The motor generates the torque and speed necessary for the actuator to meet the requirements, and the drive converts the local power source (typically 110 or 220 Vac, 60 Hz) to the type required by the motor. The power ratings for motors and drives must match the peak and rms requirements of the application. The controller converts input from an operator supervisory system such as a PLC, or a computer to control the motor and execute the motion profiles. Six relatively simple steps are all that's required for a motion designer to match an actuator to a load:

1. ***Begin with the rod-screw actuator requirements***
   - Stroke length
   - Load weight
   - Load speed
   - Thrust force
   - Resolution/repeatability
   - Actuator attenuation
   - Load orientation
   - Duty cycle
2. ***Evaluate the load orientation:***
   Rod-screw actuators are best suited to applications where horizontal, vertical or inclined mountings with large thrust capacities are needed. Loads are usually guided and supported for either pushing or pulling orientations. When loads need to be side or end loaded, and a rod screw is the actuation of choice, consider bending moments and their effect on the bearing load capacity of the actuator.
3. ***Select screw form and nut configuration:***
   Evaluate the application for accuracy, backlash, smoothness, and life, then select the appropriate screw from the following:
   - Standard rolled ACME screws are used with engineered solid plastic or bronze nuts. The nonhardened screws have a pitch accuracy rating of 0.001 in./ft. An ACME thread with bronze nuts can prevent the actuator from back driving in vertical applications.
   - Rolled ball screws are used with ball nuts. They have a pitch accuracy rating of 0.004 in./ft. The combination provides higher thrust capacity and longer life in continuous-duty applications.
   - Select the nut configuration of solid single, ball single or ball with low backlash.
4. ***Select the screw pitch, lead, and actuator body size.*** Evaluate the thrust, speed and stroke requirements relative to the screw capability curves. Screw speed charts will help determine a starting point. If the first screw size is not adequate, move to the next actuator body size and reevaluate. Repeat this process until the correct screw pitch and body size are identified.
   - Pitch and lead: Lower pitch (higher lead) provides higher linear speed, but requires more drive torque.
   - Body size: Larger bodies can accommodate larger diameter screws permitting higher rotational speeds, more thrust capability and longer screw lengths.
   - Confirm selection: Confirm your choice against the manufacturer's specifications. Use detailed calculations of thrust and torque requirements to confirm actuator selection and to help select motor and drive.
5. ***Determine environmental considerations.*** If the requirements include a washdown or installation in a clean room or an explosive environment, these factors may influence the actuator's performance.
6. ***Select the actuator's options and accessories.*** Mounting couplers, gearheads, motor mounting configurations and switches are accessories the system may or may not need.