ROLLON®
LinearEvolution

Rollon: How to accomplish predictable, reliable linear motion

Tips for correctly specifying and sizing your actuator

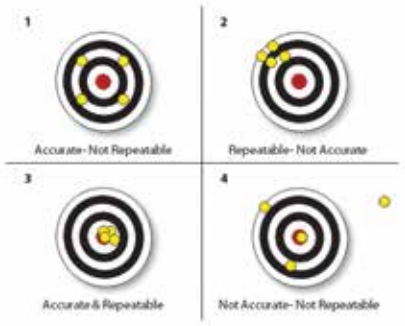
On the surface, it may seem like choosing the right actuator for a given application is an easy task. In reality, however, much more goes into selecting a reliable actuator than some engineers and system integrators may be aware of. Actuators that perform poorly are often the result of basic specification errors. To achieve reliable and repeatable linear motion, it helps to understand the four key elements that define a high quality actuator:

- A structural system that can accurately secure all actuator components in physical space and provide methods to hold the actuator in its workplace.
- A rotary-to-linear motion converter comprised of the complete drive train of individual components.
- A linear wear element to accurately guide the carriage in a straight line with minimal friction and maximum load capacity and life.
- A moving carriage that securely holds the workpiece, gripper, camera, optics or other payload.

When selecting the best actuator for the specific task, there are several important details to keep in mind. In this paper, we focus on how to accomplish predictable and reliable linear motion for industrial applications.

Accuracy and repeatability

Unless you take the time to define what you need to accomplish with your actuator, you will likely wind up over-specifying or overpaying especially if you misunderstand the difference between accuracy and repeatability. In most actuator applications, repeatability is more important than absolute accuracy. Repeatability can be either unidirectional or bidirectional, meaning it measures a system's ability to achieve a command position when approached from the same direction or either direction, respectively. The two main specifications involved with accuracy are travel and positioning. It is common to specify accuracy in units of microns or thousandths of an inch.As an example, imagine a robot with a gripper sitting on top of a linear actuator. The actuator is used to move the robot into a variety of positions so that the gripper can pick up cases and place them on pallets. This motion must be repeatable and fairly accurate to move the robot into position, although pinpoint accuracy is not required. As a rule of thumb, positioning repeatability to ±50 µm is more than acceptable in the majority of end-of-line packaging operations involving actuators. For applications that require more precise positioning, consider adding a linear encoder.



Capacity: Think about the loads, moments and forces the actuator will be required to withstand. An industrial duty actuator will provide high stiffness and handle maximum load capacity in five out of six degrees of freedom, allowing free and low friction movement in the sixth.

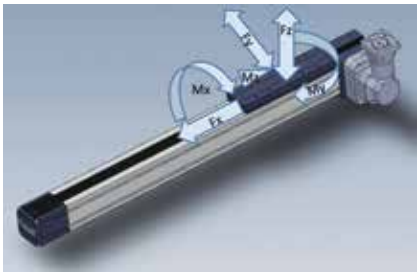
The types of capacity to consider for your actuator include:

- Static load capacity.
- Dynamic load capacity.
- Bending moment capacity.
- Thrust capacity.
- Units of force and moment are N & N-m in the ISO system vs. lbf and in-lbf in.

Travel length : The stroke of an actuator, measured in millimeters or inches, specifies the distance it will be required to move. However, total movement must include a safety stroke, also known as hard stop-to-hard stop distance. Carefully distinguishing the difference between stroke and overall length is important when selecting an actuator. Also be sure to define the volumetric envelope or total footprint that the system must fit within.

Usage : The usage factor, also known as duty cycle, is commonly expressed in cycles per minute. Useful life is the number of hours, years, cycles or linear distance the actuator will be expected to achieve. In other words, this specification describes how frequently the actuator will run and how long it needs to last.

Continue on page no.82



Continued from page no.80

Consider application details, such as the motion profile, cycle time and dwell time in addition to lifetime requirements. Make sure to ask your supplier about maintenance schedules as well: Some actuators only require relubrication after 20,000 km, while others need more requent care.

Ambient Environment : The working conditions surrounding your actuator are collectively called the ambient environment. To best monitor these conditions, it is important to keep the following factors in mind:

- Operating temperature range.
- Relative humidity range.
- Type and amount of contaminant particles.
- Presence of corrosive fluids or chemicals.
- Periodic cleaning or washdown requirements.

In demanding or extreme environments, special seals and bellows may be required to protect the actuator's moving parts from moisture, dust and other contaminants. Ask your supplier if these are available if needed.

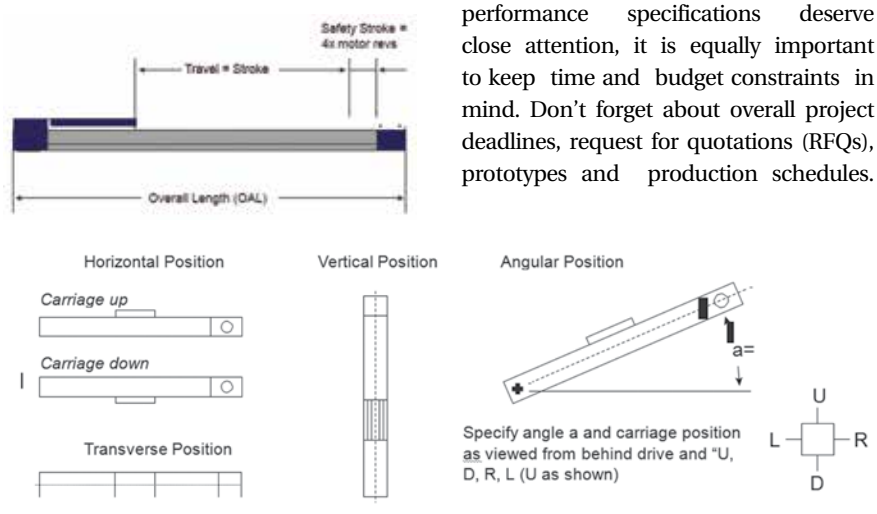


Figure 1

Timing : Project timelines are frequently ignored when specifying an actuator, especially in the beginning. Although performance specifications deserve close attention, it is equally important to keep time and budget constraints in mind. Don't forget about overall project deadlines, request for quotations (RFQs), prototypes and production schedules. Whether you are a system integrator, OEM or end user, ignoring these issues can result in much wasted time and effort. There is nothing worse than finding the perfect actuator and then realizing it does not fit within the project's time and budget constraints.

Orientation : One of the most important factors in choosing the right actuator is knowing how it will be mounted in the available geometric space. This vital piece of information also determines how loads and forces will be oriented. Will the carriage be face up or face down in a horizontal orientation? Vertical orientations and slanted placements are also possible depending on the system footprint and application details. Each orientation will influence the force calculations that determine the actuator's ability to carry a given load. Note that multi-axis systems will require special brackets and cross plates to rigidly connect actuators and reduce misalignment and vibration (See Figure 1).

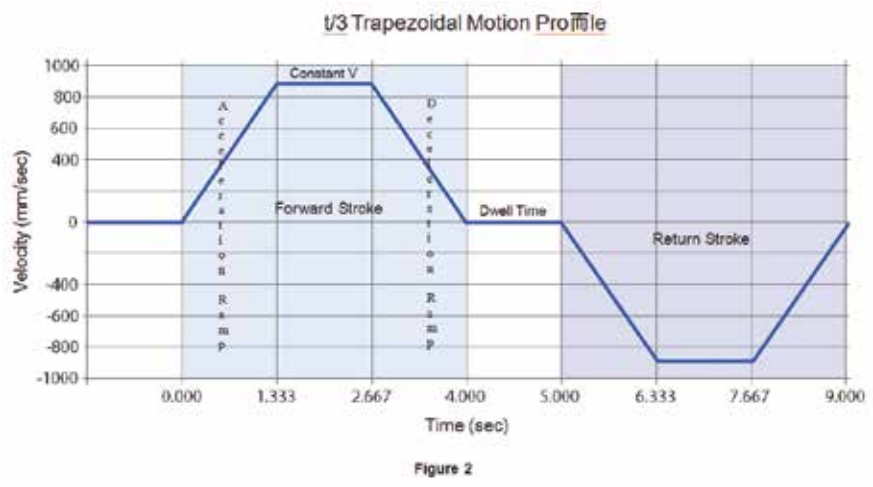


Figure 2

Rates : To choose the best actuator for the application, it is critical to know the desired motion profile, which includes travel speed as well as the required acceleration and deceleration rates. While some industrial duty actuators are designed to support high loads at travel speeds to 5 m/s, others are more limited in their speed and load capacities. The most important point is to correctly match the actuator to the task at hand (See Figure 2). Specifying an actuator is not rocket science, but it does require some planning and a basic understanding of the issues described here. Gathering expert advice from a trusted supplier can significantly streamline this process.

Rollon India Pvt. Ltd.
1st floor, Regus Gem Business Centre
26/1 Hosur road, Bommanahalli
Bangalore 560068, INDIA
Tel: +91 80 67027066 Fax: +91 80 67027004
info@rollonindia.in
Web: www.rollonindia.in