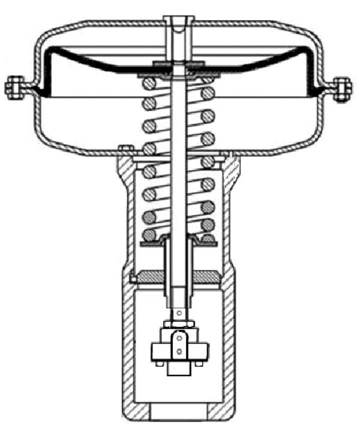
TECH TIP

# Pneumatic Actuator Comparison

The most common type of control valve actuator on the market today is the pneumatic diaphragm type. Using compressed air as the force medium along with springs, the valve movement is based on air pressure. Recent developments in this technology center on digital positioners with advanced diagnostics to help detect and predict air problems, but the compressibility of air is a major problem source. For this reason the performance of the actuator will always be limited due to frictional and dynamic load, process conditions, and the environment.



The ultimate limit to loop performance depends on the amount of dead time, causing limit cycles, overshoot and slow response. Once a limit cycle occurs, effective control is lost and unwanted process variability is created. This results in poor resolution, and overshoot. If friction is present with a pneumatic actuator, the valve will move too much to overcome it and the process variable will go too far. Then, the controller output will reverse direction and the same thing will happen again. This presents a problem especially for small signal changes. The valve actuator also needs to be stiff enough to resist movement when the flowing load changes. Pneumatics can have problems maintaining stiffness, especially with load changes like negative gradients. With many control valves, the input signal to the valve has to change by more than 5% before we see any change in process variable.

Valves on fast processes should be able to respond to a load or set-point change within a second or two, but many will take 30 seconds or more to get to their new position due to the compressibility of air. Pneumatic tubing length can also be a factor. 500 feet of ¼” tubing has a lag of about 4 seconds. This is very long, considering that a 4-20 mA signal will have no delay along the same length.

Exlar actuators were designed with closed loop valve control in mind. Exlar actuators continuously hold the position of the valve stem or shaft allowing extremely fast response to the smallest command signal changes without overshoot even when friction is present. This results in improved loop performance and reduced process variability.