EMERSON EXCHANGE 2025

ACCELERATING INNOVATION

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Unlock the secrets to specifying the perfect control valve actuators!

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Agenda

- The Basics
- Why “Safety Margin” might be a bad idea?
- The Better Actuator Specification

The Basics

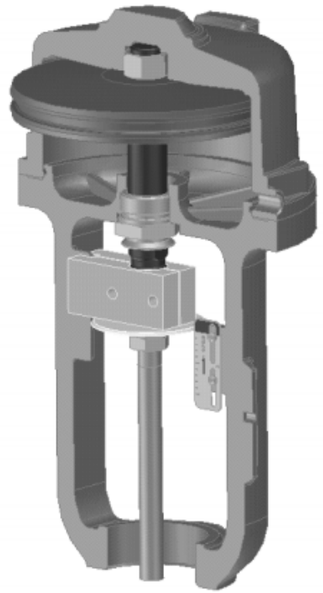
Role of an “Control Valve” actuator

- Position the throttling element accurately
- Offer throttling resolution for fine control
- Provide shutoff by pushing hard on the seat
- Take control valve to a fail-safe position

- On-Off valves don’t have any throttling requirements

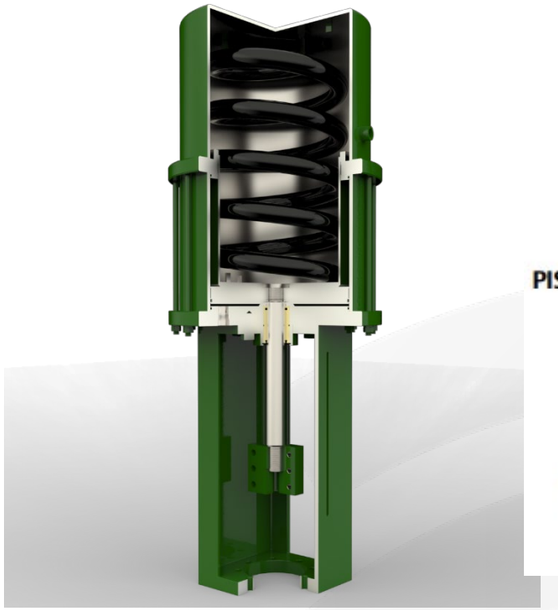
Types of actuators

Springless Piston



Spring & Diaphragm

Piston Spring-Return (Single Acting)



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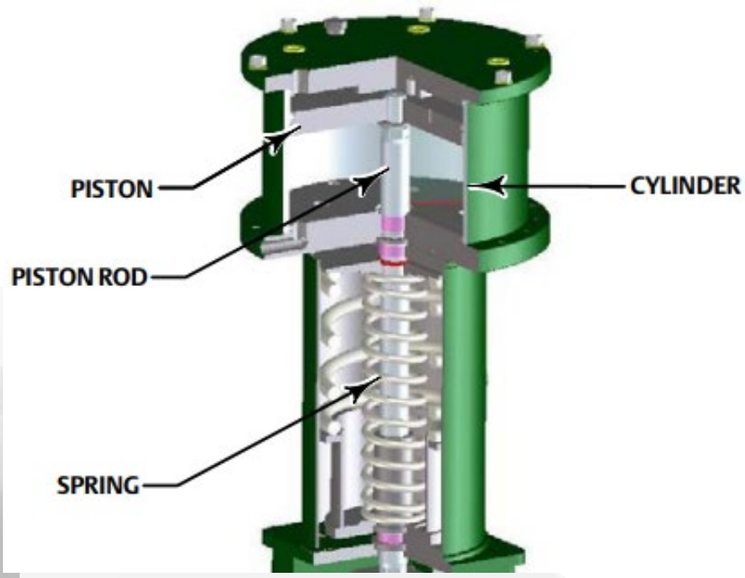
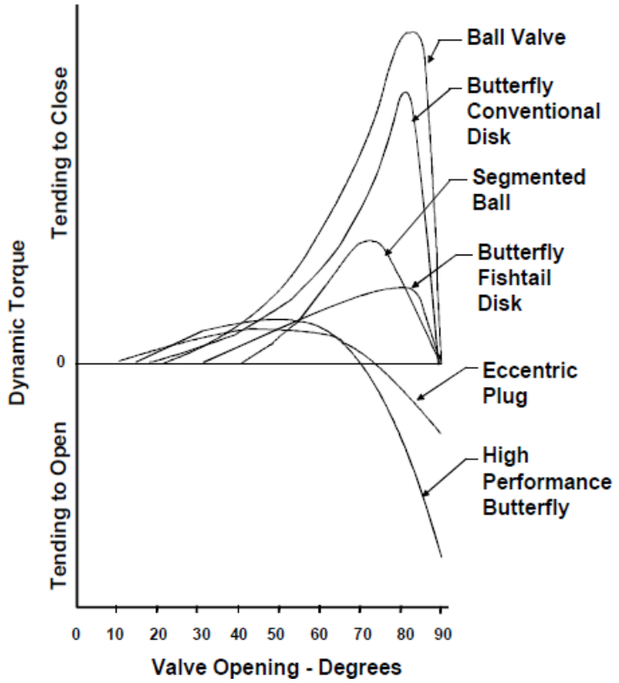
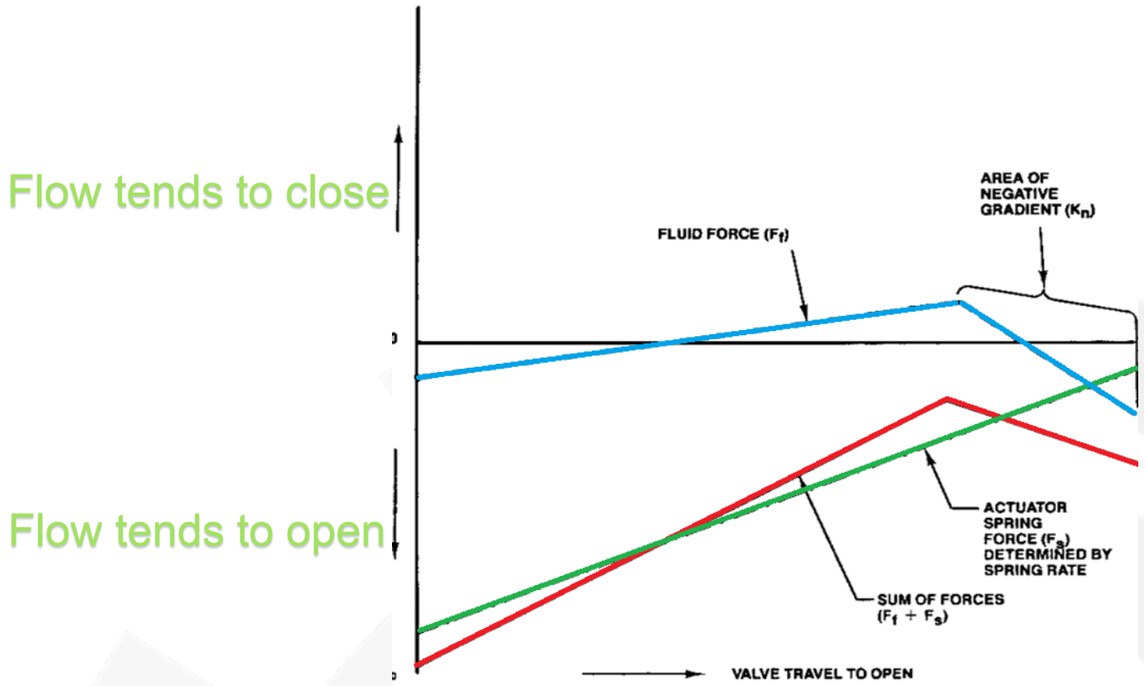


Rotary vs. Sliding Stem

- Position Seated mostly
- High Dynamic forces

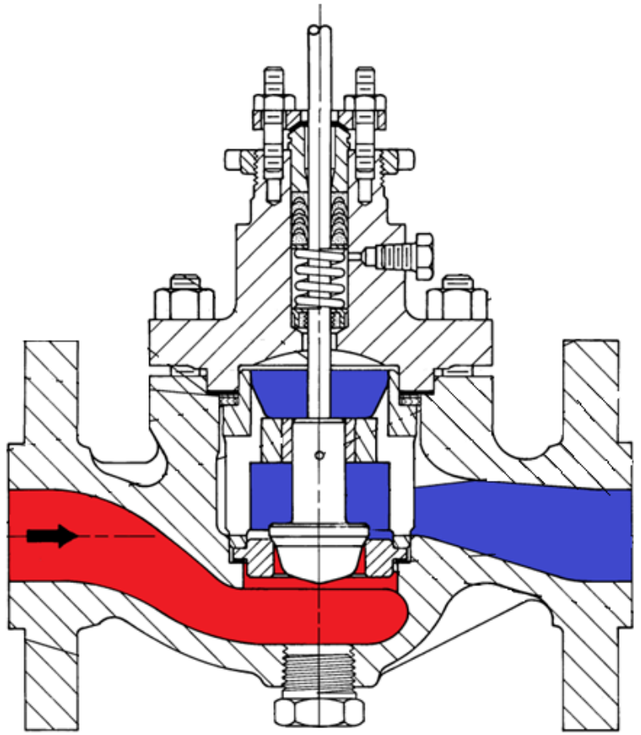


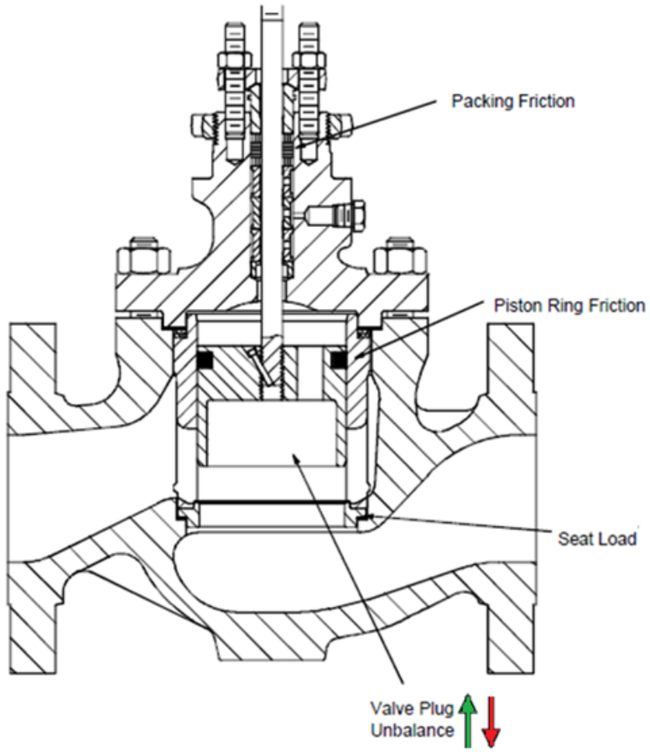
- Thrust Seated
- Minimal Dynamic forces
  - Except for localized areas of high gradients



What goes into Required Thrust Calculations?

- Unbalance Forces
- Friction
  - Packing
  - Sealring
- Seat Load to achieve shutoff
  - Higher for tighter leakage classes
  - ANSI/FCI Class II to VI

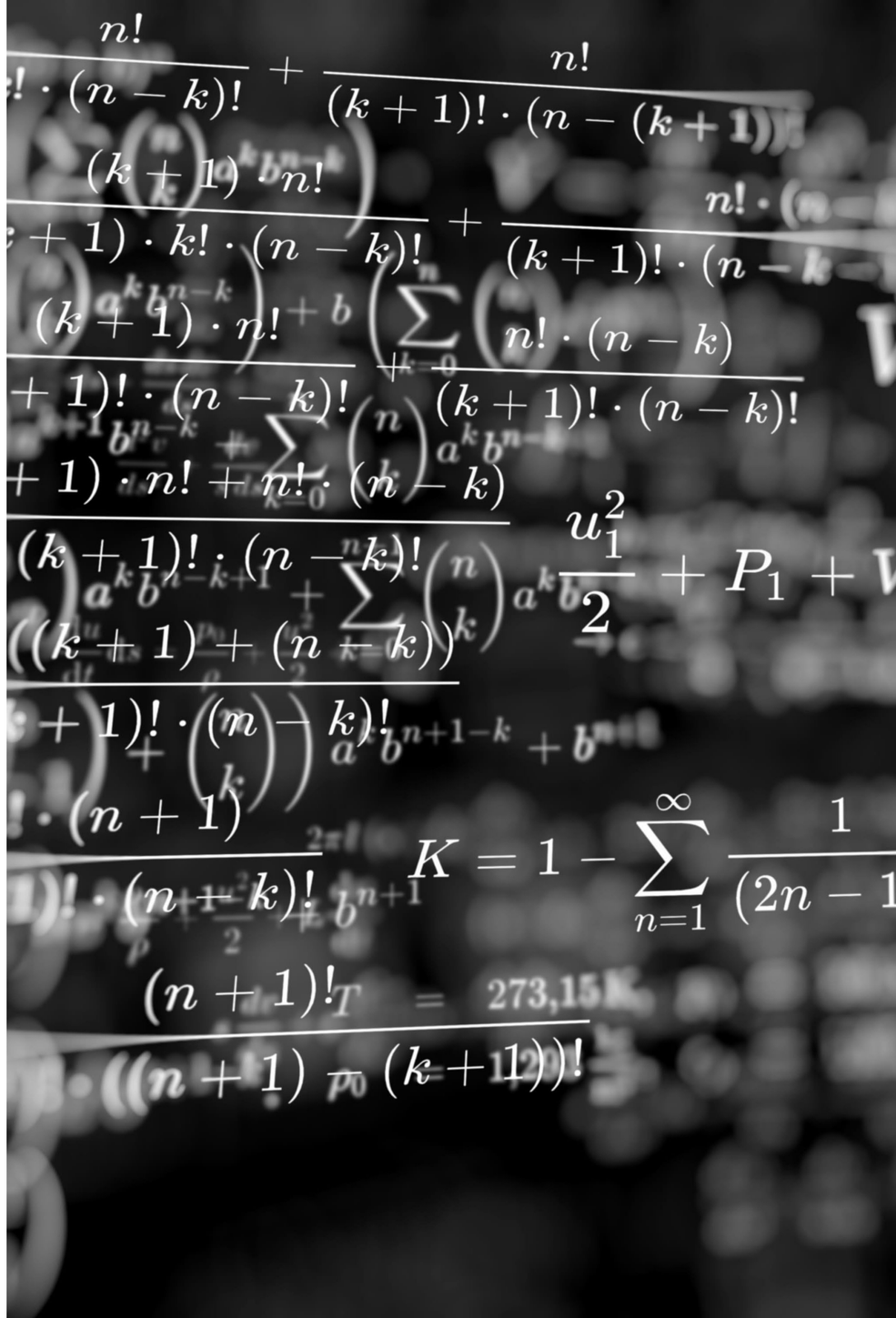




- Valve Thrust Up (to open) = Friction (+/- Unbalance forces)
- Valve Thrust Down (to close) = Friction + Seat Load (+/- Unbalance forces)

What does a Safety Margin get you?

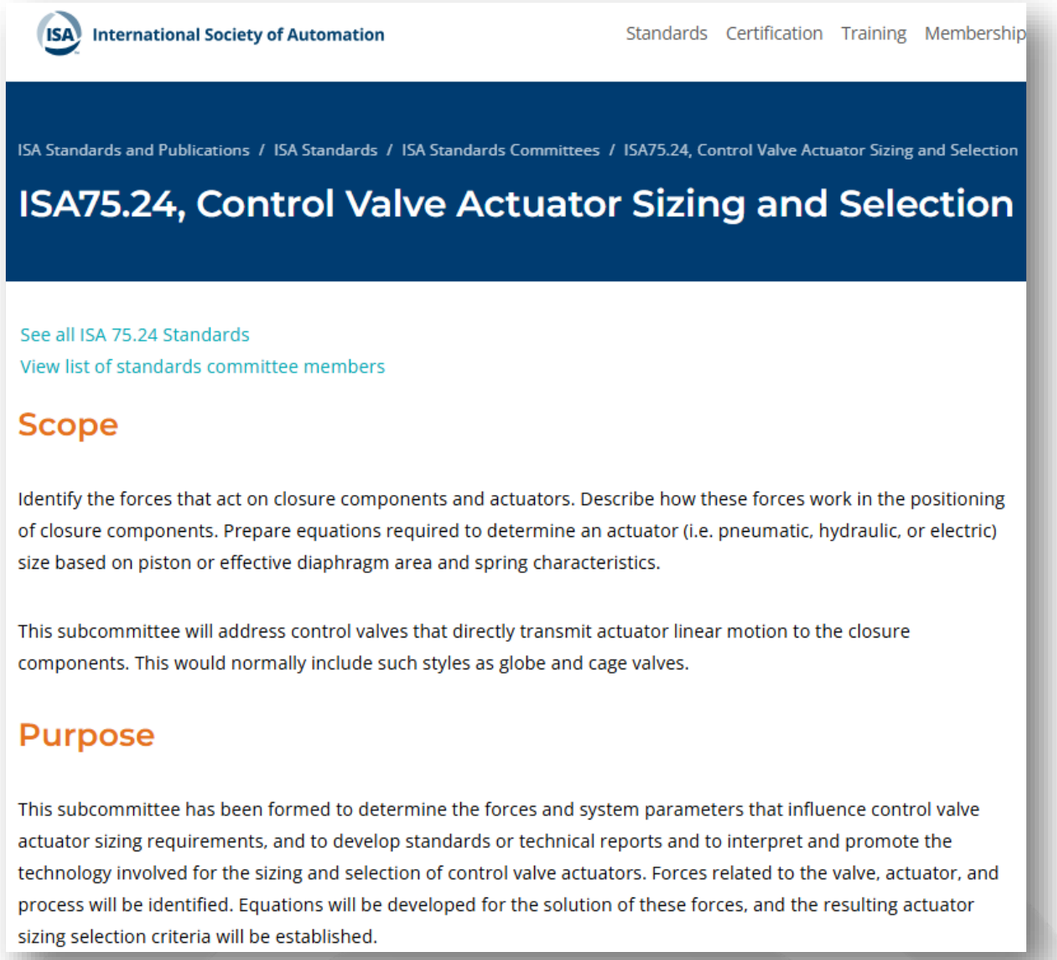
- Available actuator thrust > Required Valve Thrust
- Generally, **more closing thrust!**
  - An actuator capable of pushing harder on the seat
  - This is more commonly needed in the On/Off valve market



Why “safety margin” might be a bad idea?

Taking a closer look into the thrust calcs

- Thrust Calculations are Internal
  - Based on valve design, testing
  - There is no international standard
  - Hard for external verification of accuracy
    - Primary reason customers enforce a safety margin
- Most actuators are sized against full design pressure



Risks of Oversizing

- Larger actuator than needed
- Valve Stem buckling
  - Larger stem might be needed
  - Stronger material might be needed
- Valve Seat overload
  - Strong material
  - Change in seat angle/design

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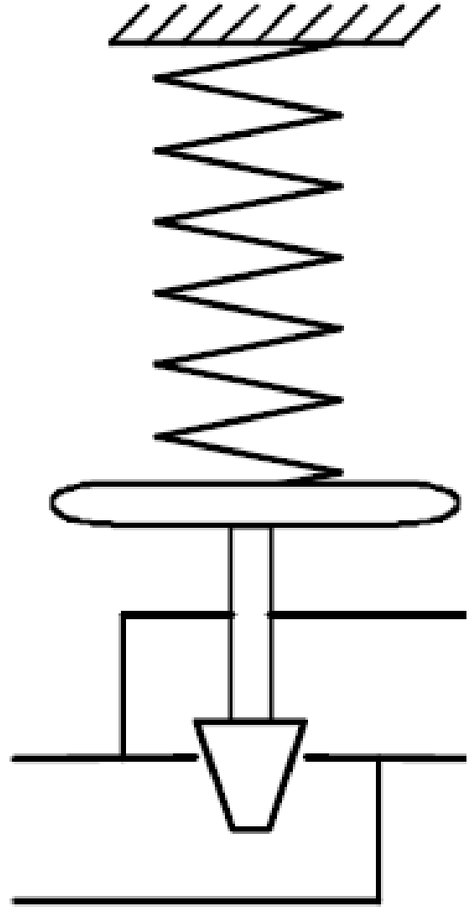

- Issues become amplified in High Pressure applications
  - E.g. A 7-stage anti-cavitation operating in 8000 psig application

More Thrust does not mean better control

- In the example shown below, a vendor chose to meet the safety margin requirement using a weaker spring
- This has allowed them to use a smaller actuator
- The shortened benchset might translate to poor throttling resolution and control

Piston Area	Spring Rate	Spring Preload	Actuator Closing Thrust	Actuator Opening Thrust	Benchset	Psi/inch of travel
700 in2 (30in)	2450 lbf/in	12600 lbs	13800 lbf	4700 lbf	20 to 48 psig	3.5
520 in2 (26in)	600 lbf/in	18700 lbs	19000 lbf	4300 lbf	37 to 46 psig	1.15

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The Better Actuator Specification

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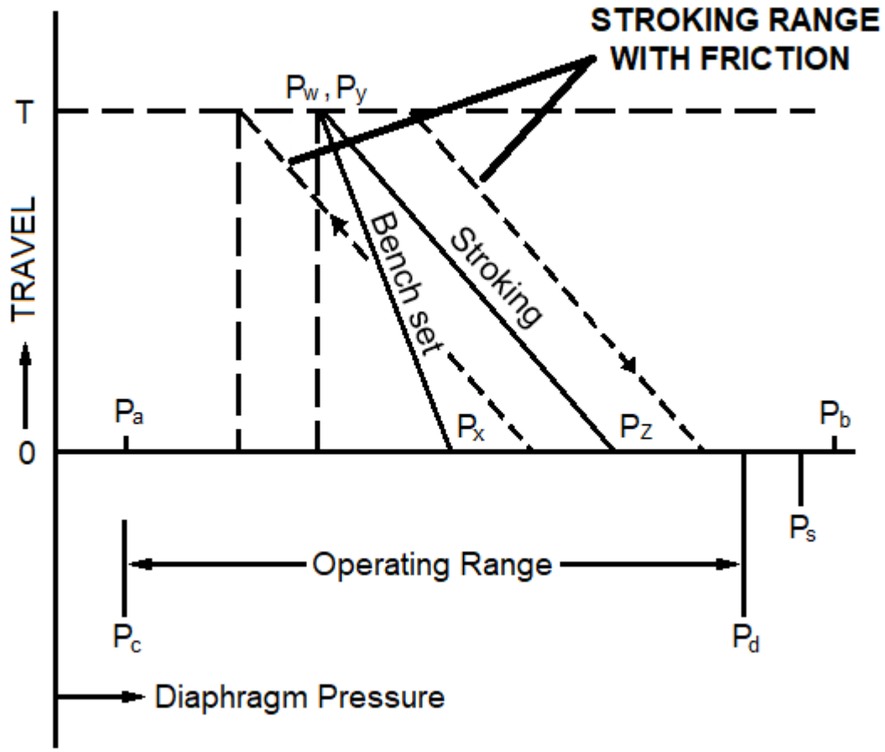
- Avoid blanket oversizing requirements
- Specify realistic Shutoff Pressure drops
- Identify applications that might need oversizing
  - Applications with sticky fluid, scaling, fouling or uncertainty in process conditions
- Does this valve need tight shutoff?
- Class V water seat leak test
  - Tested in the factory at **service pressure drops**. Very accurate representation of real-world performance
- Specify a wide Stroking Range requirement
  - 25% of supply pressure or 10 psig minimum
- Application specific dynamic performance specifications



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Thank You