Pneumatic Valve Actuators

MSI Technical Bulletin 040
Subject: Information regarding pneumatic actuators used on MSI plug valves.

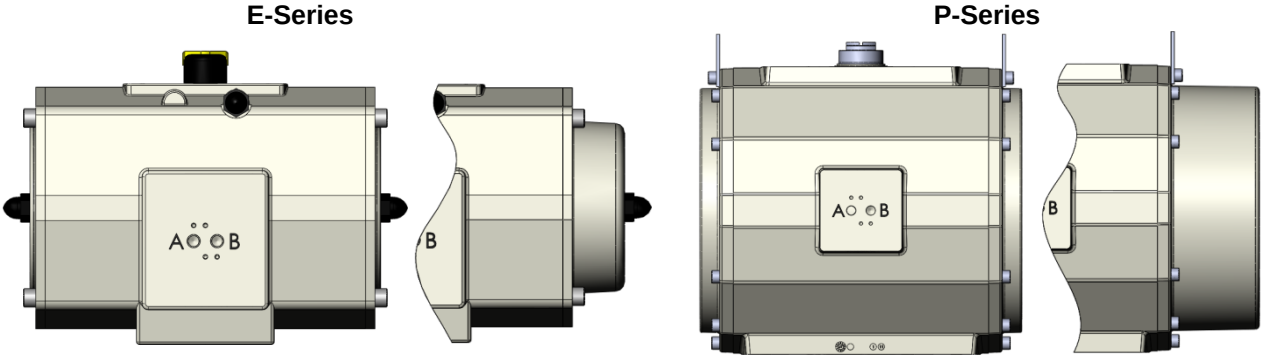
MSI offers Emerson Process, El-O-Matic E and P series pneumatic actuators for plug valves. The El-O-Matic rack-and-pinion rotary actuators are available in two versions: double acting and single acting. The 'double acting' version needs air to actuate the valve and air to return to the original position. The 'single acting' version needs air to actuate the valve, and has a FAIL SAFE spring that returns the actuator to the original position upon loss of pressure. The FAIL SAFE can be set up in the valve open or valve close position as required.

Table 1

MSI part #		AA0025	AA0018	AA0019	AA0021	AA0023	AA0026	AA0027
Model #		ES-200	ES-350	ES-950	ED-200	ED-950	PS-2500	PS-4000
Valve Size Availability		1" 5M max	1" 15M max	2" 15M max	1" 15M max	2" 15M max	2" 15M max 3" 10M max	3" 15M max
Action		SINGLE	SINGLE	SINGLE	DOUBLE	DOUBLE	SINGLE	SINGLE
Number of Springs		6	6	6	0	0	14	14
Operating Time (sec)		2.3	3.6	5.4	2.3	5.4	7	12
Air Consumption at 1 atm (cu./in.)	port A	49	110	287	49	287	488	824
	port B	61	116	299	61	299	568	1068
Supply Pressure		120 psi MAX***						
Torque (ft-lbs) @120 psi		167	282	739	256	1128	2028	3445
Return Torque (ft-lbs)		145	256	641			1364	2301
Operating Media		Dry Air, Lubricated Air, or Inert Gases						
Standard Temperature		-20 to 80°C (-4 to 176°F)						
Low Temperature		-40 to 80°C (-40 to 176°F) Available Upon Request						
High Temperature		-20 to 120°C (-4 to 248°F) Available Upon Request						
Lubrication		Factory lubricated for the normal life of the actuator						

***Actuators are sized accordingly so that they can actuate the valve at less than 120 psi required. Ports are ¼" NPT.

E-Series **P-Series**



ED = Double Acting **ES = Spring Return** **PD = Double Acting** **PS = Spring Return**

Double Acting Operation

a) On a 'double acting' actuator, air applied to Port A produces **counter-clockwise** rotation on the valve plug, which **opens** the valve in a standard setup. As the internal pistons move, Port B acts as a vent. (see Figure 1 below)

b) Air applied to Port B produces **clockwise** rotation on the valve plug, which **closes** the valve. As the internal pistons move, Port A acts as a vent. (see Figure 2 below)

Figure 1

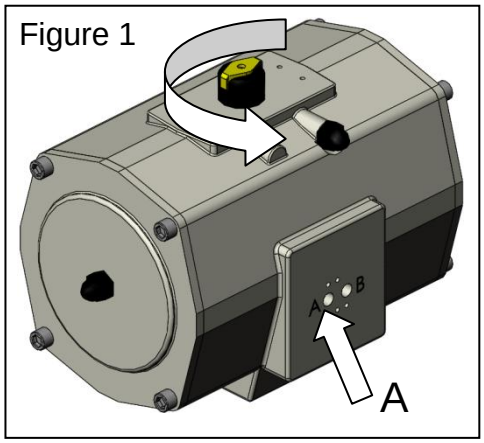
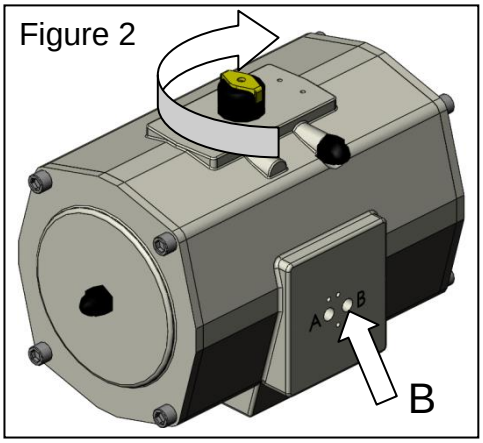


Figure 2



Single Acting Operation

a) On a 'single acting' actuator, air applied to Port A produces **counter-clockwise** rotation on the valve plug, which **opens** the valve in a standard setup. Port B acts as a vent as the internal pistons move. (see Figure 3 below)

b) Upon loss of pressure, the stored energy from the compressed springs rotates the valve plug **clockwise** to the **close** position (FAIL SAFE CLOSE). Air is exhausted through Port A, while Port B acts as a breather as the internal pistons move. (see Figure 4 below)

Figure 3

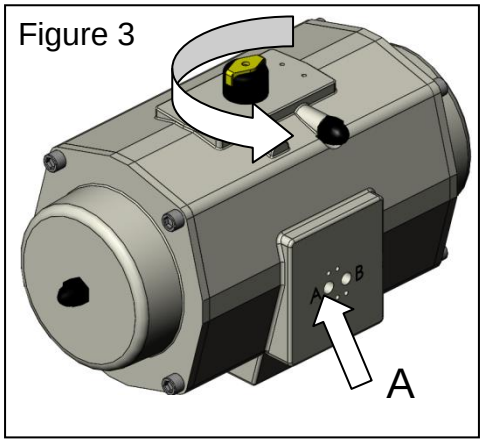
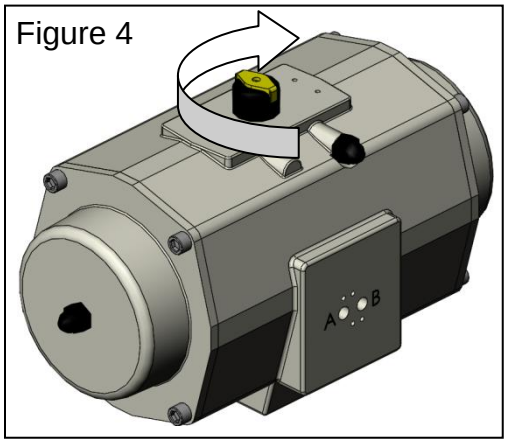
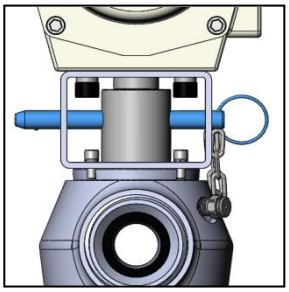


Figure 4

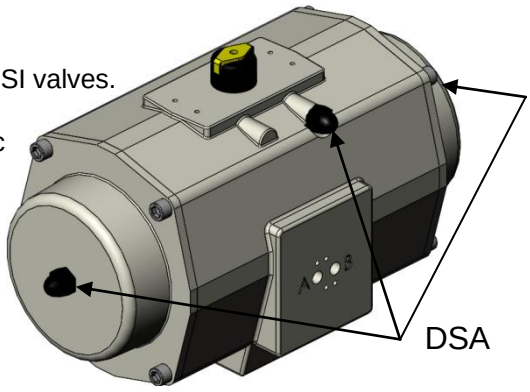


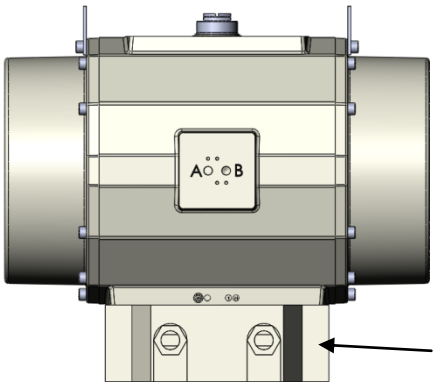
Note 1: On FAIL SAFE CLOSE assemblies, the valve will be shipped locked in the OPEN position using a locking pin across the mounting bracket and actuator adapter (see right image). Prior to operating the valve, the pin needs to be removed. To remove the pin, pressurize Port A to overcome the spring force trying to CLOSE the valve. Once the pin is not in a bind, the pin can be removed.



Note 2: Although less common, the fail safe mechanism can also be set up so that air applied to Port A **closes** the valve, and the compressed springs **open** the valve upon loss of pressure (FAIL SAFE OPEN). Available upon request.

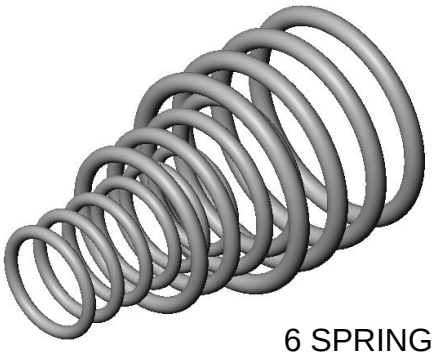
Double Stroke Adjustment (E Series only) – Standard on MSI valves. The valve open and close positions can be finely adjusted by means of stop screws. The particular stop which limits a specific position depends on the setup required. On a typical assembly, the **closed** position is adjusted by turning the stop-screw (1) located in the actuator body. The **open** position is adjusted by turning the stop-screws (2) in the actuator end caps.





Limit Stop Plate (P Series only) – Available upon request. The valve open and close positions can be finely adjusted by means of stop screws (2) located on the mounting plate underneath the actuator. One stop will limit the open position, and the other will limit the closed position. The particular stop (left or right) which limits a specific position depends on the setup required.

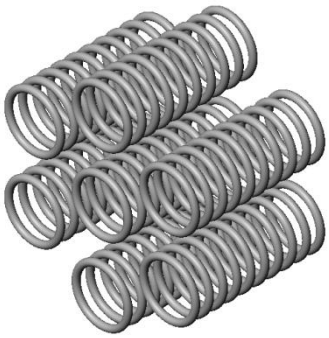
Springs return – The spring configuration in the actuator determines how much spring return torque will be available. As a default, MSI uses the maximum number of springs available for each actuator series (see below) to provide the maximum amount of return stroke torque possible in each actuator. The torque values listed in Table 1 assume these spring settings. At the end user's discretion, the spring setting can be adjusted to have less springs, therefore less pressure required to actuate the valve, but also less return stroke torque available (which might be the desired outcome based on a specific setup).



6 SPRINGS

INNER, MID, & OUTER SPRING

The E Series uses a maximum of 6 springs
(3 springs on each actuator end cap)



14 SPRINGS

The P Series uses a maximum of 14 springs
(7 springs on each actuator end cap)

You may contact an MSI representative at sales@diwmsi.com or engineering@diwmsi.com if you have any further questions or concerns.

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