FLOWSERVE™

Spring Cylinder

Valtek Rotary Actuators

Valtek Rotary Actuators
Spring Cylinder Actuators

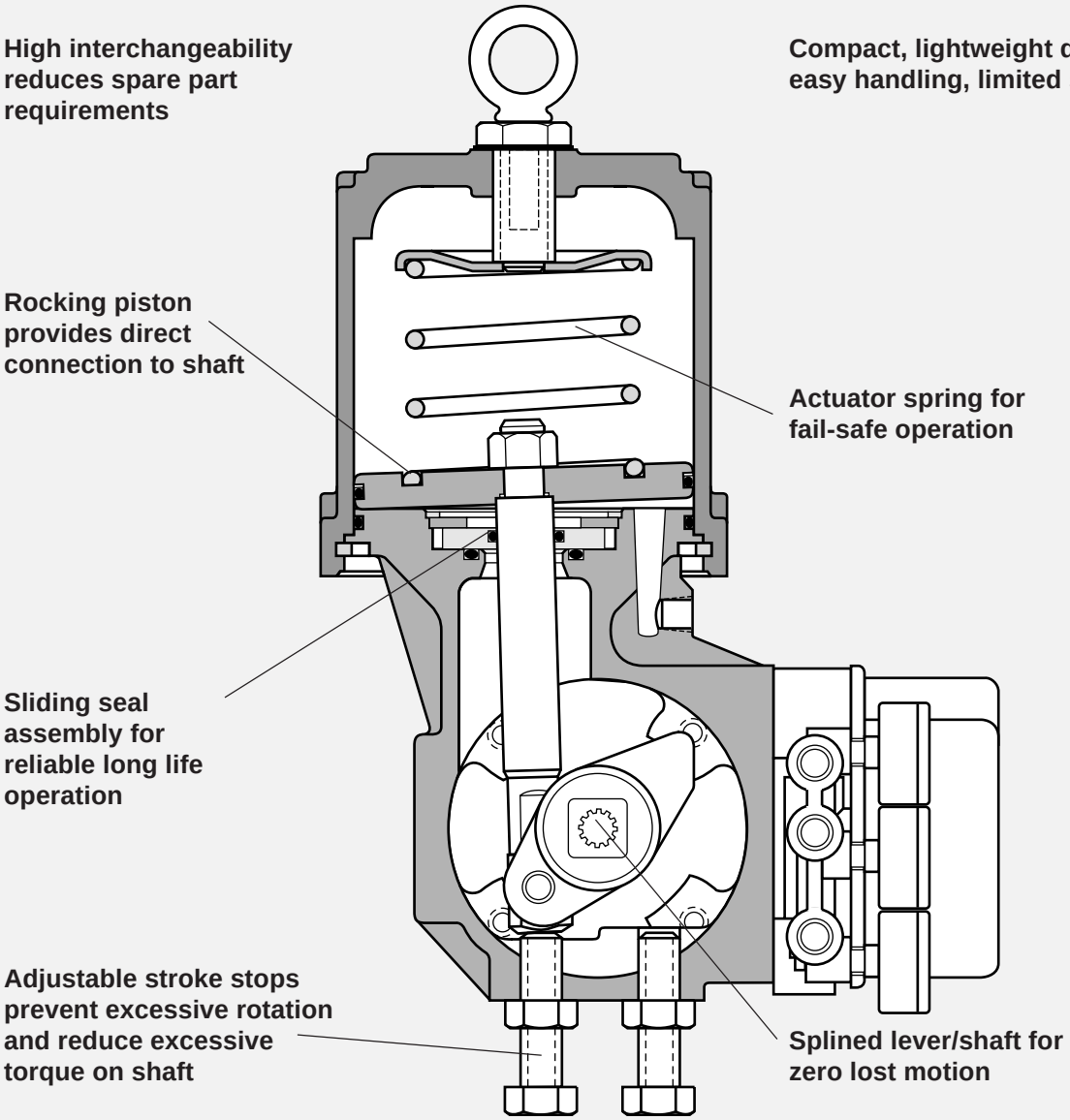


Figure 1: Spring Cylinder Rotary Actuator Features

The Valtek spring cylinder rotary actuator combines high torque and pneumatic stiffness with excellent throttling capabilities. These characteristics are designed into a lightweight, rugged and compact assembly, making the Valtek rotary actuator the foremost choice for quarter turn applications. The Valtek rotary actuator is designed to operate the Valdisk high performance butterfly valve, the ShearStream V-notch ball valve, or other applications requiring precise rotary motion. Valtek pneumatic and electro-pneumatic positioners are available for throttling applications.

The actuator, cylinder and Valtek positioner are designed for supply pressures up to 150 psi*, making very high torques attainable. The actuator uses a rocking piston for direct conversion of linear motion to rotary motion. The rocking piston assembly combined with a splined shaft and lever eliminates lost motion.

*(*See Tables I and II for limitations on certain sizes.)*

Valtek Rotary Actuators
Features and Advantages

Important features and advantages of the Valtek rotary spring cylinder actuator include:

Features	Advantages
Accepts up to 150 psi air supply	• Achieves higher torques • Obtains stiff piston positioning • Permits higher ΔP limits on valve
Rocking piston	• Provides direct connection to shaft • Assures zero lost motion between actuator and valve • Utilizes fewer parts
Splined shaft and lever	• Allows zero lost motion
Compact, lightweight, rugged	• Permits easy maintenance • Installs in limited space applications • Easily meets seismic requirements
Low friction bearings	• Provide millions of cycles with minimal wear • Combined with direct linkage, provides very low hysteresis
Field reversible	• Requires no extra parts • Permits fast, easy field reversing • Requires no change of spring action
Fail-safe spring	• Moves actuator to failure position without pressure assistance
Air-purged, fully enclosed transfer case	• Prevents corrosion of linkage • Ensures safe operation • Contains external position indicator • Allows four mounting positions without retubing, changing or adding parts
Stroke stops	• Allow both ends of stroke to be adjusted

The Valtek rotary spring cylinder actuator also capitalizes on established features of other Valtek actuators:

Interchangeability	• Minimizes requirements for stocking spare parts • Reduces inventory costs • Uses identical parts in differing rotary actuator sizes • Utilizes many Valtek linear actuator parts
Spool-type four-way Positioner	• Provides high-performance modulating positioner control • Ensures ease of calibration and maintenance due to fewer parts

Valtek's rotary spring cylinder actuator features high torques, positioning stiffness and easy maintenance to produce a high-performance rotary actuator that excels in maintenance-free throttling and on/off control applications.

Valtek Rotary Actuators
Stiffness

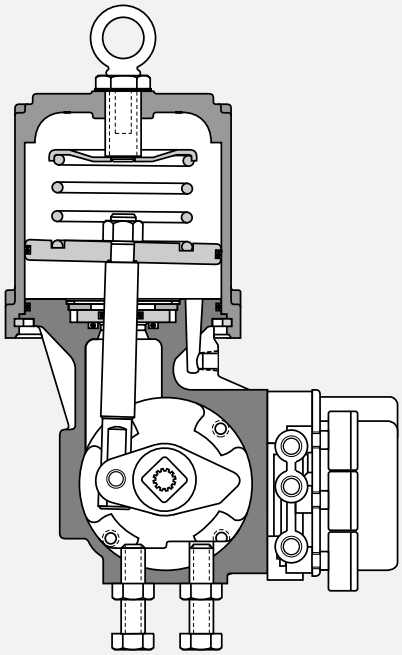


Figure 2: Actuator at Mid-stroke

Control valves generally are used by the process control industry to regulate constantly fluctuating flows. As the dynamic forces of a flow increase or decrease, the control valve must remain in the same position as dictated by the controller. To do this, the valve is dependent upon the actuator stiffness to minimize these position fluctuations.

Actuator stiffness is defined as the ability of the actuator to withstand suddenly changing dynamic fluid forces acting on the valve trim.

Since supply air pressure is delivered to both sides of the piston in the cylinder, the stiffness of the Valtek spring cylinder rotary actuator is significantly greater than that of a diaphragm actuator.

The stiffness (spring rate) is equal to the expression:

$$K = \frac{kPA^2}{v}$$

Where: K = spring rate
k = ratio of specific heat
P = supply pressure
A^2 = piston area (in^2)
v = cylinder volume under piston

For a 25 square-inch cylinder actuator (typical for a 2-inch valve) with a supply air pressure of 100 psi, the spring rate would be nearly 10,000 pounds per inch near the seat. As the volume under the piston becomes smaller, the stiffness factor becomes larger in a Valtek spring cylinder rotary actuator. The result of the higher actuator stiffness in cylinder actuators is that rotary valves can be operated in the flow-to-close orientation without position fluctuations caused by dynamic forces (flow fluctuations).

The spring rate for a diaphragm actuator remains the same, regardless of diaphragm position. The equivalent diaphragm actuator (46 square-inch) on the same valve with a 3-15 psi signal has a spring rate of less than 1000 pounds per inch. When a rotary valve with a diaphragm actuator is operated near its closed position, sudden changes in dynamic force can cause valve to slam shut.

In contrast, the stiffness of Valtek spring cylinder rotary actuators actually increases as the closing member approaches the seating surface. Thus Valtek rotary actuators and rotary valves may be operated with the valve shaft upstream or downstream.

See Valtek's Sizing & Secltion Manual, Section 16, *Rotary Actuator Sizing,* for more information.

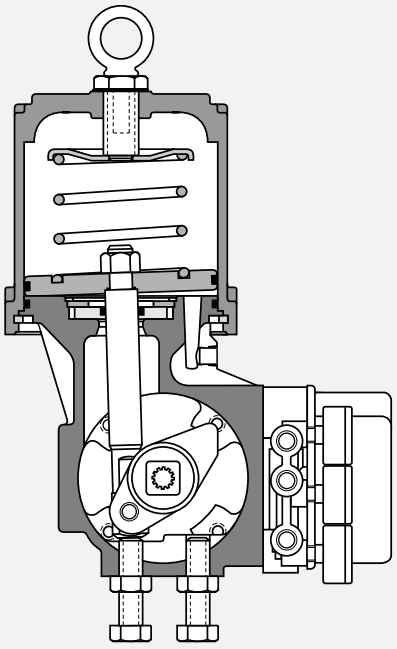


Figure 3: Actuator with High Stiffness / Spring Rate

Valtek Rotary Actuators
Performance

Torque Producing Capability

Valtek spring cylinder rotary actuators produce substantially higher torque than comparable diaphragm actuators because the cylinder operates with supply pressures up to 150 psi. Throttling diaphragm actuators are limited to 40-60 psi, thus decreasing their torque-producing capability. Higher actuator air supply, coupled with high-pressure air on both sides of the actuator piston, provide exceptional stiffness for precise throttling control. Valtek rotary actuator stiffness is sufficient to control high pressure drops and to permit the valve to throttle near the seat.

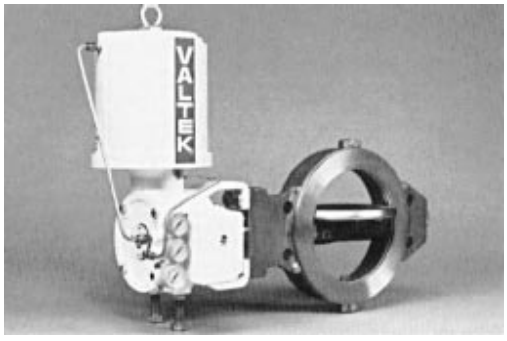
Cam Characterizable Operation

Valtek's standard Beta positioner, is provided with a reversible cam that characterizes Valdisk's C_V to either modified equal percent or linear performance. The same cam enhances the ShearStream control valve's inherent equal percent characteristic.

A second rotary cam is also available. This optional cam gives ShearStream valves a linear relationship of rotation with respect to the controller signal. It is reversible for use in air-to-close or air-to-open, fail-open applications and is also linear in this mode.

Speed and Sensitivity

High air-handling capacity of the positioner, combined with relatively low cylinder volumes, produces fast stroking speeds. High operating speed is achieved with virtually no overshoot when approaching the final disc or ball position. At the same time, static sensitivity of the unit is excellent. For example, as little as 0.017 psi is required to rotate the shaft 0.01 degrees (the minimum detectable movement in the tests conducted) on a size 25 actuator. A signal change of only 0.02 psi is required to reverse the shaft motion.



Frequency Response

The frequency response of Valtek cylinder actuators is extremely high – generally an order of magnitude better than comparable diaphragm actuator units. Such response is achieved through a double-acting configuration that uses pressure on both sides of the piston.

Size 25 Actuator, 9 psi ±2 psi

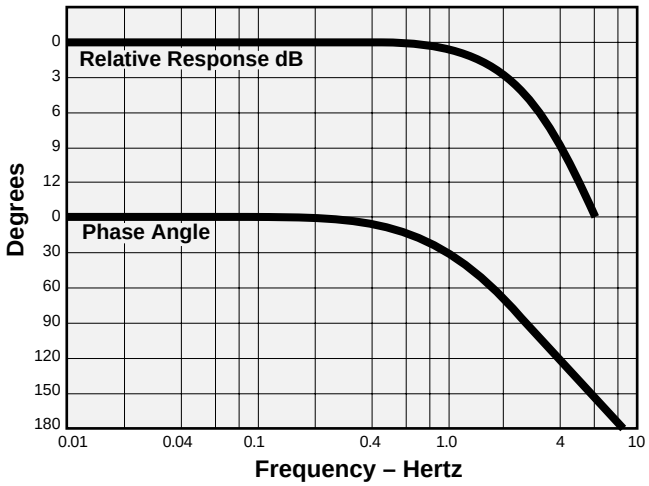


Figure 4: Frequency Response

Hysteresis and Repeatability

An important characteristic of any actuator is its ability to respond to signal changes from the controller and to give uniform response unaffected by decreasing or increasing pressures. Tests have shown that both the hysteresis and repeatability of the spring cylinder rotary actuator, with Beta positioner are less than 0.7 percent of full scale. (See Table VII: Beta Positioner Performance on page 10.)

Size 25 Actuator, Signal 4.2 to 13.8 psig

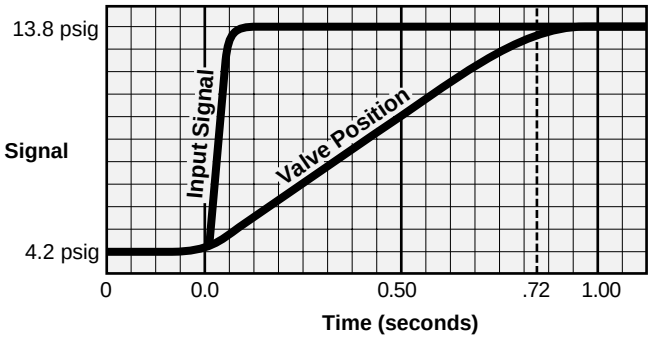


Figure 5: Step Test

Valtek Rotary Actuators

Torque Output

Table I: Net Torque Output of Actuators at Various Supply Pressures, (in.-lb.)

Actuator Size	Supply Pressure	Degrees from Fail Position on Air Supply Loss									
		0	10	20	30	40	50	60	70	80	90
STD 25 with STD Spring	150	3013	3399	3700	3907	4000	3970	3811	3514	3084	2532
	140	3808	3165	3444	3631	3714	3685	3531	3253	2854	2339
	120	2397	2695	2928	3080	3145	3110	2972	2731	2390	1962
	100	1986	2228	2412	2530	2573	2535	2414	2211	1928	1577
	80	1574	1759	1896	1979	2002	1961	1856	1688	1463	1191
	60	1163	1290	1381	1428	1430	1386	1298	1167	1001	806
	Spring Torque	72	115	167	225	284	338	379	399	391	349
STD 25 with HD Spring	150	2647	2973	3223	3386	3448	3403	3246	2976	2600	2124
	140	2441	2738	2964	3110	3162	3115	2966	2716	2368	1931
	120	2030	2270	2450	2558	2590	2542	2409	2195	1905	1552
	100	1618	1802	1934	2009	2020	1967	1850	1673	1441	1167
	80	1206	1333	1418	1457	1448	1392	1292	1151	978	781
	60	795	865	902	907	877	818	733	630	515	396
	Spring Torque	440	542	647	749	839	908	945	937	878	758
STD 50 with STD Spring	150	10701	11981	13015	13751	14134	14089	13575	12568	11043	9035
	140	9970	11157	12114	12798	13136	13083	12596	11653	10232	8365
	120	8516	9513	10318	10874	11141	11075	10649	9826	8615	7053
	100	7059	7873	8515	8953	9153	9073	8693	7999	6995	5712
	80	5602	6227	6716	7033	7156	7062	6736	6174	5372	4373
	60	4147	4586	4913	5114	5166	5058	4784	4347	3755	3034
	Spring Torque	222	343	489	651	816	966	1081	1134	1107	983
STD 50 with HD Spring	150	9774	10898	11781	12380	12651	12533	12000	11036	9648	7850
	140	9044	10074	10880	11425	11652	11527	11021	10122	8837	7183
	120	7591	8430	9083	9502	9657	9519	9073	8300	7216	5865
	100	6133	6790	7281	7585	7668	7516	7117	6473	5597	4527
	80	4678	5148	5481	5660	5671	5508	5163	4646	3974	3186
	60	3223	3505	3681	3741	3680	3501	3209	2821	2356	1846
	Spring Torque	1148	1428	1726	2026	2304	2529	2662	2667	2511	2167
STD 100 with STD Spring	150	26194	29415	32022	33847	34730	34559	33234	30711	26943	22035
	140	24385	27397	29784	31459	32253	32069	30831	28446	26936	20378
	120	20805	23329	25330	26685	27303	27104	25983	23921	20932	17119
	100	17226	19271	20859	21914	22368	22119	21134	19394	16920	13808
	80	13640	15200	16399	17153	17413	17133	16296	14878	12915	10485
	60	10055	11139	11929	12391	12472	12159	11447	10350	8901	7167
	Spring Torque	704	1049	1461	1913	2370	2783	3088	3225	3135	2775
STD 100 with Dual Springs	150	24678	27231	29008	29925	29917	28969	27058	24266	20699	16483
	140	22881	25195	26771	27539	27459	26475	24632	22001	18691	14832
	120	19304	21127	22317	22784	22507	21490	19782	17472	14680	11563
	100	15713	17070	17847	18012	17567	16518	14946	12956	10674	8245
	80	12130	12999	13385	13248	12612	11538	10101	8432	6662	4927
	60	8545	8939	8921	8483	7673	6558	5257	3910	2662	1611
	Spring Torque	2217	3256	4485	5831	7185	8405	9299	9691	9407	8316
STD 200 with STD Spring	80*	27695	31132	33903	35838	36820	36663	35280	32620	28633	23416
	70	24156	27119	29480	31134	31916	31730	30501	28139	25670	20206
	60	20595	23091	25069	26406	27014	26813	25699	24656	20697	16926
	50	17051	19072	20643	21696	22126	21876	20897	19173	16724	13646
	Spring Torque	704	1049	1461	1913	2370	2783	3088	3225	3135	2775
STD 200 with Dual Springs	80*	26192	28930	30894	31940	32005	31052	29104	26177	22393	17887
	70	22636	24918	26467	27214	27122	26136	24302	21693	18420	14650
	60	19094	20889	22056	22505	22217	21198	19499	17208	14445	11370
	50	15538	16872	17629	17779	17326	16275	14709	12735	10478	8083
	Spring Torque	2217	3256	4485	5831	7185	8405	9299	9691	9407	8316

NOTE: *For air-to-open/fail-closed actuators the 0 degree position shown above corresponds to the disc or ball being seated. For air-to-close/fail-open actuators the 90 degree position shown above corresponds to the disc or ball being seated.*

* Size 200 actuator limited to 80 psi air supply pressure

Valtek Rotary Actuators
Specifications

Table II: Rotary Actuator Data

Actuator Size (sq.in.)	Stroke (inches)	*Actuator Moment Arm (inches)	Max Air Supply (psi)	Spring Design	Spring Rate (lb./in.)	Upper Cylinder Area (sq.in.)	Lower Cylinder Area (sq.in.)	Shipping Weight**
25	1.88	0.94	150	STD HD (Cap)	180 222	23.76	23.07	30
50	3.25	1.63	150	STD HD (Cap)	164 235	47.17	46.07	60
100	4.00	2.00	150	STD DUAL	300 885	95.03	93.26	160
200	4.00	2.00	80	STD DUAL	300 885	188.69	186.92	265

* Valve in closed position
** Estimated, including Beta Positioner

Table III: Actuator Specifications

Type	Cylinder with positive spring action
Sizes	25, 50, 100 and 200 sq. in.
Spring Designs	Single (std.), heavy-duty, dual
Action	Field reversible: Air-to-open, Air-to-close
Operating pressure	Up to 150 psi**
Temperature range	-40°F to 350°F*

* Ambient temperatures greater than 180°F require Viton O-rings. Ambient temperatures below -40°F require fluorosilicone O-rings. (Viton is a registered trademark of E.I. DuPont.)
** See Table II for limitations on certain actuators.

Table IV: Stroking Speeds with Positioner*

Actuator Size	Time in Seconds for 90° Rotation		Actuator Stroke (inches)
	1/4" Tubing (standard)	3/8" Tubing (optional)	
25 (std)	1.0	1.0	1.88
50 (std)	3.5	3.5	3.25
100 (std)	9.5	9.0	4.00

* Beta positioner stroking valve to fail position. Consult factory for speeds faster than those shown above.

Table V: Materials of Construction

Yoke	Ductile iron
Transfer case	Anodized aluminum
Splined lever arm	Ductile iron
Stem	416 stainless steel
Bearings	Filament wound fiberglass with Teflon liner
Sliding seal	Delrin 100, aluminum
Retaining ring	Cadmium plated steel
Piston	Anodized aluminum
Cylinder	Anodized aluminum
O-ring	Buna N (std.)
Actuator spring	Coated steel (rust proof)
Spring button	Painted steel or cadmium plated

Ordering Information

When ordering individual rotary actuators, the following information must be provided:

1. Operating conditions, throttling or on/off.
2. Maximum air supply pressure.
3. Valve rotation in degrees.
4. Actuator torque required at both ends of rotation.
5. Positioner and input signal range, if needed.
6. Stroking time requirements, if critical.

Valtek Rotary Actuators
Beta Positioners

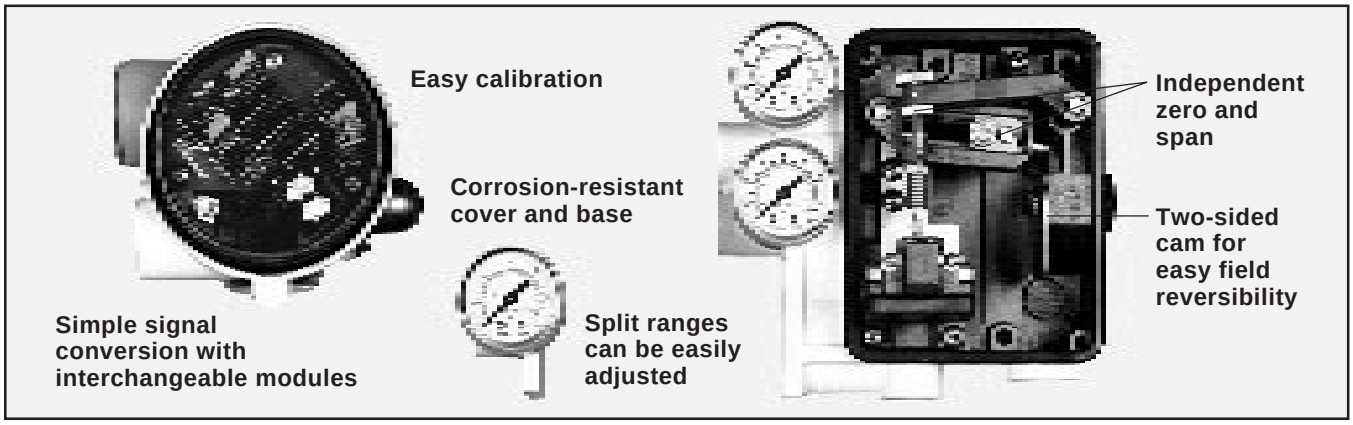


Figure 6: Beta Positioner Features

Flowserve primarily utilizes Beta positioners. The Valtek Beta positioner is available with either a pneumatic module for air control signals, or an electro-pneumatic (I/P) module for milliamp electrical control signals. Beta positioners are single or double-acting, force-balanced instruments that provide fast, sensitive and accurate positioning of cylinder and diaphragm actuators. These positioners are compact, field reversible, designed for high performance, and ruggedly built for reliability.

Features

- **P/P or I/P Signal Convertible** – Field conversion from one control signal to another is easily accomplished by replacing one module with the other.
- **Corrosion Resistant** – Cover and base assembly are epoxy powder painted and continuously purged from the inside with instrument air. Internal working parts are constructed from 300 series stainless steel, anodized aluminum or Buna-N.
- **Shock and Vibration Resistant** – Beta positioners are designed with a high natural frequency coupled with pneumatic damping. It is unaffected by vibration, accel-eration up to 2 G's, and frequencies to 500 Hz.
- **For Single or Double-acting Actuators** – Usable with either single or double-acting actuators (both linear and rotary) makes the Beta positioner versatile.
- **Standard Mounting** – Beta positioners use the same standard mounting as Valtek System 80 positioners. By changing the cams and follower arms, the same positioner can be used on both linear and rotary actuators. This results in fewer required spare parts.
- **Easily Field Reversed** – Action can be reversed in the field by simply turning the cam over, reversing the anti-backlash spring and changing the output tubing.
- **Insensitive to Mounting Position** – Positioners can be mounted in any orientation.
- **Simple Calibration** – Calibration is easy due to minimal interaction between zero and span. Positioner adjustments are totally enclosed for protection and to discourage tampering.
- **Split-Range Service** – Standard signal ranges are 4 - 20 mA for the electro-pneumatic (I/P) module and 3 - 15 psi for the pneumatic (P/P) model. Optional ranges are 10 - 50 mA and 6 - 30 psi, respectively. All models can be calibrated for a 2 or 3-way split range.
- **Simplified Maintenance** – Positioners' simplicity, modular design and few parts, make maintenance easy.
- **No Regulator Required** – Beta positioners are designed to withstand 150 psi at all ports, and are insensitive to supply pressure fluctuations.
- **Low Air Consumption** – Steady state air consumption is .25 SCFM @ 60 psi supply (I/P module max. .31 SCFM).
- **Changeable Flow Charactaristics** – Easily changed cam provides characterized flow feedback.
- **High Air Flow Gain Model** – Standard on 200 square-inch actuators and above, optional on others.
- **Output Gauge Helps Monitor Unit** – Indicates transducer output to the positioner, permitting easy verification of transducer and positioner calibration.
- **Minimum Pressure Cutoff** – When initiated, causes the IP 2000 module output to decrease to near zero when the input signal falls below a user-determined point.
- **Replaceable Coalescing Filter** (IP 2000) – Removes particles that could clog transducer. Large orifice/air passages provide additional protection against clogging.
- **Self-controlling Internal Regulator** (IP 2000) – Reduces pressure to 22 psi, eliminating need for external regulator.

Valtek Rotary Actuators
Beta Positioner Operation

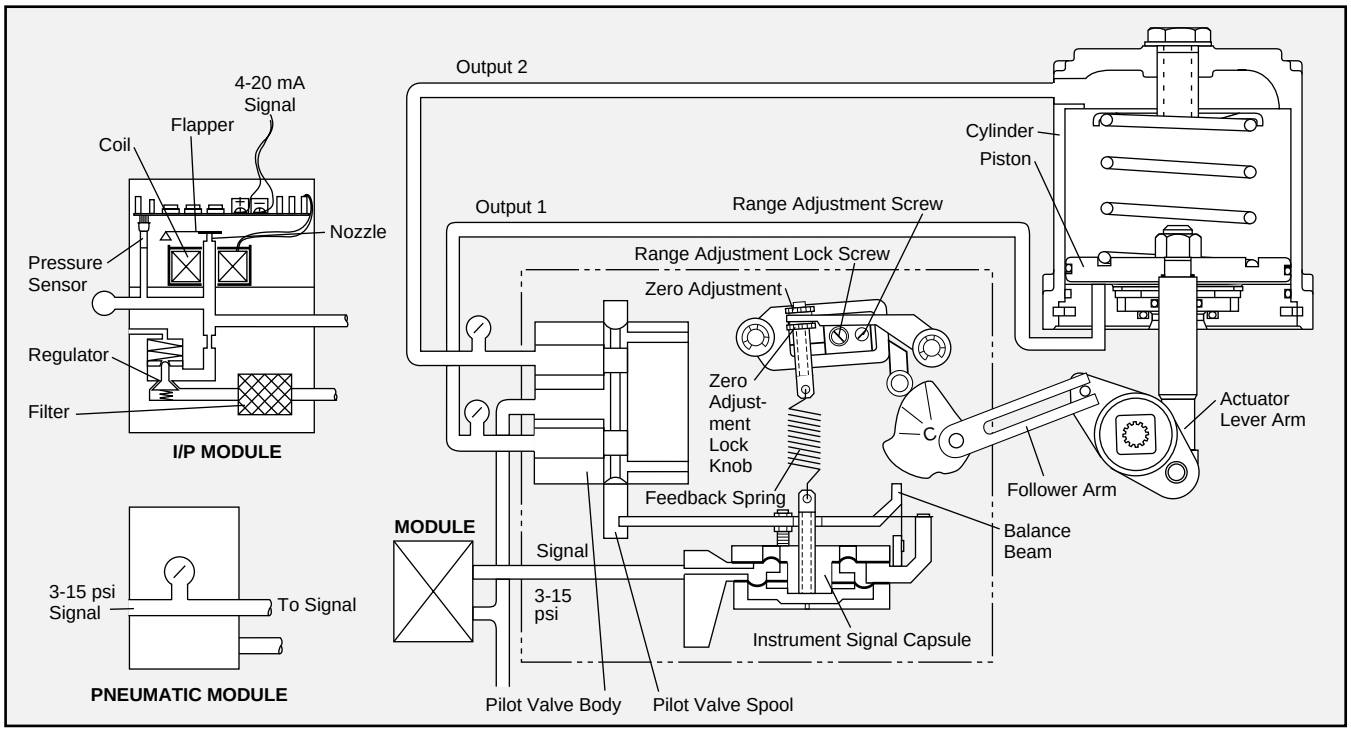


Figure 7: Positioner Schematic for Air-to-Open (Retract)

The Beta positioner is a force-balanced instrument. Figure 4 shows a Beta positioner, with either a pneumatic or electro-pneumatic module, installed on a double-acting actuator for air-to-open action. Positioning is based on a balance of two forces; one proportional to the instrument signal and the other proportional to the stem position.

With the IP 2000 model, the current signal is first converted to a 3-15 psi air signal. For the pneumatic model, the 3-15 psi signal is passed directly into the positioner. The transducer receives an electric input signal and converts it to an output proportional to the input. The supply pressure is filtered and regulated in the transducer by a filter element and an internal regulator.

The output of the transducer is controlled by a feedback loop consisting of a pressure sensor, electromagnetic pressure modulator and circuit board. The pressure modulator consists of a stiff flapper that is attracted by the electromagnet to a nozzle. The nozzle-flapper spacing determines the transducer output.

Based on the difference between the input and the output measured by the pressure sensor, the circuit board sends a current to the pressure modulator that adjusts the nozzle-flapper spacing to provide the correct output.

The detailed sequence of positioner operations are as follows: An increase in the instrument signal forces the instrument signal capsule and balance beam downward. This motion of the balance beam also pulls the pilot valve spool downward from its equilibrium position. This opens the pilot valve ports, supplying air to port 1 and exhausting air from port 2. This causes the actuator piston upward.

This upward motion of the piston is transmitted back to the positioner through the feedback linkage and cam resulting in the spring being stretched proportionally to the valve position. The piston continues to stroke upward until the force in the feedback spring increases sufficiently to counter the force generated by the instrument signal capsule. At this point, the balance beam and spool begin to return to equilibrium position. As the valve spool ports start to close, the air flow rate to the actuator is decreased.

After the piston has reached the required position, the feedback spring tension force will equal the force generated in the instrument signal capsule. The balance beam and instrument signal capsule will remain in their equilibrium positions with no air flowing to the actuator until a change in the instrument signal is made.

A decrease in the instrument signal reverses the described actions causing a proportional downward movement of the actuator piston and stem.

Valtek Rotary Actuators

Beta Positioner Specifications

Table VI: Beta Positioner Specifications

Specification	Pneumatic Module	I/P 2000 Module
Input signal range:	3-15 psi, 2 or 3-way split range; 6-30 psi, 2 or 3-way split range; 4-way split range	4-20 and 10-50 mA with 2 or 3 and 4-way split range
Supply pressure	30 psi to 150 psi	Same
Ambient temperature limits	Standard model: -20° F to +185° F Ext. temp. model: -50° F to +250° F	Standard model: -20° F to +180° F Ext. temp. model: -40° F to +180° F
Connections	Supply, instrument and output: 1/4-inch NPT; Gauges: 1/8-inch NPT	Signal: 1/2-inch NPT elect. conduit; Output: 1/4-inch NPT; Gauges: 1/8-inch NPT
Standard materials	Stainless steel, anodized aluminum, nickel-plated steel, epoxy powder-painted steel and Buna-N	Same
Loop Load	N/A	5.3 volts + 5 ohms (270 ohms at 20 mA)
Hazardous Location Approvals (FM and CSA approved)	N/A	Intrinsically safe: Class I, Division 1, Groups A, B, C, D; Class II, Groups E, F, G Explosion-proof: Class I, Division 1, Groups B, C, D; Class II, Groups E, F, G Non-incendive: Class I, Division 2, Groups A, B, C, D, F, G
Net weight	3 lbs.	5.5 lbs.

Table VII: Beta Positioner Performance*

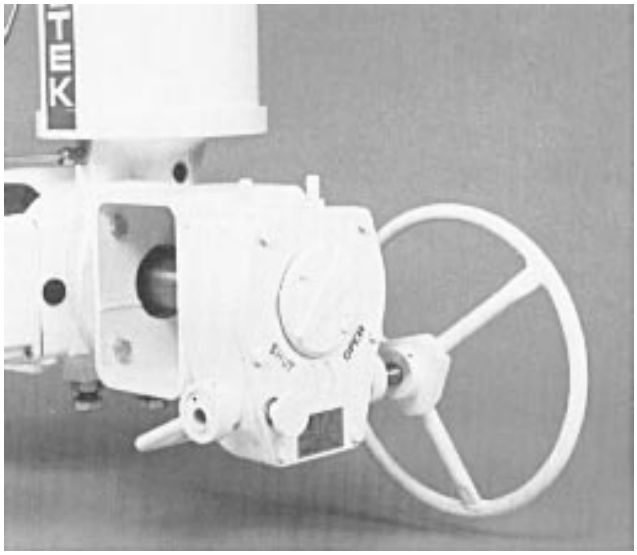
		Pneumatic Module	IP 2000 Module
Independent Linearity – Maximum deviation from a best fit straight line		±1.0% F.S.	±1.0% F.S.
Hysteresis – Maximum position error for the same value of input when approached from opposite ends of the scale.		0.5% F.S.	0.5% F.S.
Repeatability – Maximum variation in position for the same value of input when approached from the same direction.		0.2% F.S.	0.2% F.S.
Response Level – Maximum change in input required to cause a change in valve stem position in one direction.		0.2% F.S.	0.2% F.S.
Dead Band – Maximum change in input required to cause a reversal in valve stem movement.		0.3% F.S.	0.3% F.S.
Resolution – Smallest possible change in valve stem position.		.1% F.S.	.1% F.S.
Steady State Air Consumption @ 60 psi		.25 SCFM	.31 SCFM
Supply Pressure Effect – Position change for a 10 psi supply pressure change.		.05 % F.S.	.06% F.S.
"Open-loop" Gain – Ratio of cylinder pressure unbalance to instrument pressure change with locked stem.		300:1 psi/psi @60 psi	400:1 psi/mA @60 psi
Maximum Flow Capacity @ 60 psi		11 SCFM	11 SCFM
Frequency Response – (With sinusoidal input of ±5% F.S. centered about 50% F.S.)	-6 dB Frequency Phase Angle at -6dB	.8 Hz -71°	.8 Hz -71.1°
Stroking Speed –	Closed to open -	2.3 in/sec.	2.3 in/sec.
	Open to closed -	1.3 in/sec.	1.3 in./sec.

*Data is based on tests of the Beta positioner mounted on a double-acting cylinder actuator having a piston area of 25 square inches with a valve stroke of 1.5 inches and 60 psi supply pressure. Instrument signal was 3-15 psi with pneumatic module and 4-20 mA with I/P module.

Valtek Rotary Actuators
Options

Declutchable Handwheel Actuator

Designed to override the actuator in case of air failure or if manual operation is desired. This unit has a special high-output worm gear that develops as much torque as the standard Valtek pneumatic rotary actuator.



Manual Handwheel Actuator

For applications requiring infrequent use but reliable operation, a high-torque, manual handwheel actuator is available. There are three sizes to match the torque requirements of any application. The sealed housing is made of cast iron and filled with grease for maintenance-free operation.

Heavy-duty Springs

For high shutoff pressure, heavy-duty springs are available. A spring cap installed in the cylinder is used for high pressure drop applications, requiring the installation of the longer heavy-duty spring. The same spring can be used for both fail-open and fail-closed applications. Dual springs are available with 100 and 200 square-inch rotary actuators.

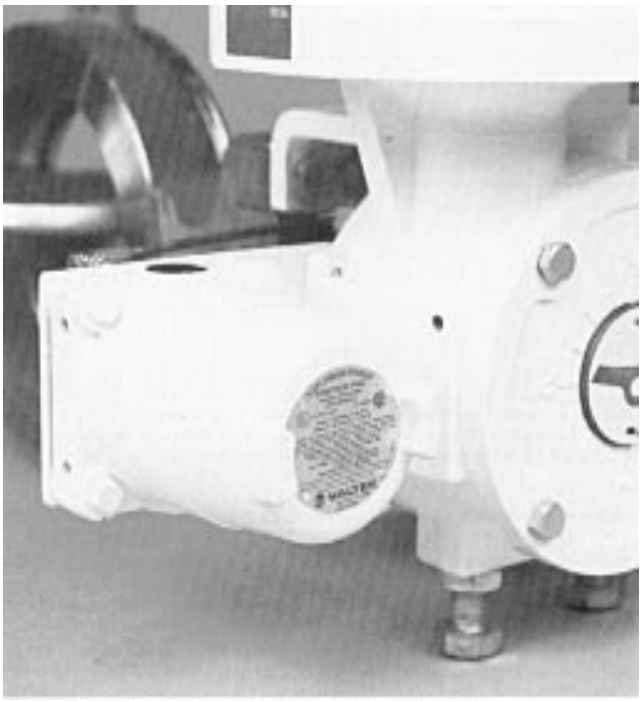
Solenoid Valves

The three-way solenoid valve is used to interrupt the instrument signal to the pneumatic positioner.

For on/off applications where throttling is not required, the four-way solenoid valve is used. It ensures fast, positive, two-directional action. Solenoid valves are available in both AC and DC voltages.

Position Pac

Position Pac is a position transmitter that exceeds the capabilities of normal limit switches by providing a continuous electrical output signal proportional to the position of the control valve. Position Pac operates with two wires on a 4 to 20 mA DC voltage, ensuring infinite resolution for safe, dependable monitoring of a control valve's position to within linearity $\pm$1 percent. Mounted on the transfer case opposite the valve, the infinite resolution potentiometer is easily adjusted with zero and span settings for field calibration. Position Pac models may contain a potentiometer and transmitter, two or four limit switches, or a combination of a transmitter and two limit switches. A rugged aluminum housing provides weather and explosion-proof protection from external conditions.



Air Filters

An air filter is recommended for installation upstream of the positioner. It features high flow capacity and handles up to 150 psi supply air pressure. Easy access to the large drip well permits inspection and replacement of the filter cartridge, while the integral drain valve allows removal of trapped oil, moisture and other foreign material. Regulators are usually not required with Valtek actuators and positioners.

Valtek Rotary Actuators

Dimensions

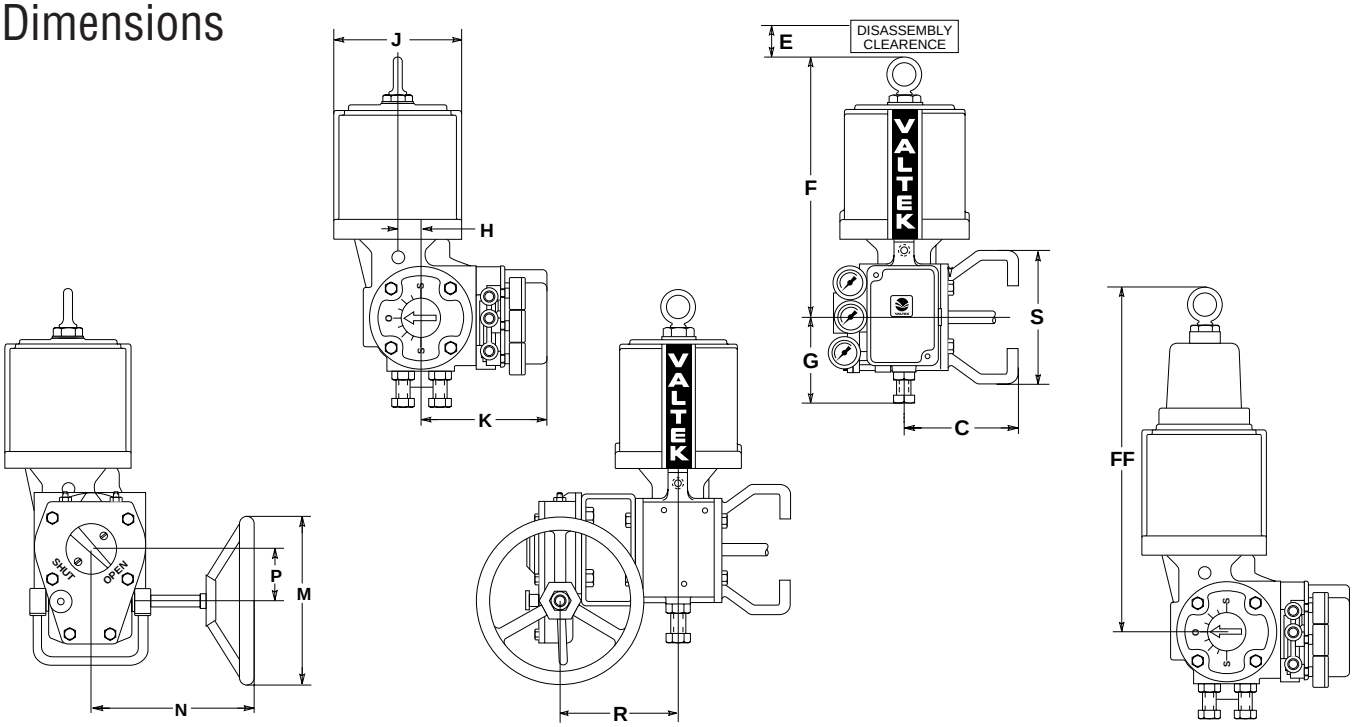


Table VIII: Rotary Actuator Dimensions (inches/mm)

Size (in.)	C* (act)		E		F		FF		G		H		J		K		M		N		P		R		S**		Press. Conn.
25	6.7	171	6.0	152	13.1	332	16.5	420	5.6	142	1.1	29	6.5	165	6.5	166	10.0	254	9.8	248	2.6	67	6.9	176	6.8	171	1/4 NPT
50	6.7	171	8.0	203	17.2	437	23.5	598	6.7	170	2.0	50	9.1	232	7.4	188	12.0	305	10.3	260	3.4	86	9.1	230	6.8	171	1/4 NPT
100	6.7	171	11.0	279	22.9	583	N/A	N/A	9.1	230	2.4	61	12.5	318	8.5	215	18.0	457	12.8	324	5.4	137	10.4	263	6.8	171	3/4 NPT
200	6.7	171	11.0	279	23.6	599	N/A	N/A	9.1	230	2.4	61	17.5	445	8.5	215	18.0	457	12.8	324	5.4	137	10.4	263	6.8	171	3/4 NPT

*7.8/198 on size 100 and 200 actuators, 16-inch and larger valves.
**7.9/202 on size 50 actuators and 8, 10-inch valves; 9.4/238 on size 100, 200 actuators and 8,10,12-inch valves; 11.3/286 on size 100, 200 actuators and 16-inch and larger valves.
NOTE: Size 100 and 200 actuators do not include lifting rings.

For more information, contact:

For more information about Flowserve Corporation,
contact www.flowserve.com or call USA 972 443 6500

Manufacturing Facilities

Valtek Control Valves
1350 N. Mt. Springs Prkwy.
Springville, UT 84663
Phone 801 489 8611
Facsimile 801 489 3719

Valtek-Kammer Valve
1300 Parkway View Drive
Pittsburgh, PA 15205 USA
Telephone 412 787 8803
Facsimile 412 787 1944

Valtek-Kammer Ventile
Manderscheidstr. 19
45141 Essen, Germany
Telephone (49) 2 01 89 19 5
Facsimile (49) 2 01 891 9600

Valtek-Kammer Vannes
Alläe du Quartz 1
CH-2300 La Chaux-de-Fonds
Switzerland
Telephone (41) 32 925 9700
Facsimile (41) 32 926 5422

Quick Response Centers

Valtek Houston
5114 Railroad Street
Deer Park, TX 77536 USA
Telephone 281 479 9500
Facsimile 281 479 8511

Valtek Philadelphia
104 Chelsea Parkway
Boothwyn, PA 19061 USA
Telephone 610 497 8600
Facsimile 610 497 6680

CERTIFIED ISO 9000 SELECT LOCATIONS