



***Valtek XL Series
High Performance Positioner
for Control Valves***

Valtek XL Series Positioner

Features

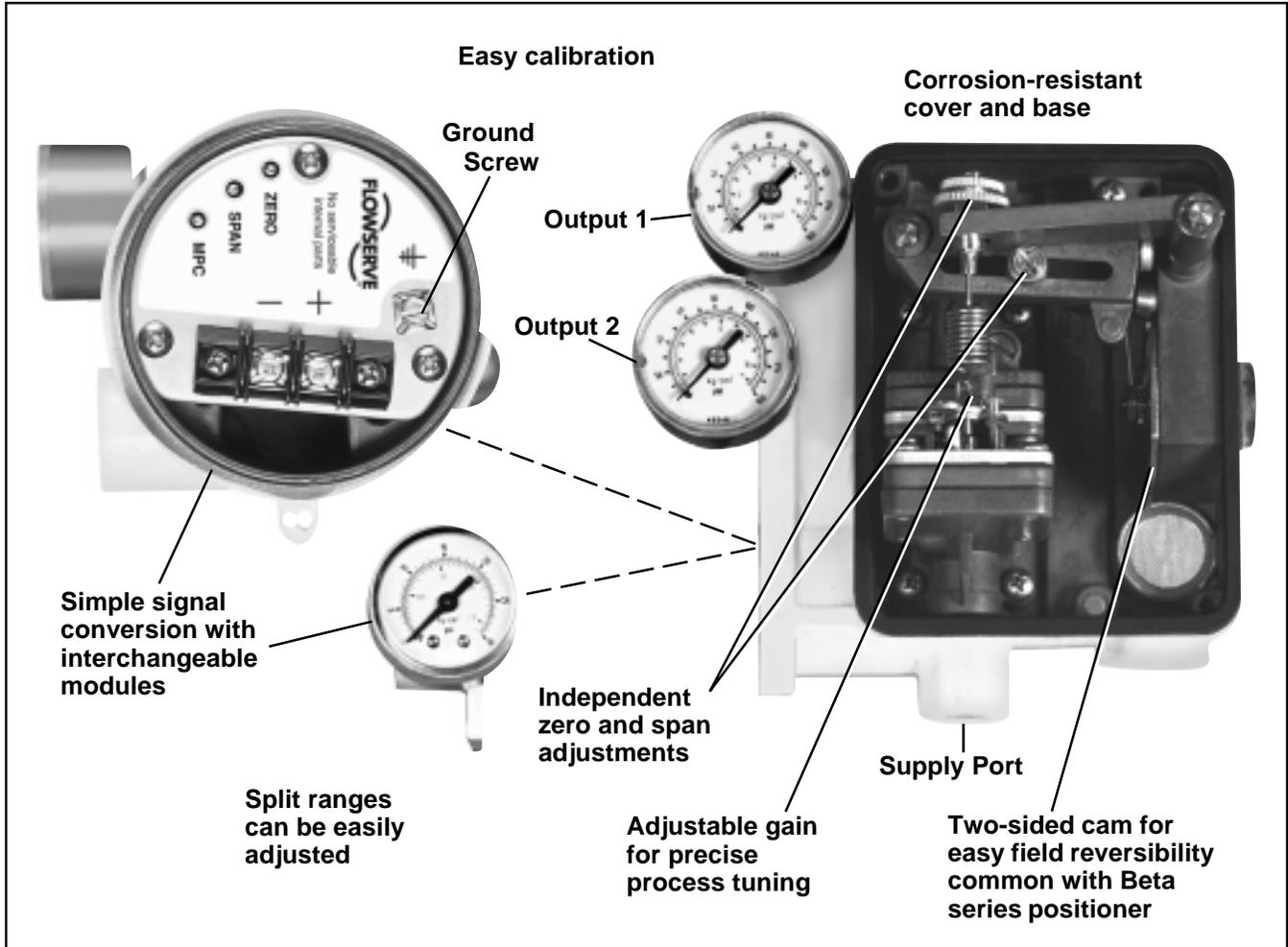


Figure 1: Features of XL Series Positioner with Pneumatic or Electro-pneumatic Modules

Introduction

The Valtek® XL series, two-stage positioner offers fast and sensitive dynamic response characteristics to meet extremely demanding control objectives. The positioner is available with either an electro-pneumatic (I/P) transducer module for milliamp current control signals or a pneumatic module for air control signals.

Designed for high performance, this positioner is compact, field reversible and ruggedly built for reliability in severe industrial environments. The XL positioner uses common mounting brackets and follower arms with the

Beta Series and 80R positioners; therefore, the positioner can be mounted on either Valtek linear or rotary actuators without additional hardware. Two and three-way split ranges are available without special feedback springs.

Mounting kits are available to install the XL positioner on other manufacturers' actuators for improved performance.

Valtek XL Series Positioner



Figure 2: XL Series Positioner Mounted on Valtek Linear Actuator



Figure 3: XL Series Positioner Mounted on Fisher 657 Actuator

Calibration is easy using the XL positioner due to minimal interaction between zero and span. Also, the positioner's simplicity, modular design and few parts, make maintenance quick and easy.

In addition to offering premium performance to meet demanding control needs, the XL positioner is also adaptable for various applications and can be used on both single- and double-acting valve actuators. (See Figure 2 and 3.) The XL positioner with NT 3000 I/P

transducer module is universally certified for intrinsically safe and explosion proof applications. (See Table II for a complete listing.)

When an application demands extremely fast strokes and fine control, the XL Series positioner is clearly the best, dependable solution.

Valtek XL Series Positioner

Advantages

I/P or P/P Signal Convertible	Field conversion from one control signal to another is easily accomplished by replacing one module with the other, greatly reducing spare parts inventory.
Shock and Vibration Resistant	XL positioners are designed with a high natural frequency coupled with pneumatic damping – unaffected by vibrations with acceleration 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 XL Series positioner versatile.
Easily Field Reversed	Action can be reversed in the field by simply turning the cam over, reversing anti-backlash spring and changing output tubing.
Easy Calibration Procedures	Calibration is easy due to minimal interaction between zero and span. Other positioner adjustments are enclosed for protection to discourage tampering.
Split-Range Service	Standard signal ranges are 4 - 20 mA for the electro-pneumatic (I/P) model and 3 - 15 psi for the pneumatic (P/P) model. Optional range is 10 - 50 mA. All models can be calibrated for a 2- or 3-way split range without additional parts.
Simplified Maintenance	The XL positioner's simplicity, modular design and few parts, make maintenance quick and easy.
No Regulator* Required	The XL positioner with the NT 3000 I/P or the pneumatic module is designed to withstand 150 psi at all ports and is relatively insensitive to supply pressure fluctuation.
Changeable Flow Characteristics	Easily changed cam provides flow characterization.
Insensitive to Mounting Position	Positioner can be mounted in any orientation without affecting performance.
Corrosion Resistant Parts for Long Life	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.
Low Air Consumption	Steady state air consumption is .28 SCFM / .48 m ³ /hr @ 60 psi / 4.1 bar supply maximum (.34 SCFM / .58 m ³ /hr with I/P module).
Extended Temperature Model	I/P: -40° F to 185° F / -40° C to 85° C; P/P: -50° F to 250° F / -46° C to 121° C
Oxygen Service Model	Pneumatic models are available with fluorosilicone diaphragms and O-rings.

With the NT 3000 I/P Transducer

Replaceable Coalescing Filter*	Removes particles that may clog transducer. Large orifice / air passages provide additional protection against clogging. Positioner includes orifice screen to prevent clogging.
Minimum Pressure Cutoff	When enabled, causes the NT 3000 transducer output to decrease to near zero when input signal falls below a user-settable point.
Output Gauge Helps Monitor Unit	Indicates transducer output to positioner, permitting easy troubleshooting.
Self-controlling Internal Regulator	Reduces pressure to 22 psi / 1.52 bar, eliminating need for external regulator.

*With any sensitive pneumatic instrument, a clean air supply is required. This instrument must have an air supply meeting or exceeding SA7.3.

Valtek XL Series Positioner Operation

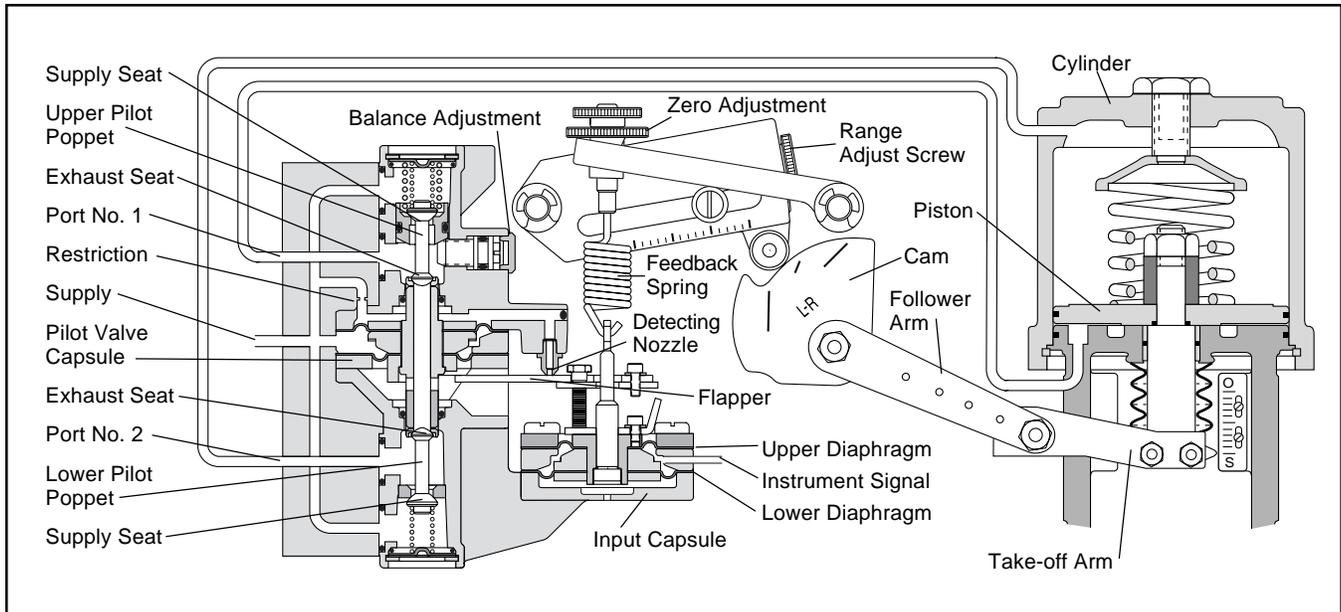


Figure 4: XL Positioner Schematic for Air-to-Open

The XL positioner is a two-stage, force-balanced instrument. Figure 4 shows an XL positioner with either an electro-pneumatic or 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.

The current signal for the NT 3000 I/P module is first converted to a 3-15 psi air signal, while the 3-15 psi air signal for the pneumatic model is passed directly into the positioner. The transducer receives an electric current 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 pressure to the positioner. For more information, refer to the NT 3000 I/P Transducer Module technical bulletin

The positioner operates as follows: An increase in the instrument signal forces the instrument signal capsule and flapper downward. The detecting nozzle now releases air and the pressure decreases on top of the pilot valve capsule. The pressure differential moves the pilot valve capsule upward, opening the upper supply seat and allowing supply pressure to port 1. This opens the exhaust seat on port 2, causing the actuator piston to move upward.

The 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 their 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 flapper 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 signal reverses the action, causing downward movement of the actuator piston and stem.

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Performance Test Results

Table I: XL Series Positioner Specifications

Specification	Pneumatic Module	I/P Module
Input Signal Range	3-15 psi / .21-1.0 bar , 2- or 3-way split range; 6-30 psi / .41-2.1 bar , 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 / 2.1-10.2 bar	Same
Ambient Temperature Limits	Standard model: -20° F to +185° F / -29° C to 85° C Ext. temp. model: -50° F to +250° F / -45° C to 121° C	Standard model: -20° F to +180° F / -29° C to 82° C Ext. temp. model: -40° F to +180° F / -40° C to 82° C
Connections	Supply, instrument and output: 1/4-inch NPT; Gauges: 1/8-inch NPT	Signal: 1/2-inch NPT elect. conduit; M20 Output: 1/4-inch NPT; Gauges: 1/8-inch NPT
Standard Materials	Stainless steel, anodized aluminum, epoxy powder-painted steel and Buna-N	Same
Loop Load	N/A	5.3 volts + 5 ohms (270 ohms at 20 mA)
Net Weight	3 lbs. / 1.4 Kg	5.5 lbs. / 2.5 Kg

Table II: NT 3000 I/P (Electro-pneumatic) Transducer

Hazardous Location Approvals	Explosion proof: CL I, Div 1, Grp B, C, D FM / CSA EExd, IIB + H ₂ T6 CENELEC Exd, IIB + H ₂ T6 SAA / CEPEL	Intrinsically safe: CL I, II, III, Div 1, Grp A-E FM / CSA EEx ia IIC T4 (T _a = 80° C) CENELEC Ex ia IIC T4 SAA/CEPEL
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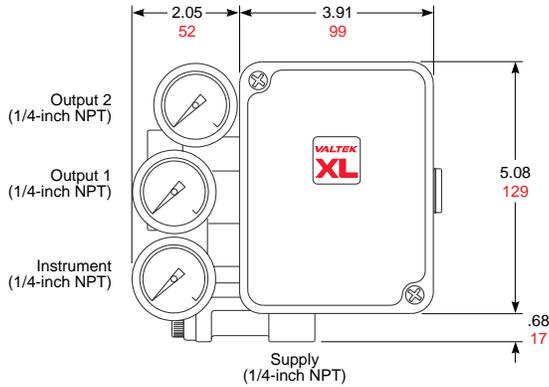
Table III: XL Series Positioner Performance

TEST		XL	XL I/P
Response Level – Average change in input required to cause a change in valve stem position in one direction		0.1% F.S.*	0.1% F.S.
Dead Band – Average change in input required to cause a reversal in valve stem movement		0.1% F.S.	0.1% F.S.
Resolution – Smallest possible change in valve stem position		0.1% F.S.	0.1% F.S.
Independent Linearity – Maximum deviation from a best fit straight line		±1.0% F.S.	±1.0% F.S.
Repeatability – Average variation in position for the same value of input when approached from the same direction.		0.1% F.S.	0.1% F.S.
Steady State Air Consumption @ 60 psi / 4.1 bar		0.28 SCFM .47 m³/hr	0.34 SCFM .58 m³/hr
Supply Pressure Effect – Position change for a 10 psi / .69 bar supply pressure change.		0.2 % F.S.	0.2% F.S.
“Open-loop” Gain – Ratio of cylinder pressure unbalance to instrument pressure change with locked stem @ 60 psi / 4.1 bar		Adjustable 400 to 1100:1 psi / psi @ 60 psi	Adjustable 535 to 1465:1 psi / psi @ 60 psi
Maximum Flow Capacity @ 60 psi / 4.1 bar		16.5 SCFM 28 m³/hr	16.5 SCFM 28 m³/hr
Frequency Response – (With sinusoidal Frequency of ± 5% F.S. centered about 50% F.S.)	-6 dB Frequency Phase Angle at -6dB	6.0hz -156.0°	6.0hz -156.0°
Stroking Speed – Speeds for a 100% step change in the input signal	opening closing	1.88 in / sec. 3.0 in / sec.	1.88 in / sec 3.0 in / sec

NOTE: Testing was performed on a Mark One with a 25 square-inch actuator, air-to-open, Teflon® packing, 1.0-inch valve with a 0.75-inch stroke. Results may vary depending on valve system configuration. *F.S. = Full Scale.

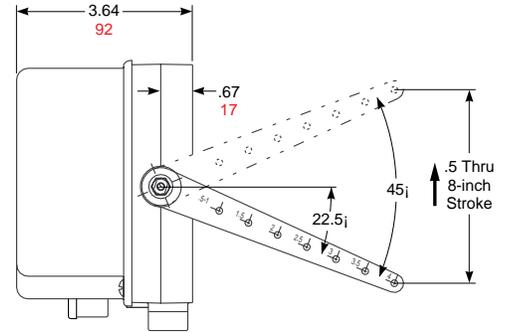
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Dimensions with Pneumatic (P/P) Module

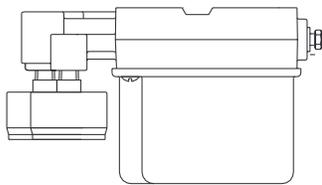


Front View

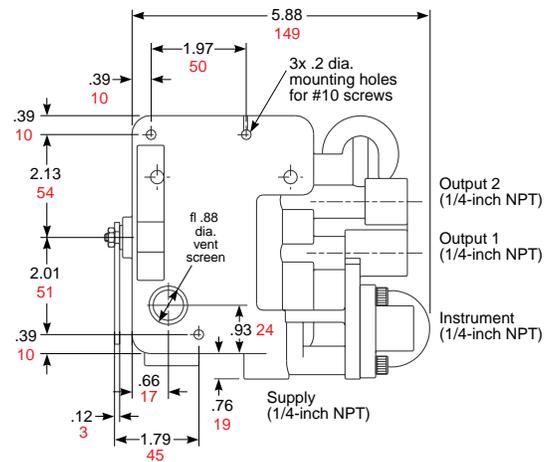
(inches / mm)



Side View



Top View



Back View

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