

High Performance
High Performance
High Performance



FLOWSERVE[®]

VALTEK[®]

XL Series Positioners

Valtek XL Series Positioners

Features

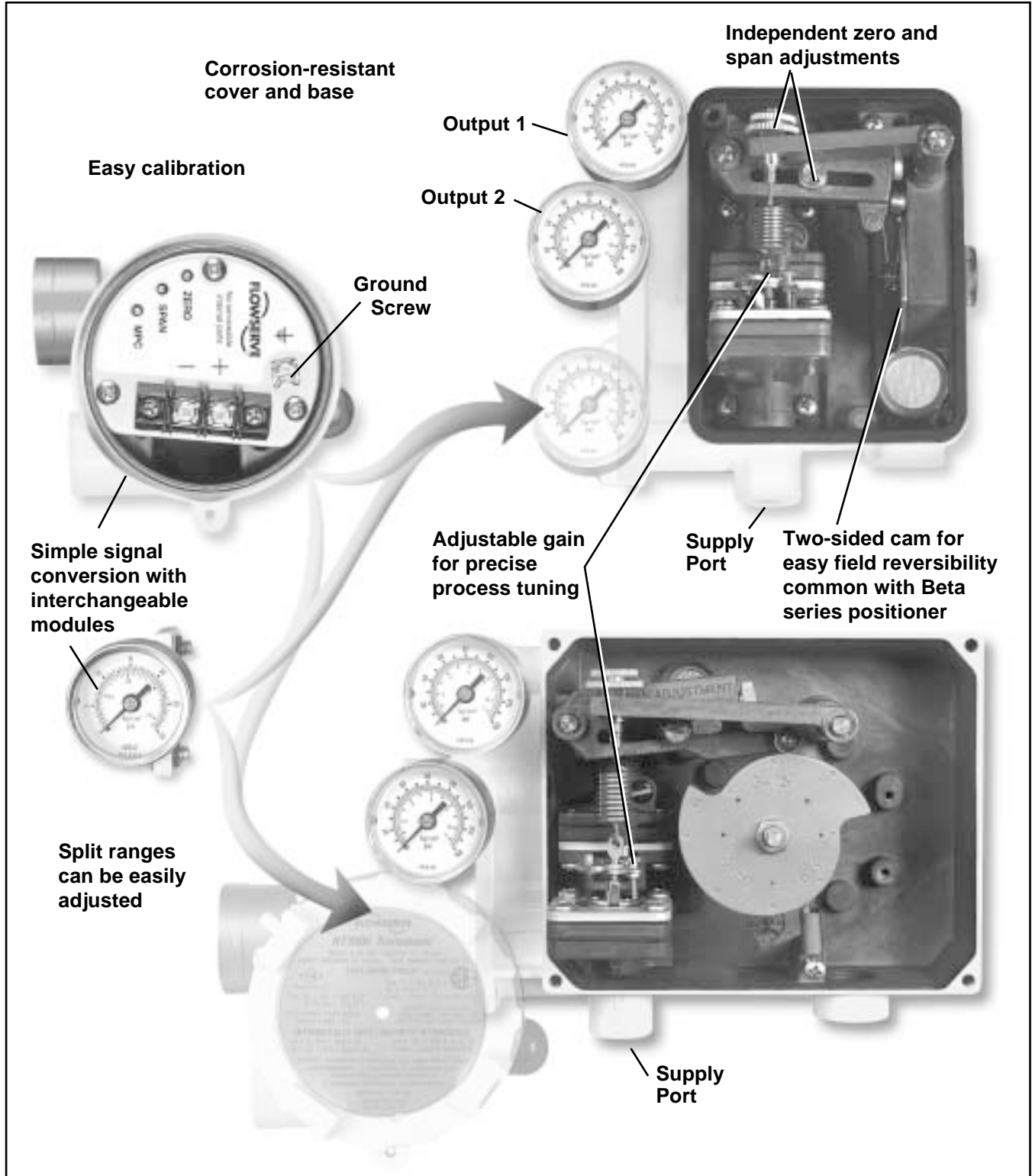


Figure 1: Features of XL Series Positioners with Pneumatic or Electro-pneumatic Modules

Valtek XL Series Positioners

Introduction



Figure 2: XL Positioner Mounted on Valtek Linear Actuator

The Valtek® XL™ Series (XL and XL90), two-stage positioners offer fast and sensitive dynamic response characteristics to meet extremely demanding control objectives. The positioners are 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, these positioners are field reversible and ruggedly built for reliability in severe industrial environments. The XL positioner uses



Figure 3: XL Positioner Mounted on Competitor's Actuator

common mounting brackets and follower arms with the Valtek Beta and 80R positioners. The XL90 uses common rotary mounting brackets identical to the Logix 1000 Series positioners: therefore, the positioners can be mounted on existing 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 Series positioners on other manufacturers' actuators for improved performance.

Valtek XL Series Positioners

Advantages

Calibrating the XL Series positioners is easy due to minimal interaction between zero and span. Also, the positioners' simplicity, modular design and few parts, make maintenance quick and easy.

In addition to providing premium performance to meet demanding control needs, the XL Series positioners are also adaptable for various applications and can be used on both single- and double-acting valve actuators. (See

Figures 2 and 3.) The XL Series positioners with NT 3000 I/P transducer module are universally certified for intrinsically safe and explosion-proof applications. (See Table II for a complete listing.)

When an application demands fast strokes and fine control, the XL Series positioners are clearly the best, dependable solution.

Features	Benefits
For Single or Double-acting Actuators	Usable with either single or double-acting actuators (both linear and rotary) makes the XL Series positioners versatile.
Easily Field Reversed	Action can be reversed in the field on linear valves by simply turning the cam over, reversing anti-backlash spring and changing output tubing.
Changeable Flow Characteristics	Easily changed cam provides flow characterization.
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 (0.21-1.03 bar) for the pneumatic (P/P) model. Optional range is 10-50 mA (I/P) or 6-30 psi (0.41-2.06 bar) (P/P). All models can be calibrated for a 2- or 3-way split range without additional parts.
Shock and Vibration Resistant	XL Series 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.
Insensitive to Mounting Position	Positioners can be mounted in any orientation without affecting performance.
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.
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 nitrile.
Simplified Maintenance	The XL Series positioners' simplicity, modular design and few parts, make maintenance quick and easy.
No Regulator* Required	The XL Series positioners with the NT 3000 I/P or the pneumatic module are designed to withstand 150 psi (10.34 bar) at all ports and are relatively insensitive to supply pressure fluctuation.

*With any sensitive pneumatic instrument, a clean air supply is required. This instrument must have an air supply meeting or exceeding ISA-7.0.01.

Valtek XL Series Positioners

Advantages

Low Air Consumption	Steady state air consumption is 0.28 SCFM (0.48 m ³ /hr) @ 60 psi (4.1 bar); supply maximum 0.34 SCFM (0.58 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.

XL 90 Positioner Additional Advantages

Direct Rotary Mounting	Eliminates linkage backlash or deadband, thus increasing performance.
Visual Position Indicator	High visibility neon green provides quick visual indication of valve / actuator position. With optional UltraDome, visibility is increased to more than 180 degrees.
Optional Internal Switches	4-20 mA position transmitter provides analog feedback of position independent of control signal. Micro or magnetic switches provide discrete open and closed (or any position in between).
Optional UltraSwitch	Provides explosion-proof / intrinsically safe 4-20 mA position feedback and discrete limit switches.

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, allows 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 ISA-7.0.01.

Valtek XL Series Positioners

Operation

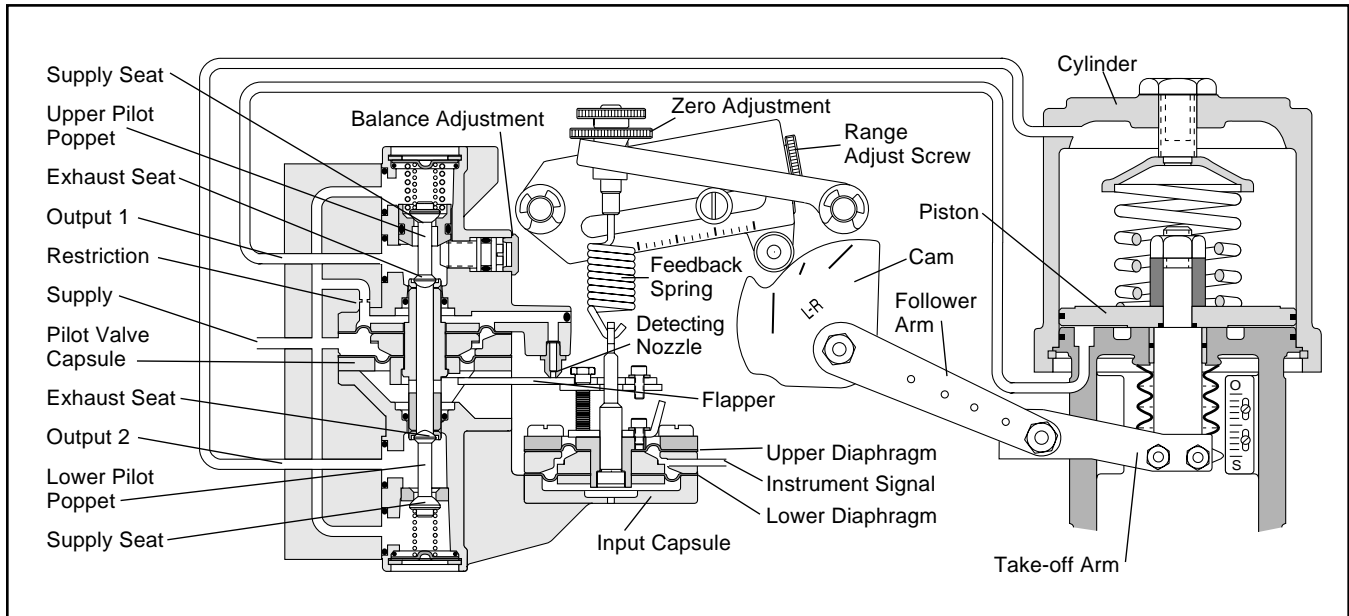


Figure 4: XL Series Positioners' Schematic for Air-to-Open (linear valve shown)

The XL Series positioners are two-stage, force-balanced instruments. Figure 4 shows an XL Series positioner used in conjunction 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 (0.2-1.03 bar) air signal, while the 3-15 psi air signal for the pneumatic model is passed directly into the positioner. 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 nozzle-flapper spacing to provide correct output pressure to the positioner. For more information, refer to *NT 3000 Series Electro-pneumatic Transducer Module* technical bulletin.

The positioner operates as follows: An increase in the instrument signal forces the instrument signal capsule and flapper downward. The 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 output 1. This opens the exhaust seat on output 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.

Valtek XL90 Positioner

Options

Valtek XL90 Rotary Positioner

The XL90 positioner utilizes a rotary feedback mechanism that can be used on applications with 60, 90 and up to 180 degrees rotation. While the XL90 is used primarily on rotary applications it can be used on linear applications when the double D rotary input shaft option is used (standard on Valtek and Sereg models).

By using the same internal positioning parts as its linear-motion counterpart (XL positioner), interchangeability between the XL and XL90 is significant, allowing for lower spare part inventory. In addition to its high-performance positioning functions, the XL90 allows the use of internal position feedback potentiometers that provide 4-20 mA analog signal independent of the control signal, as well as limit switches that provide discrete open/closed signals or any discrete intermediate position. The position indicator allows for easy viewing of valve/actuator position and the optional Ultra-dome provides increased visibility of position. The UltraSwitch option provides explosion-proof or intrinsically safe switches and/or position feedback. Mounting is accomplished using NAMUR, F05, Westlock or standard Valtek mounting. Available in either pneumatic or I/P models, the XL90 is the premier choice for rotary positioning.

XL90 OPTIONS

Option F: 4-20 mA Transmitter

The XL 90 Feedback option allows accurate and reliable monitoring of valve position when installed in the XL 90 positioner.

The Feedback option may be used in any non-hazardous location. For hazardous locations utilize the UltraSwitch explosion-proof limit switch enclosure.

Voltage Supply Required: 6-30 VDC

Impedance: 300 Ohms at 20 mA

Note: Impedance changes with current (refer to IOM 48). To properly design the current loop, use 300 Ohms and 20 mA current.

Option J and K: Mechanical Switches

Mechanical switch technology is proven and the most cost effective switching method used today. Tool-free cam adjustment is accomplished through a spring-loaded spline arrangement. Simply push or pull the cam,

disengaging the splines, and rotate to the desired switch trip point. After releasing, the spring causes automatic spline engagement, locking the setting.

2-SPDT

Load Capacity: 10 amps at 125 VAC, 5 amps at 250 VAC, 0.5 amp at 125 VDC, 0.25 amp at 250 VDC.

Operating Force: 4.8 ounces

Differential Travel: 0.016 inches minimum

Mechanical Life: 10,000,000 cycles

Option M and N: Proximity Switches

Proximity reed switches offer cost effective contacts for extended life in corrosive applications. These switches are tripped by magnets embedded in cams to indicate valve open and closed positions. Tool-free cam adjustment is accomplished through a spring-loaded spline arrangement. Simply push or pull the cam, disengaging the splines, and rotate to desired switch trip point. After releasing, the spring causes automatic spline engagement, locking the setting.

SPST Proximity Switches

Load Capacity: 0.35 amp 140 VAC, 1 amp 50 VDC, 50 Watt maximum contact rating

Contact Material: Rhodium plated

Actuated by magnetic force

SPDT Proximity Switches

Load Capacity: 0.25 amp 120 VAC, 0.25 amp 28 VDC, 3 Watt maximum contact rating

Contact Material: Ruthenium plated

Actuated by magnetic force

MOV and 0.25 amp fuse protected

Option Q: Intrinsically Safe Solid State Proximity Switches

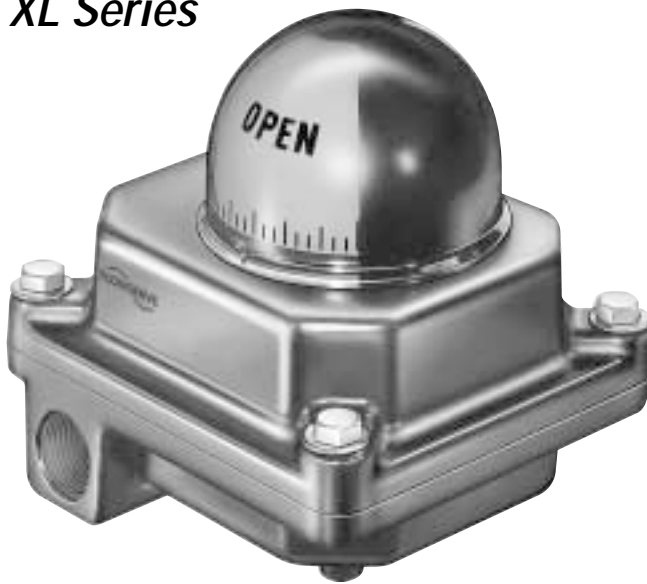
With the same mounting as the mechanical switches, the FM/CSA rated I.S. Solid State Proximity Switches can be used to obtain valve open and closed position. Tool-free cam adjustment is accomplished through a spring-loaded spline arrangement. Simply push or pull the cam, disengaging the splines, and rotate to the desired switch trip point. After releasing, the spring causes automatic spline engagement, locking the setting.

NAMUR Output: $\leq 1\text{mA} = \text{Off}$; $\geq 3\text{mA} = \text{On}$

Voltage Range: 5-25 VDC

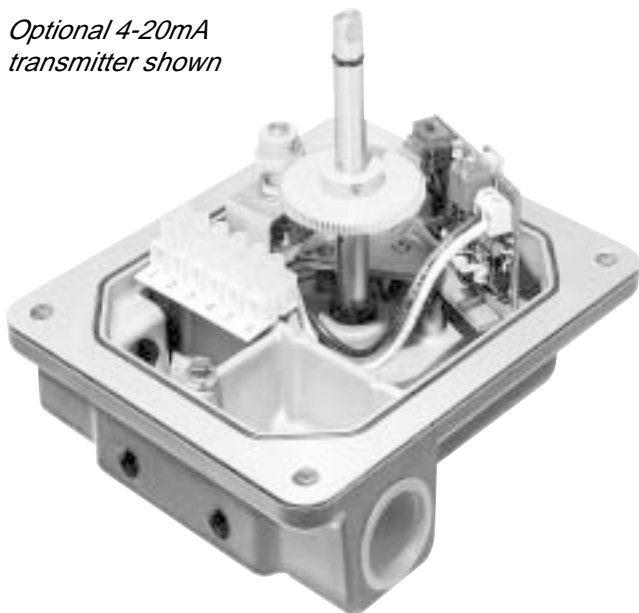
Valtek XL90 Positioner UltraSwitch Options*

XL Series



The XL series rotary limit switch enclosure provides a rugged heavy duty package for visual and remote electrical indication of valve position. The die cast aluminum housing has a dichromate undercoat and electrostatic powder top coat for superior corrosion resistance. The housing is suitable for NEMA 4, 4X, 7 and 9 locations and is available with optional position transmitters and a wide range of limit switch options.

Optional 4-20mA transmitter shown



* See ordering chart on back page.

PL Series



The PL series offers many features similar to the XL series. The PL series housing is a non-metallic engineered resin and provides an excellent enclosure for harsh corrosive environments. Designed to meet NEMA 4X standards, the housing also features a unique labyrinth cover seal.

XL and PL Features:

- Pharos indicator for high contrast wide angle viewing. XL series utilizes a snap on design, PL series utilizes bolt-on design.
- Quick set spring loaded cams are extra wide and splined to allow tool free limit switch calibration.
- Switches available in a wide range of options.
- Terminal strip is multipoint and prewired.
- Housing on XL series is die cast aluminum with dichromate undercoat and electrostatic powder top coat, UL Listed and C-UL approved for hazardous locations. PL series housing is non-metallic and suitable for corrosive environments.
- Dual 0.75-inch conduit entries are standard.
- NAMUR mounting shaft eliminates coupling and maximizes interchangeability.
- Captive stainless steel cover screws.
- Potting compartments available on XL series for factory sealed leads.

Valtek XL90 Positioner
Cover and other Options



Figure 5: Cover Options

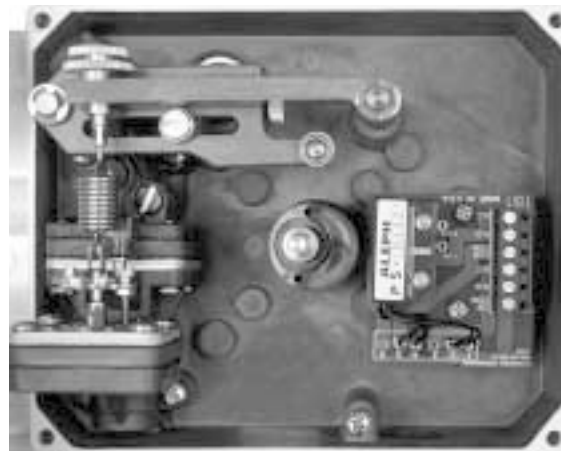


Figure 6: XL90 Proximity Switch Option (cam removed for easy viewing)

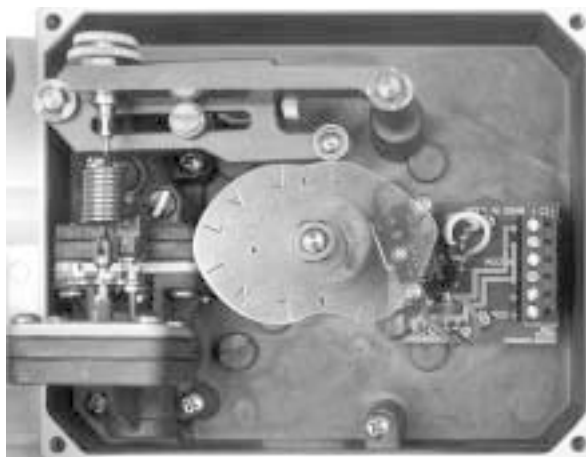


Figure 7: XL90 Mechanical Switch Option (cam dimmed for easy viewing)

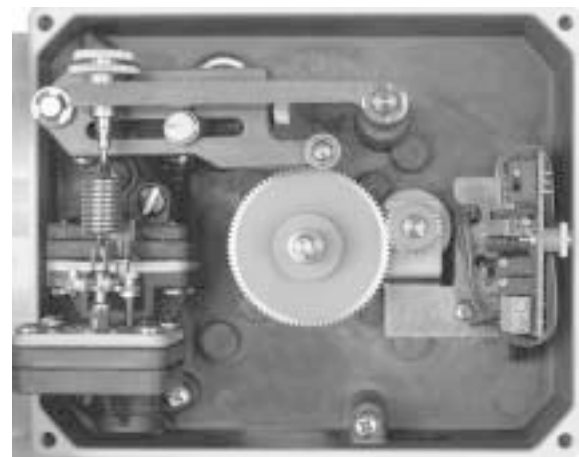


Figure 8: XL90 4-20 mA Position Feedback Option (cam removed for easy viewing)

XL90 Model Numbering System (Does not include UltraSwitch Options)

	Prefix	Input Model	Indication	Gages	Temp.	Cam	Conduit Thread Connection	Option	Output Shaft
PREFIX									
Selection									
Valtek Manufacture - White Epoxy	VW								
Sereg Manufacture - White Epoxy	SW								
Automax Manufacture - Black Epoxy	MB								
Automax Manufacture - White Food Grade Epoxy	MW								
Accord Manufacture - Black Epoxy	AB								
Accord Manufacture - White Food Grade Epoxy	AW								
INPUT MODEL									
Selection									
Pneumatic Input 3-15 psi (0.2-1.03 bar)		90							
Electro-Pneumatic Input 4-20mA <i>General Purpose NT 3000</i>		91							
Electro-Pneumatic Input 4-20mA <i>FM/CSA Explosion Proof and Intrins. Safe NT 3000</i>		92							
Electro-Pneumatic Input 4-20mA <i>CENELEC EExd (Explosion Proof) NT 3000</i>		93							
Electro-Pneumatic Input 4-20mA <i>CENELEC EExia & EExib (Intrinsically Safe) NT 3000</i>		94							
Electro-Pneumatic Input 4-20mA <i>SAA Explosion Proof eX d, Intrinsically Safe Ex ia Ex N NT 3000</i>		95							
INDICATION									
Selection									
Flat Lens with Green Indicator <i>(Standard)</i>			1						
Ultradome with Green Indicator			U						
Cover for top-mounted Namur UltraSwitch <i>(includes UltraSwitch mounting kit)</i>			T						
GAUGES									
Selection									
Stainless Steel Gauges with Brass Fittings <i>(Standard)</i>				2					
Stainless Steel Gauge (bar/psi/kPa)				4					
Stainless Steel Gauges with Brass Fittings (kg/cm ² /psi)				6					
Stainless Steel Gauges				8					
No Gauges				Z					
TEMPERATURE									
Selection									
Standard Temperature (Buna-N soft goods)					7				
Extended Temperature (Fluorosilicone soft goods)					8				
CAM									
Selection									
Accord Linear Cam						A			
Accord 30, 45, 60 & 90 Degree Linear Cam						B			
Accord Linear, Square, Square Root (Damper) Cam						C			
Accord 0-60 Degree Cam (Butterfly Valves)						D			
Sereg Linear and =% Cam - Diaphragm Actuator						E			
Valtek Linear Cam - Piston Actuator						F			
Valtek =% Cam-Piston Actuator-Rotary Valve						G			
CONDUIT THREAD CONNECTION									
Selection									
1/2" NPT (Standard)							P		
M20 Threads							R		
OPTIONS – AS NEEDED (SEE NOTES 1-4 BELOW)									
ANALOG OUTPUTS									
Selection									
4-20mA Transmitter								F	
INTERNAL LIMIT SWITCHES									
OR									
2-SPDT Mechanical Switches with High Resolution Cams								J	
2-SPDT Mechanical Switches								K	
2-SPST Proximity Switches								M	
2-SPDT Proximity Switches								N	
2-Intrinsically Safe Solid State Proximity Switches								Q	
OUTPUT SHAFT									
Selection									
Double D									D
NAMUR									L

- Notes:**
- Internal limit switches and an internal transmitter cannot be used simultaneously.
 - When options F, J, K, M, or N are used with an I/P transducer, input model number 91 must be used.
 - When option Q is used with an I/P transducer, input model numbers 90 or 92 must be used.
 - Internal limit switches or an internal transmitter cannot be used in an explosion proof environment. As an alternative, the explosion proof UltraSwitch may be mounted on top of the positioner. (Use option T.)
 - Namur shaft end connections are standard for Automax and Accord positioners, Double 'D' shaft end connections are standard for Sereg and Valtek positioners. Double 'D' shaft required for linear applications.

Valtek XL Series Positioners

Performance Test Results

Table I: XL Series Positioners Specifications

Specification	Pneumatic Module	I/P Module
Input Signal Range	3-15 psi (0.21-1.0 bar), 2- or 3-way split range; 6-30 psi (0.41-2.1 bar) 2- or 3- and 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 (2.1-10.3 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: 0.25-inch NPT; gauges: 0.12-inch NPT	Signal: 0.5 inch NPT elect. conduit; M20 Output: 0.25-inch NPT; gauges: 0.12-inch NPT
Standard Materials	Stainless steel, anodized aluminum, epoxy powder-painted steel and nitrile	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: CLI, Div 1, Grp B, C, D FM / CSA EExd, IIB + H ₂ T6 CENELEC Exd, IIB + H ₂ T6 SAA / CEPEL	Intrinsically safe: CLI, 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 Positioners Performance

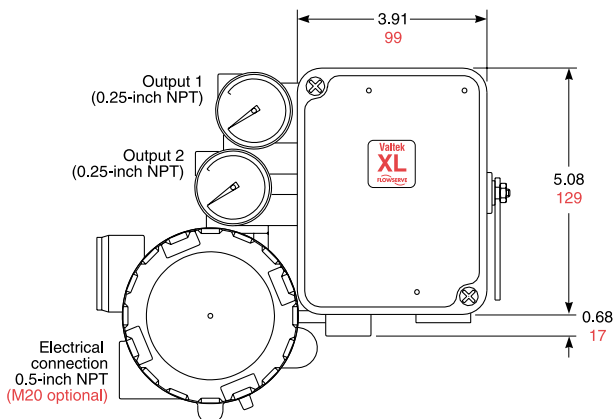
TEST		Pneumatic Model	I/P Model
Response Level – Average change in input required to cause a change in valve stem position in one direction		0.1% F.S.*	0.1% F.S.
Dead Band – Average change in input required to cause a reversal in valve stem movement		0.1% F.S.	0.1% F.S.
Resolution – Smallest possible 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 0.47 m ³ /hr	0.34 SCFM 0.58 m ³ /hr
Supply Pressure Effect – Position change for a 10 psi (0.69 bar) supply pressure change.		0.2 % F.S.	0.2% F.S.
Open-loop Gain – Ratio of actuator 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 m ³ /hr	16.5 SCFM 28 m ³ /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.	4.8 cm / sec 7.6 cm / sec

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

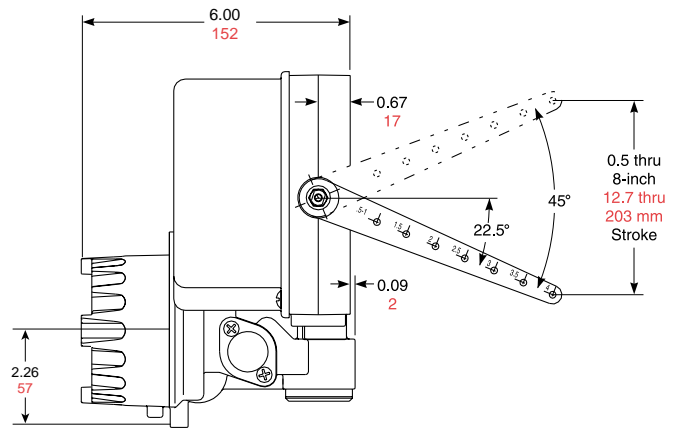
Valtek XL Positioner

Dimensions with Electro-pneumatic (I/P) Transducer

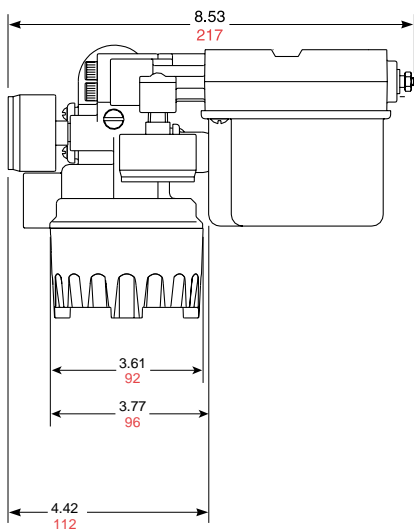
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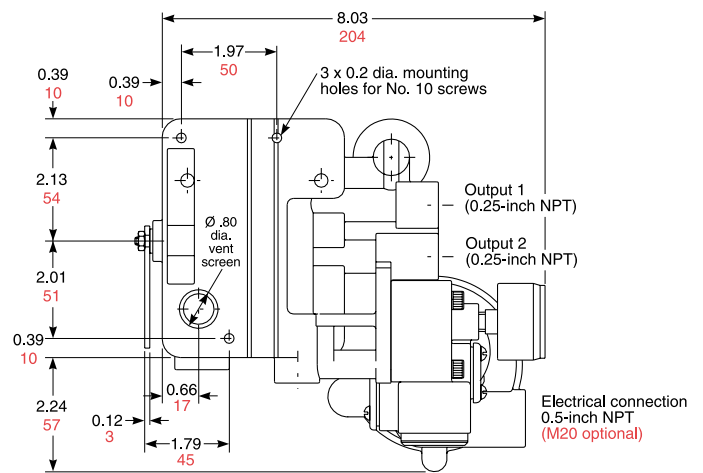
Front View



Side View



Top View

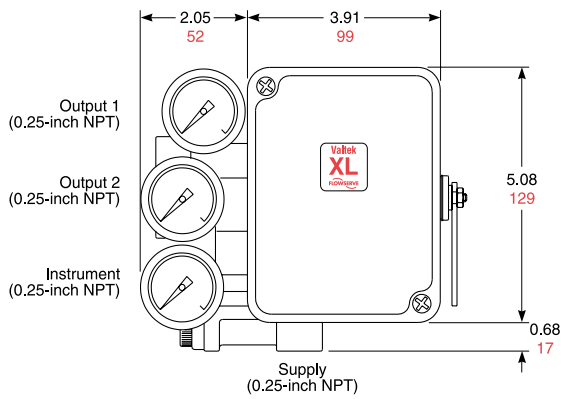


Back View

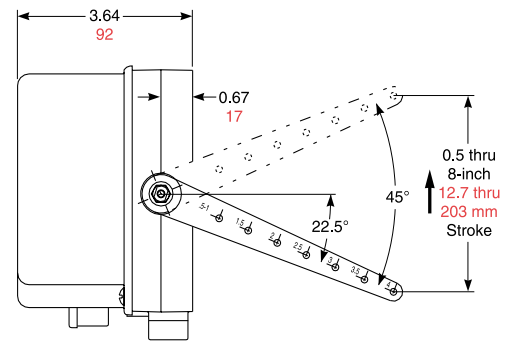
Valtek XL Positioner

Dimensions with Pneumatic (P/P) Module

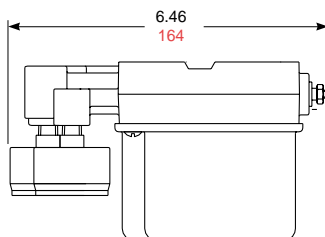
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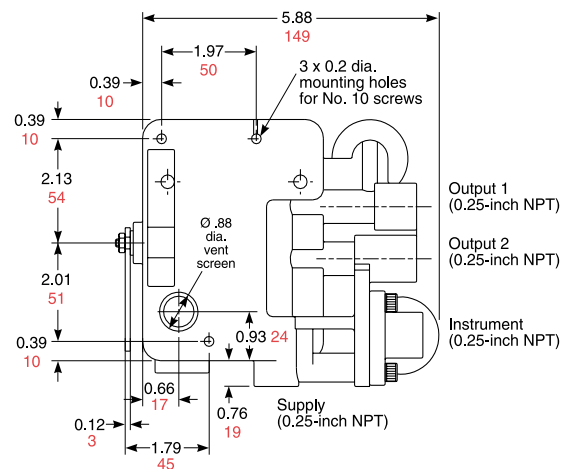
Front View



Side View



Top View

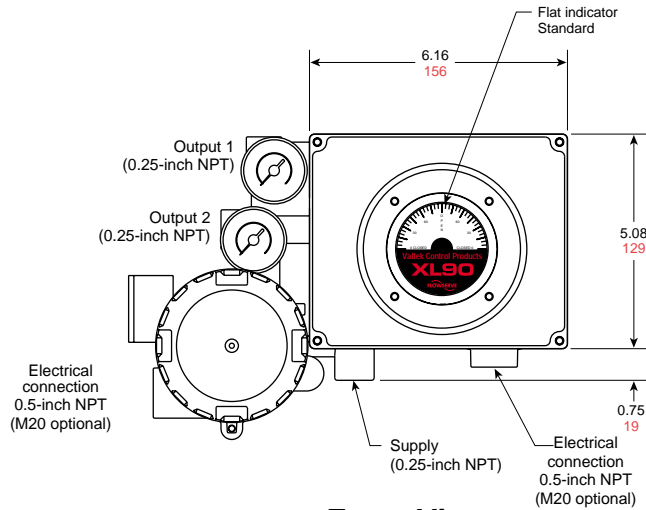


Back View

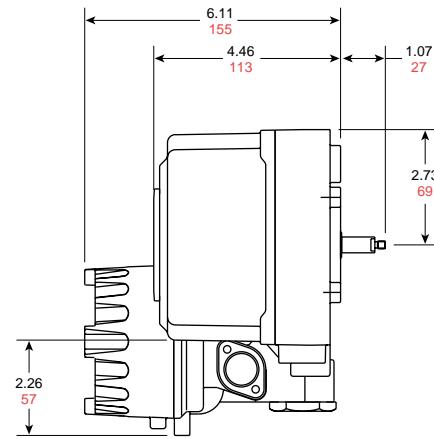
Valtek XL90 Positioner

Dimensions with Electro-pneumatic (I/P) Transducer

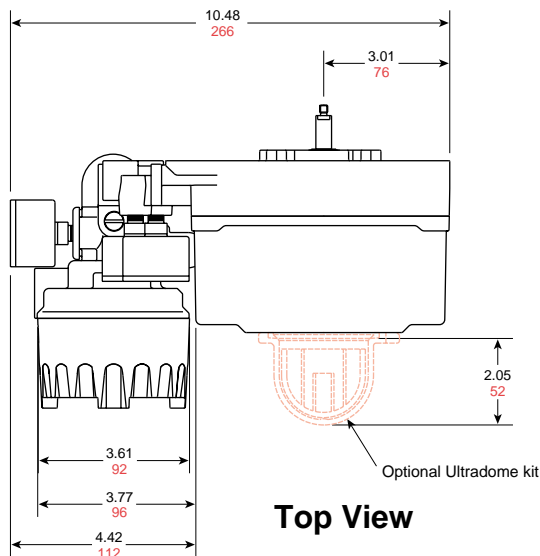
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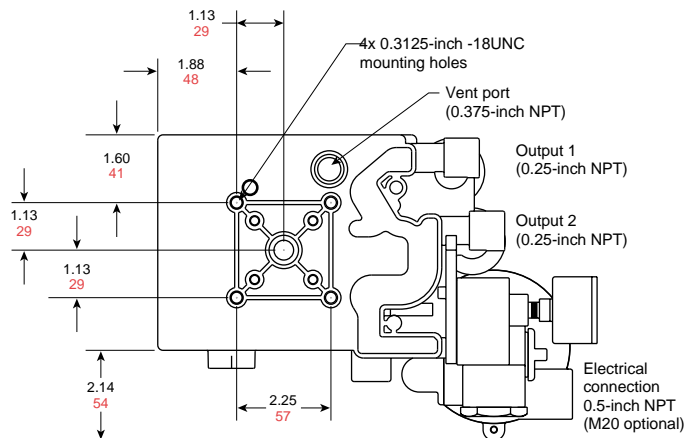
Front View



Right View



Top View

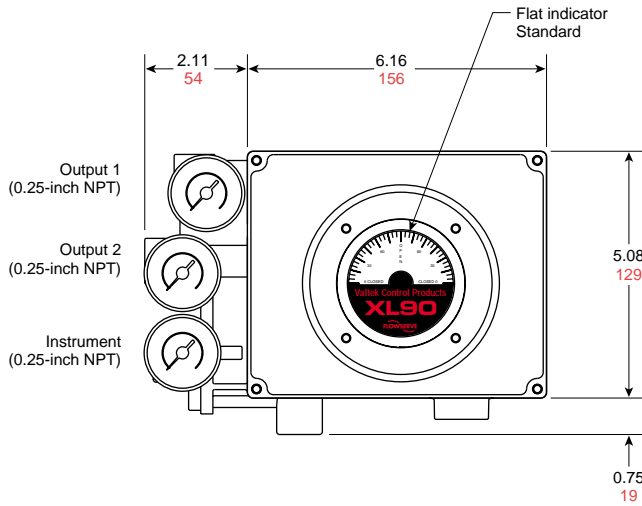


Back View

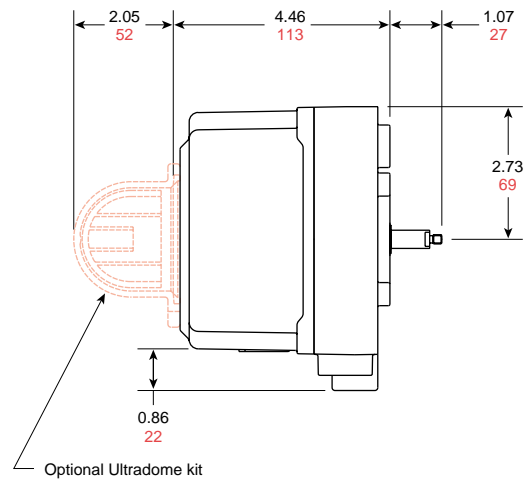
Valtek XL90 Positioner

Dimensions with Pneumatic (P/P) Module

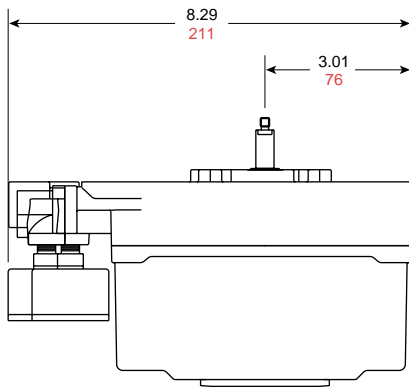
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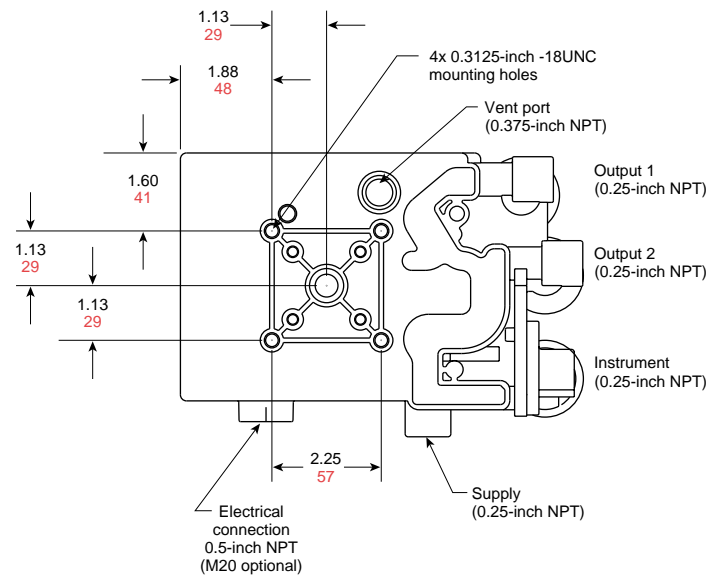
Front View



Right View



Top View



Back View

Valtek XL90 Positioner

UltraSwitch Ordering Information

UltraSwitch Ordering Information (Select Bold Type Code from each column that applies)

Model	Cover	Switches	Analog Output**
VNXL - Aluminum VNPL - Zytel	1 - Flat 2 - Pharos C - Pharos 90° 3-way D - Pharos 180° 3-way E - Pharos 180° Block Center *U - Bolt on UltraDome	0 - NONE 1 - (2) SPDT Mechanical 3 - (2) DPDT Mechanical 4 - (2) SPST Proximity 5 - (2) SPDT Proximity 7 - (2) SPDT "Go" Proximity 8 - (2) P&F NAMUR Proximity G - (2) SPDT Mechanical-Gold Plated E - (2) SPDT Sabre Proximity P - (2) SPDT Phazer Proximity T - (2) SPST BRS Proximity Contact factory for additional options	0 - NONE T - Transmitter 4-20mA A - Potentiometer 0 -1k ohm B - Potentiometer 0- 5k ohm C - Potentiometer 0-10k ohm

* PL UltraSwitch only ** Switch options 1 & 4 only; for output with no switches, specify switch option "0"

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