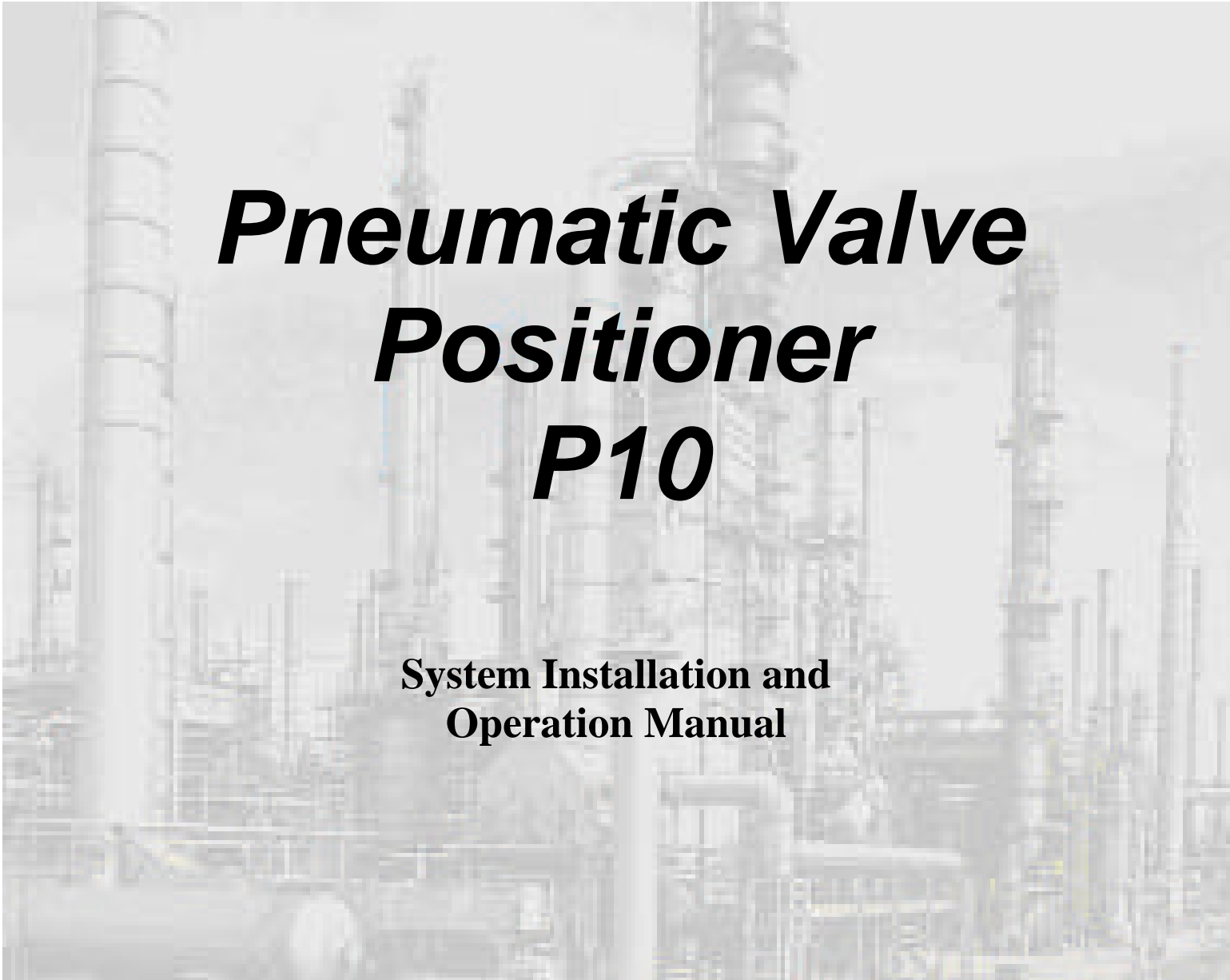


WESTLOCK
CONTROLS CORPORATION



***Pneumatic Valve
Positioner
P10***

**System Installation and
Operation Manual**

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1. Revision History

1.1. Revision 1.0

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Initial Version

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2. Introduction

General

This instruction manual provides installation, operating, calibration, maintenance, and parts ordering information for the P10 Pneumatic Valve Positioner.

The personnel qualified through training or experience should install, operate, or maintain the valve positioner only after having read and fully understood these instructions.

CAUTION

To avoid possible injury to personnel or damage to valve parts, do not touch the moving parts of the valve when positioner is operated.

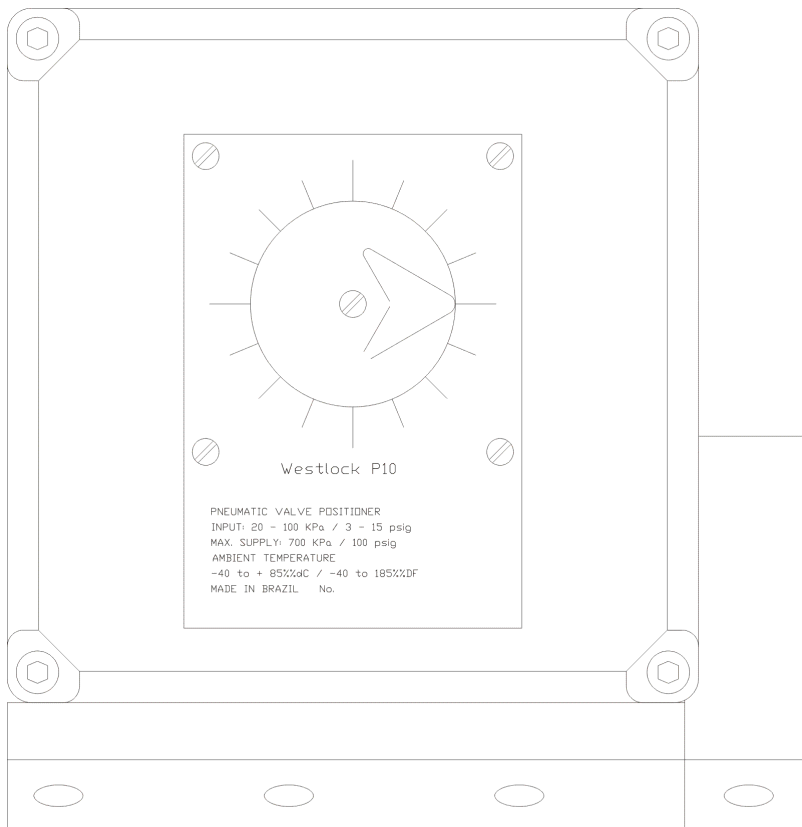


Figure1-1. P10 Pneumatic Valve Positioner

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Description

The P10 Pneumatic Valve Positioner shown in **figure 1-1** accepts a pneumatic input signal and provides fast and accurate positioning of pneumatic actuators. Typically, the input signal is 3 to 15 psi (0.2 to 1.0 bar).

The P10 is cam-characterized pneumatic valve positioner for use with either linear or rotary actuators. Available for use with single or double acting actuators, the P10 can be used in a wide variety of applications. Its rugged, durable design makes it ideal for use in harsh environments while maintaining precise, accurate positioning of the control element. A high gain, piloted spool valve in the Model P10 loads the actuator at the desired position according to the instrument signal.

Specifications

Input range

3-15 PSIG (20-100 kPa / 0.2-1.0 bar)

Supply pressure

20 - 150 psi (0.14-1 MPa)

Air consumption

0,10 SCFM (2.8 nl/min) @ 60 PSIG (4 bar)

Air delivery capacity

12,8 SCFM (370 nl/min) @ 60 PSIG (4 bar)

Stroke range

- Linear ½" to 4" based on 60° rot.
- Rotary 90°

Temperature limits

-40°C to +85°C

Performance

- Repeatability? < 0,5% of span
- Linearity? < 2 % of span
- Hysteresis? < 0.75% of span
- Dead band? < 0.3% of span
- Effect temperature? < 0.07 % / °C
- Supply Pressure Change Effect? < 0.14% of span for a 1 PSIG

Weight

- excluding options? 1.9 Kg (4.2 lbs.)
- with gauges? 2.1 Kg (4.6 lbs.)

Connection

- Connector threads? 1/4" NPT
- Gauge threads? 1/8" NPT

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Mounting

Any mounting orientation

- Diaphragm actuators according IEC 534-6 (NAMUR)
- Rotary actuators: according VDI/VDE 3845

Housing

- Housing ED Epoxy paint Die cast aluminum
- Fasteners Stainless Steel
- Diaphragm and seals? nitrile rubber

Housing Classification

Water and dustproof housing IP65 / NEMA 4

Options

- Standard or I/S I/P unit mounted directly on the positioner
- Explosion proof I/P unit mounted directly on the positioner
- Input signal 6 – 30, 3 – 27 PSIG
- Stainless Steel housing
- supply, output and input signal pressure gauges

3. Installation

General

The P10 is for use with either linear or rotary, and single or double acting actuators. The positioner can be set up for direct or reverse acting.

When a control valve is ordered with a P10 valve positioner specified to be mounted on the actuator, the factory-mounted valve positioner is connected to the actuator with the necessary tubing and adjusted in accordance with specifications of the customer.

If the valve positioner is purchased separately for mounting on a control valve already in service, the appropriate bracket for attaching the unit to an actuator must be ordered at the same time.

Figure 2-1 shows the mounting dimensions. The positioner is equipped with shaft according to VDI/VDE 3845 and ISO F holes (mounting flange-drilling pattern).

WARNING

To avoid possible injury to personnel or damage to valve parts?

Make sure to disconnect supply pressure before installing or removing the positioner from the valve.

After to use bypass valves, vent the pneumatic actuator loading pressure and relieve any actuator spring precompression.

Before mounting the P10, note the following recommendations?

- Ensure that any foreign material or a mounting bracket may clog the exhaust ports.
- Ensure that all bolts are fully tightened. The recommended torque is 16-lbf?ft (22 N?m).

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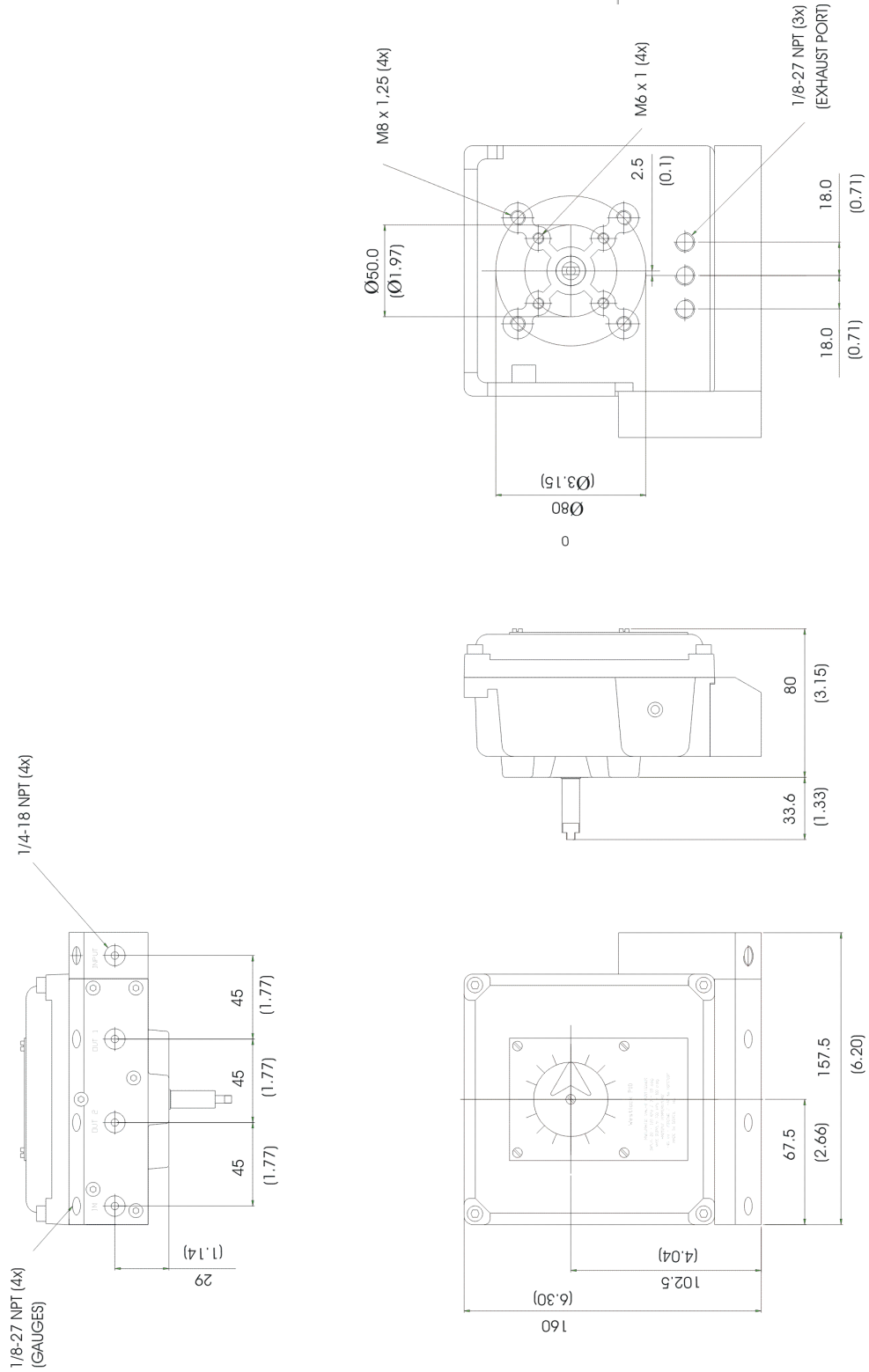


Figure 2-1. P10 Dimensions and Connections Locations

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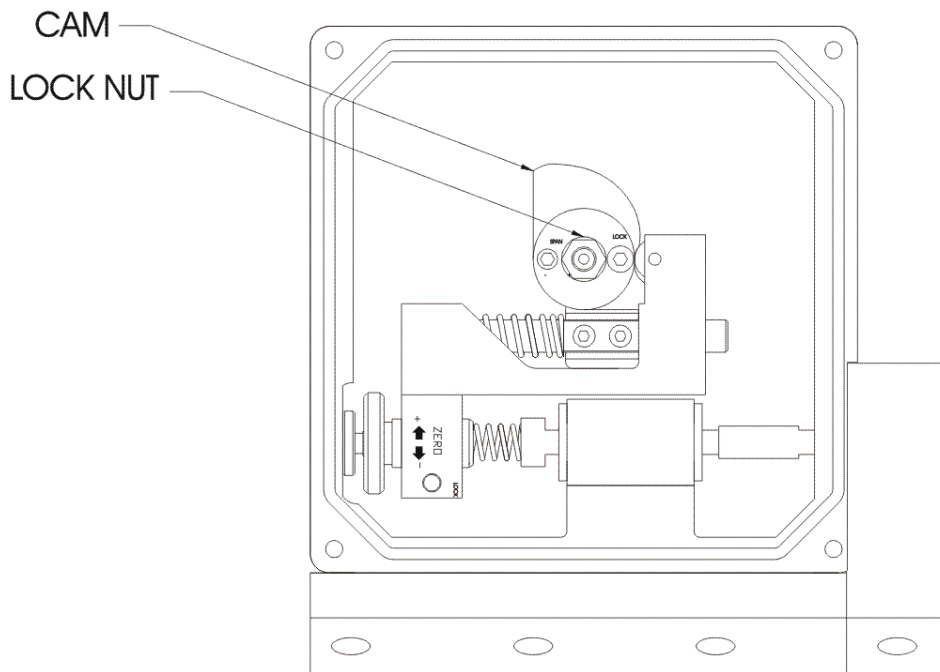
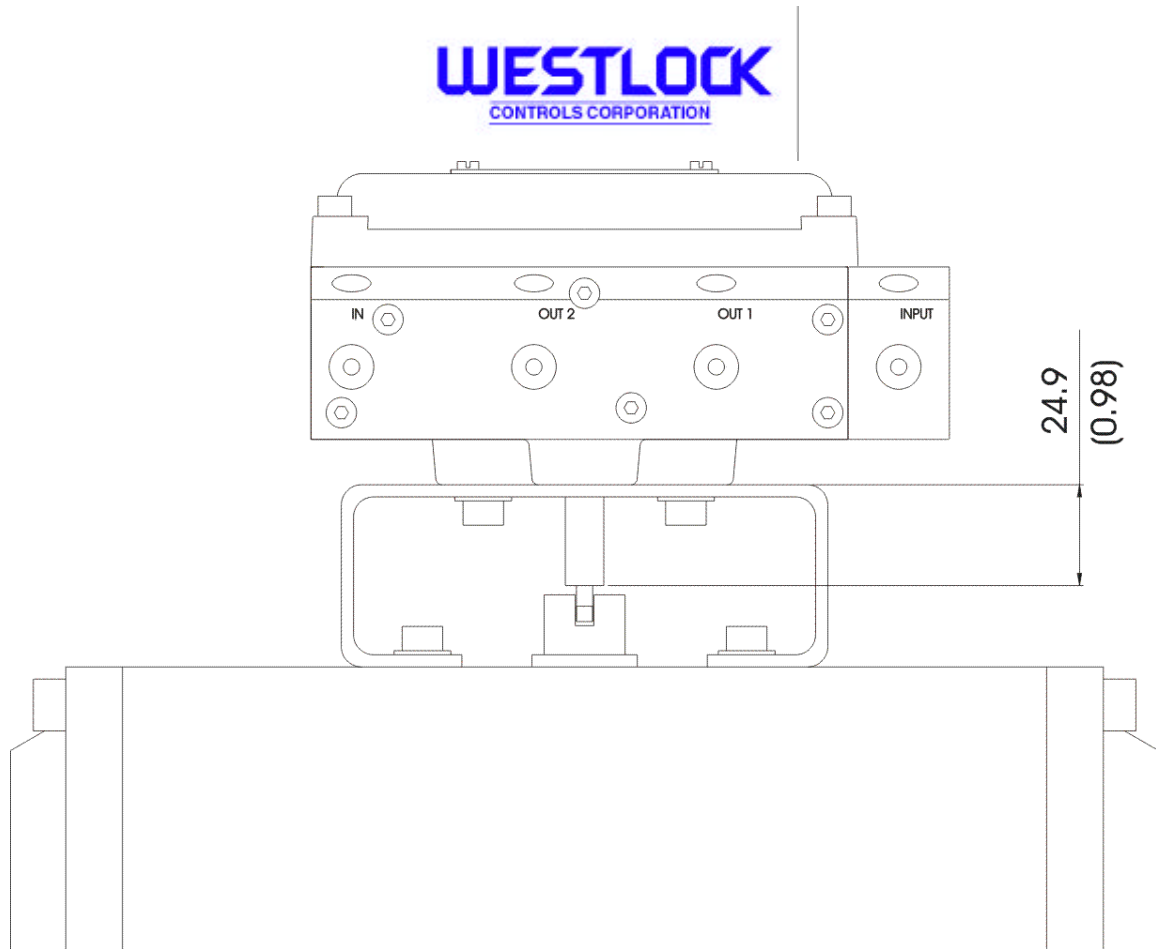


Figure 2-2. P10 Mounted on Rotary Actuator

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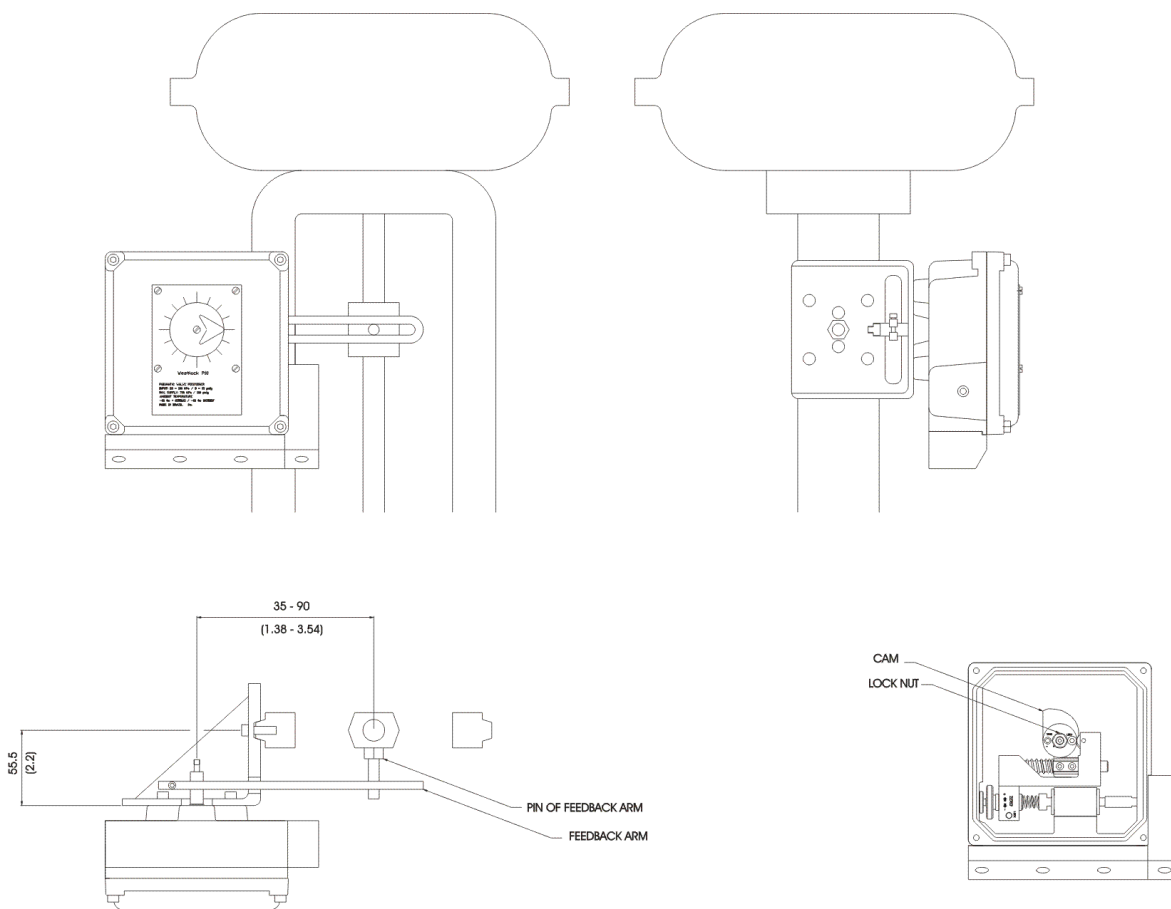


Figure 2-3. P10 Mounted on Linear Actuator

Mounting on the rotary actuators

Figure 2-2 shows P10 mounting on the rotary actuators.

1. Release all pressure from the pneumatic actuator and determine the actuator action (clockwise or counterclockwise rotation). In spring-return actuators as determined by the spring.
2. Remove the cover. Loosen the lock nut below the indicator on the shaft. Make sure that the cam is rotating freely.

NOTE

For information on the various cam mounting styles and positions, refer to the 'Cam' section, Section 3.

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3. Attach the mounting bracket according to VDI/VDE 3845 to the P10 housing with screws and lock washer.

The P10 can mount to the actuator in any one of four possible mounting quadrants. Determine the desired mounting position then proceed with the next step.

4. Attach the positioner mounting bracket to the actuator. Make sure positioner shaft and actuator shaft are engaged and centered.

5. Stroke actuator to verify there is no misalignment throughout stroke. If necessary repeat steps 3 and 4.

Mounting on the linear actuators

Figure 2-3 shows P10 mounting on linear actuator.

1. Release all pressure from the pneumatic actuator and determine the actuator action (air to open or air to close). In spring-return actuators as determined by the spring.

2. Remove the cover and the indicator. Loosen the lock nut below the indicator on the shaft. Make sure that the cam is rotating freely.

NOTE

For information on the various cam mounting styles and positions, refer to the "Cam" section, Section 3.

3. Attach the pin of feedback arm on valve stem between two jam nuts or using a tapped M6.

4. Attach the mounting bracket according to IEC 534-6 (NAMUR) – (casting yoke or pillar yoke) to the P10 housing with screws and lock washer.

5. Loosen the feedback arm to the shaft of the positioner.

6. Attach the positioner mounting bracket to the actuator yoke using screws and lock washers.

7. Attach the pin of the feedback arm to feedback arm

8. Stroke actuator to verify there is no misalignment throughout stroke. If necessary repeat steps 4 and 6.

Pressure Connections

As shown in **figure 2-1**, the connector threads are 1/4"-18 NPT female connections and the gauge threads are 1/8"-27 NPT female connections. For information on the various tubing size, refer to the appropriate actuator instruction manual.

WARNING

P10 is supplied with all pneumatic ports (supply, output and gauges) with a plastic plug to protect from direct exposure to weather. Remove during the installation.

NOTE

Use sealant on threads.
Sealing tape is not recommended.
Make sure that sealant does not migrate into the positioner.

WARNING

Make sure that all lines be completely purged.

Supply Pressure

Air supplied to the P10 must be quality instrument air, i. e., dry, clean and non -corrosive that meets the requirements of ISA Standard S7.3-1975 (R1981).

NOTE

According ISA Standard S7.3 – Quality Standard for Instrument Air

Dew point?	At least 18°F (10°C) below minimum plant ambient temperature
Size of particles	Filtered to below 5 microns
Oil content	1 ppm w/w (maximum)
Contaminants	Free of all corrosive contaminants and hazardous gases, flammable or toxic.

WARNING

Make sure that air supply pressure does not exceed the maximum rating accepted by the positioner or actuator.

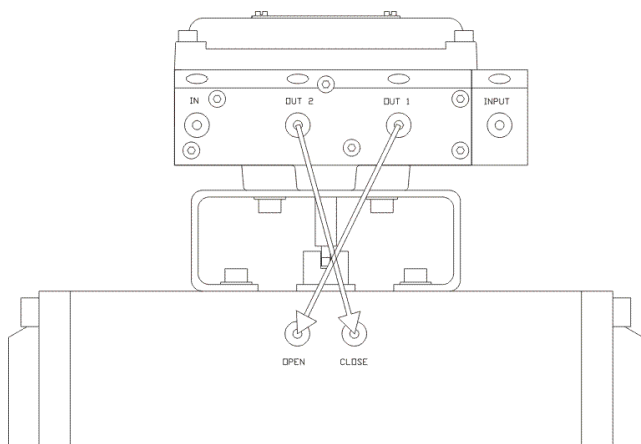
A filter-regulator capable of removing particles 10 microns in diameter is recommended for most applications.

Output Connections

Figure 2-4 shows output connections and acting of actuator.

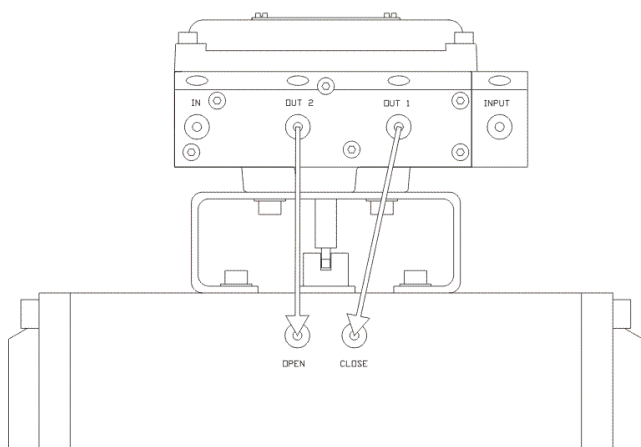
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Double Acting Actuator (Double Return):

For double acting actuators Outlet Port 2 is piped to drive the actuator towards the fail position. Outlet Port 1 is piped to drive the actuator to the span position.



Single Acting Actuator (Spring Return):

For single acting actuators Outlet Port 2 is to be plugged. Outlet Port 1 is to be piped to drive the actuator to the span position.

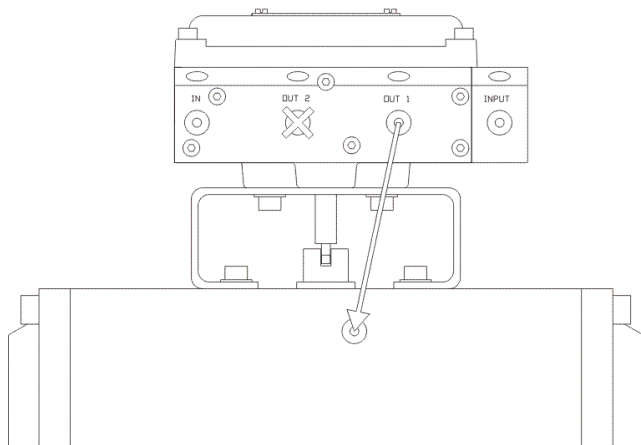


Figure 2-4. Output Connections and Acting of Actuator



Use OUT1 and OUT2 positioner output connections to the pneumatic actuator input connections. OUT1 is always connected to the actuator port used to drive actuator away from its start or fail position. OUT2 is connected to the opposite port or may be plugged for spring return actuators.

Input Signal

The pneumatic input signal ranges are 3-15 psig (20-100 KPa). Split ranges are available. Positioners with different input signal (i.e., 6-30 psig and 3-27 psig) require a different diaphragm. Refer to the ordering code to specify.

Exhaust Ports

The constant bleed of supply air from the spool valve is directed out the exhaust ports, which are 1/8 " NPT female connections. **Figure 2-1** shows the location of the exhaust ports. The P10 should not be mounted in a location where foreign material may clog the exhaust port.

WARNING

Ensure that any foreign material or a mounting bracket may clog the exhaust ports. Remove all shipping plugs from exhaust ports prior to operating positioner.

If a remote exhaust is required, the exhaust line must be as short as possible with a minimum number of bends and elbows.

Signal Interruption

Upon a loss of input signal the output identified as OUT1 (output pressure 1) goes to nearly zero, while the output identified as OUT2 (output pressure 2) goes to nearly the air supply pressure.

4. Calibration

General

Before beginning calibration, be sure the P10 is correctly mounted as described in the "Installation" section, Section 2.

CAUTION

Changes to the positioner setup may cause changes in the output pressure or valve travel.

CAUTION

Throughout the calibration of the positioner, avoid touching spring of the spool valve and pin of diaphragm as they unexpectedly move automatically.

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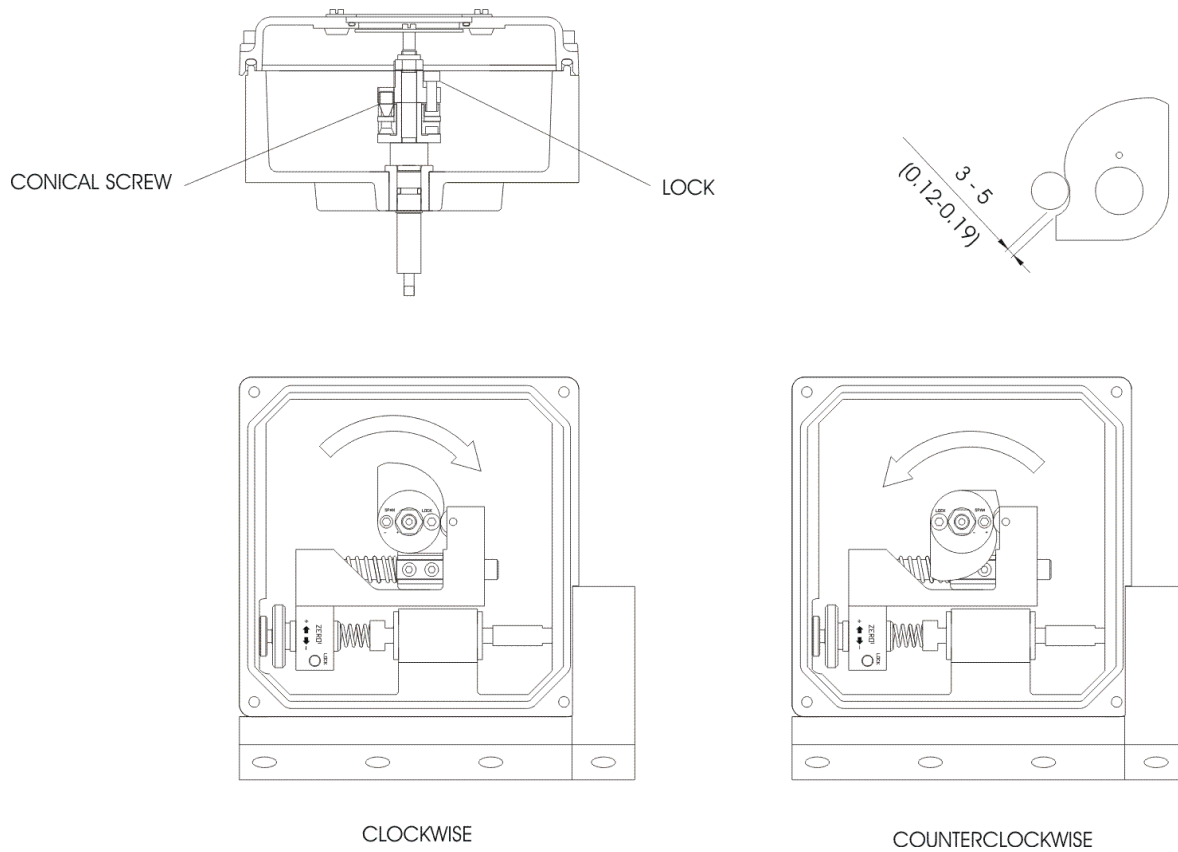


Figure 3-1. Cam Adjustment

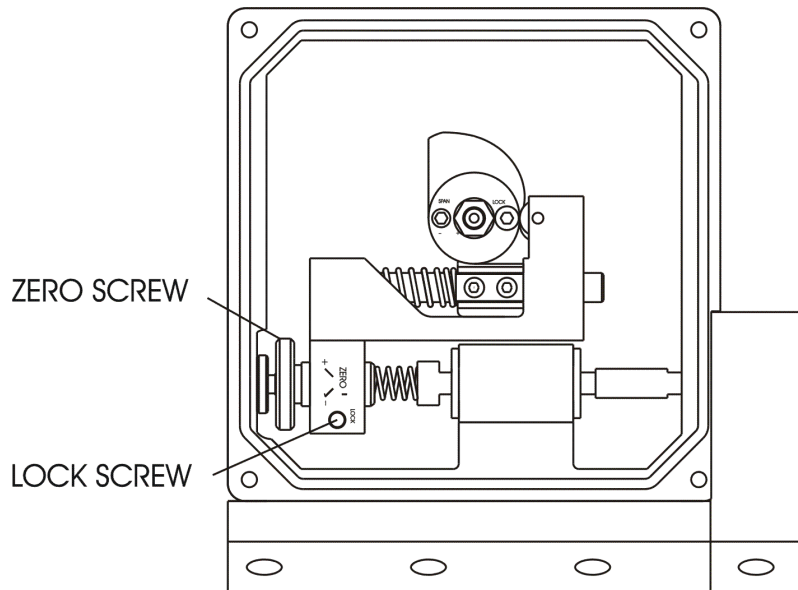


Figure 3-2. Zero Adjustment

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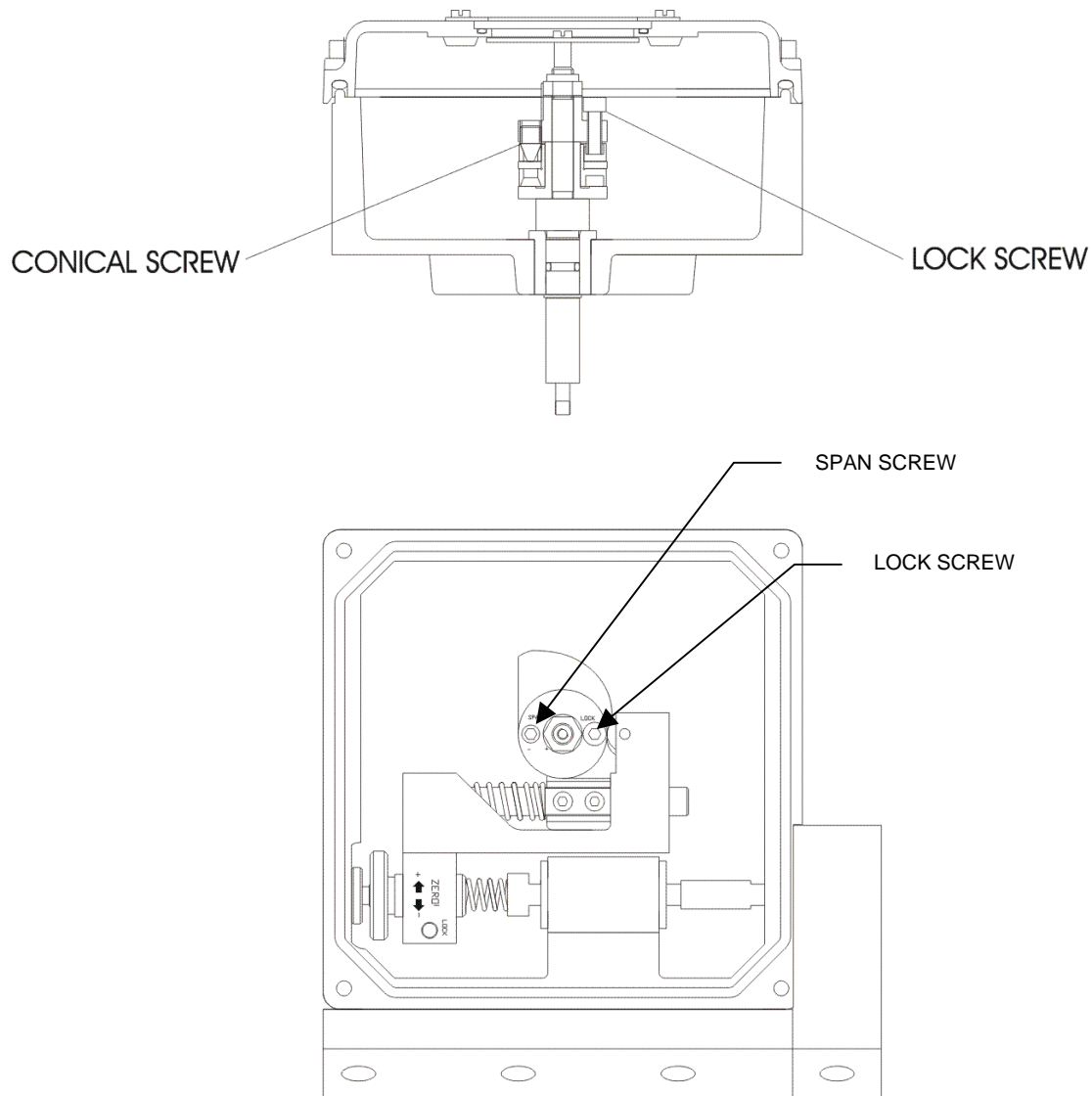


Figure 3-3. Span Adjustment

Cam adjustment

Figure 3-1 shows cam adjustment.

The standard cam is 90° rotation, and 3-15 psi for input signal operation. The cam assembly is positioned on the shaft with the flange of adjustment of span and the locking nut according the desired cam rotation – clockwise or counterclockwise. Proper adjustment is achieved when?

1. Place cam assembly according desired cam rotation – clockwise or counter-clockwise, see Figure 3.1. Cam is pre-set from factory for counter-clockwise (direct acting)

2. Loosen the locking nut until the cam assembly loosens
3. Loosen the lock screw at the flange of adjustment of span
4. Keep the conical screw aligned at the surface of the flange of adjustment of span
5. To align the low signal with the ball bearing make sure that always is riding on an active lobe of the cam.
A gap of 3-5 mm from the stopper is enough, see Figure 3.1.
6. Tighten locking nut

NOTE

Prior to zero and span position adjustment, release both the zero and span lock screws.

Zero Adjustment

Figure 3-2 shows zero adjustment.

The zero adjustment is made with zero screw. Proper adjustment is achieved when?

1. Apply low input signal (i.e., 3 psi)
2. Turn zero screw (see Figure 3-2) until desired zero position is set.
3. Tighten zero lock screw.

Span Adjustment

Figure 3-3 shows span adjustment.

1. The span adjustment is made with conical screw. Proper adjustment is achieved when?
2. Apply high input signal (i.e., 15 psi)
3. Turn the Span screw (see Figure 3-3) until the desired span position is set. The span adjustment allows adjustment between 85° and 95° from zero point. Apply low input signal (i.e., 3 psi) and repeat zero and check adjustment (repeat zero adjustment if necessary).
4. When zero and span are adjusted, first lock the span screw, then lock the zero screw.
5. Replace the cover.

5. Principle of Operation

The main parts of the P10 are spool valve, diaphragm and cam.

The diaphragm receives an input pressure signal from the controller. The input pressure applies a force at the diaphragm, which in the equilibrium state, will be equal to the force applied by the spring of the spool valve.

Therefore, upon every position change caused by the positioner, the input pressure increases or decreases according to the signal from the controller, which changes the position of the spool, thus modifying air pressure to the actuator. The cam transmits valve movement to the spring of the spool. The new balance state will have until a spring force exactly force of the diaphragm.

Spool Valve

The spool valve ensures a quick valve positioning by providing supply airflow to and from the actuator to the exhaust port.

Diaphragm

The diaphragm is used to convert the input signal pressure into force. As the input pressure increases or decreases, the diaphragm moves, causing the spool valve to the supply port to the actuator and close the exhaust port, or vice-versa.

Cam

Cams can be used to achieve the desired response to signal changes. From linear, to equal percentage, quick opening, or special rotations.

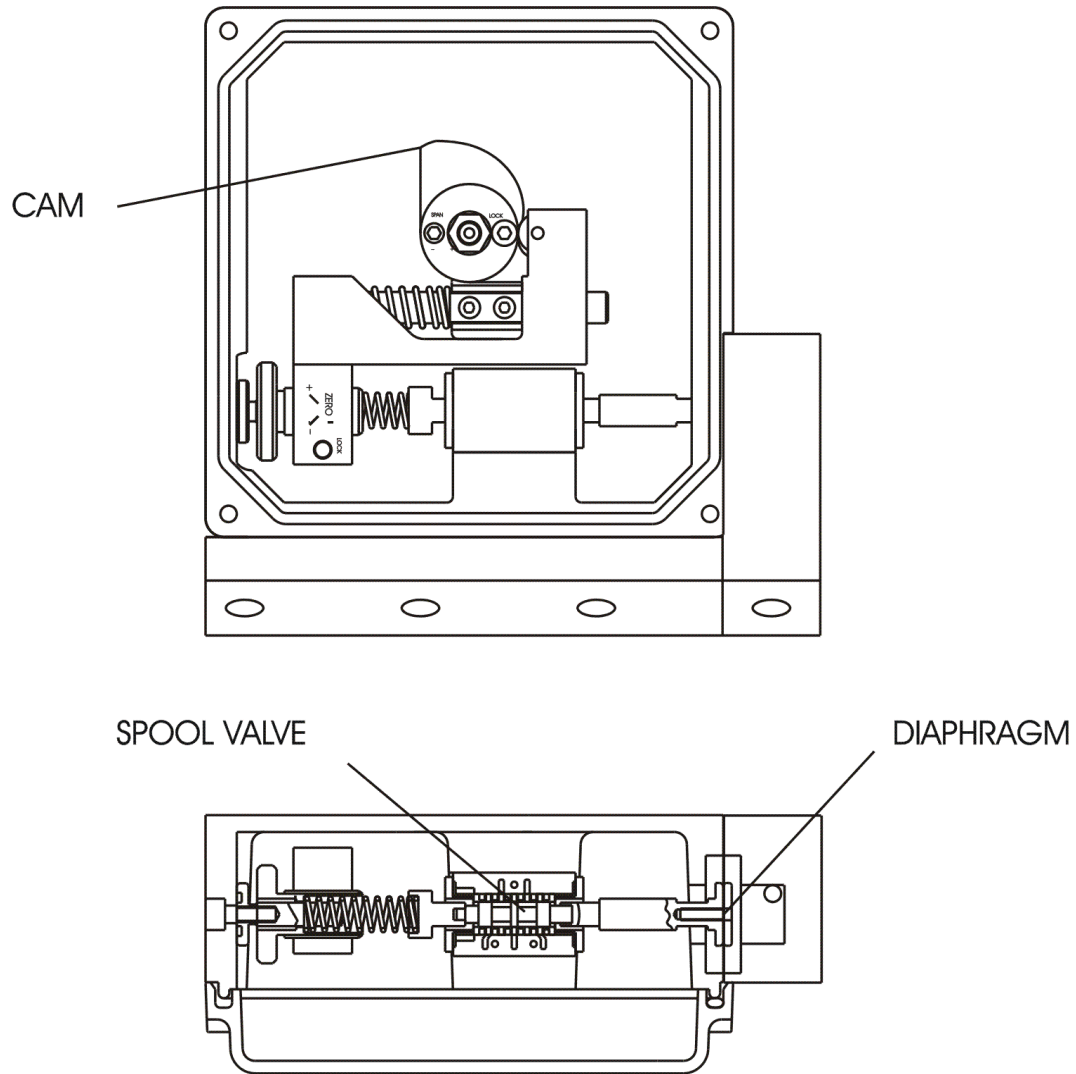


Figure 4-1. Principle of Operation

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