

Installation and Operation Manual



EPR (EPX) / EPL Series Electro-Pneumatic Positioner

Contents

1.	Safety Instructions	3
2.	Description	4
3.	Principle of Operation	4
4.	Specifications	5
5.	Internal Views	6
5.1.	EPR (EPX) Positioner	6
5.2.	EPL Positioner	6
6.	Installation	7
6.1.	Mounting EPR (EPX) Positioner	7
6.2.	Mounting EPL Positioner	8
7.	Cam and Indicator Adjustment	9
8.	Position Span Adjuster	9
9.	Air Connections	10
9.1.	EPR (EPX) Positioner	10
9.2.	EPL Positioner	11
10.	Electrical Connections	12
10.1.	General Wiring	12
10.1.1.	Limit Switches	12
10.1.2.	Position Transmitter	12
10.1.3.	Transmitter Calibration	13
10.2.	Wiring for Intrinsic Safety Ex ia IIC T6	13
10.2.1.	Connection to Terminals	13
10.2.2.	Connection to Cable Gland	14
10.3.	Wiring for Flameproof Ex dmb IIC T6/T5, Ex dmb IIB T6, Eex md IIB T5	14
10.4.	Connection to Cable Gland	14
11.	Zero and Span Setting	15
12.	Optional Restricted Pilot Valve Orifice	15
13.	Auto / Manual Operation	16
14.	Troubleshooting	16
15.	Dimensions	17

1. Safety Instructions

These safety instructions are intended to prevent hazardous situations and/or equipment damage. These instructions indicate the level of potential hazard.



WARNING: Identifies a potentially hazardous situation or practice that may lead to serious personal injury or death.



CAUTION: Indicates general precaution that could lead to minor personal injury or damage to equipment.

- This device was shipped from the factory in a proper condition to be safely installed and operated in a hazard-free manner. The notes and warnings in this document and on the actuator should be maintained and followed to ensure safe operation of the device.
- Take all necessary precautions to prevent damage to the positioner due to rough handling, impact, or improper storage.
- Do not use abrasive compounds to clean the actuator, or scrape metal surfaces with any objects.
- The system controlling the positioner must have proper safeguards to prevent damage to equipment, or injury to personnel should failure of system components occur.
- A qualified person in terms of this document is one who is familiar with the installation, commissioning and operation of the positioner and associated equipment, and who has appropriate qualifications, which may include:
 - Is trained in the operation and maintenance of electric equipment and system in accordance with established safety practices.
 - Is trained or authorized to energize, de-energize, ground, tag and lock electric circuits and equipment in accordance with established safety practices.
 - In cases where the actuator is installed in a potentially explosive (hazardous) location, is trained in the installation, commissioning, operation and maintenance of equipment in hazardous locations.
- The positioner must be installed, commissioned, operated and repaired by qualified personnel.
- All installation, commissioning, operation and maintenance must be performed under strict observation of all applicable codes, standards and safety regulations.
- Reference is specifically made here to observe all applicable safety regulations for positioners installed in potentially explosive (hazardous) locations.

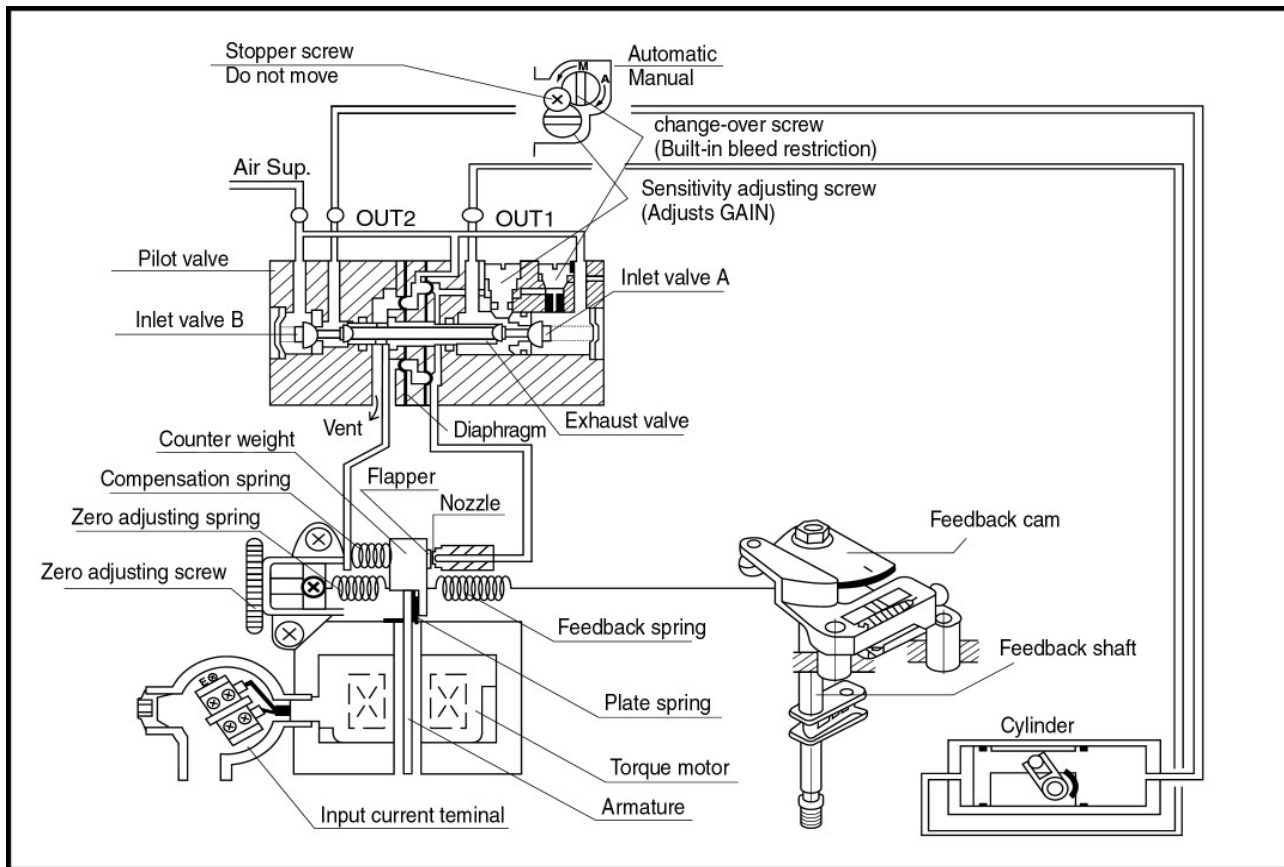
2. Description

The EPR series are electro-pneumatic positioners controlled with a 4-20mA signal for operation of quarter-turn valves.

3. Principle of Operation

As the input signal current (4-20mA) from the controller increases, the plate spring of the torque motor works as a pivot. As the armature receives the rotary torque in the counterclockwise direction, the counterweight is pushed to the left, the clearance between the nozzle and the flapper will increase, and the back pressure of the nozzle will decrease. As a result, the exhaust valve of the pilot valve moves to the right, and the output pressure of OUT1 increases (as OUT 2 decreases) to move the cylinder actuator.

The movement of the actuator in turn rotates the feedback shaft, and the feedback spring lengthens or shortens by the movement of the feedback cam connected to the feedback shaft. The actuator stays in the position where the spring force is balanced with the force generated by the input current in the torque motor. The compensation spring is for direct feedback of the motion of the exhaust valve and is connected to the counterweight to enhance the stability of the loop. The zero point is adjusted by changing the zero-adjustment spring tension.



4. Specifications

	EPR (EPX)		EPL	
Type	Rotary Type (Cam Feedback)		Linear Type (Lever Feedback)	
Action	Single Acting	Double Acting	Single Acting	Double Acting
Input Signal	4 - 20mA 24VDC (Note. 1)			
Input Resistance	235±15Ω			
Air Supply Pressure	20 - 100 PSI (1.4 – 7.0 bar), free of oil, water and moisture			
Standard Stroke	60° – 100° (Note 2)		10 – 80mm (Note 3)	
Air Piping Connection	1/4 NPT			
Conduit Connection	1/2 NPT			
Protection	IP66			
	ATEX/IECEX Ex dmb IIC T6/T5 Gb (Note 4) Ex ia IIC T6 Ga (Note 5)		-	
Ambient Temperature	Standard: -4°F to 158°F (-20°C to 70°C)			
	Ex dmb IIC T5: -40°F to 158°F (-40°C to 70°C) Ex dmb IIC T6: -40°F to 131°F (-40°C to 55°C)		-	
Pressure Gauge	Stainless Steel			
Output Characteristics	Linear			
Linearity	Within ± 1.5 % F.S			
Sensitivity	Within ± 2.0 % F.S			
Hysteresis	Within ± 1.0 % F.S			
Repeatability	Within ± 0.5 % F.S			
Air Consumption	0.18 CFM, Sup. 20PSI (5 LPM, Sup. 1.4kgf/cm ²)			
Flow Capacity	2.83 CFM, Sup. 20PSI (80 LPM, Sup. 1.4kgf/cm ²)			
Material	Aluminum Die Casting Body			
Weight	7.7 Lbs (3.5 kg) with terminal box		7.3 Lbs (3.3 kg) with terminal box	

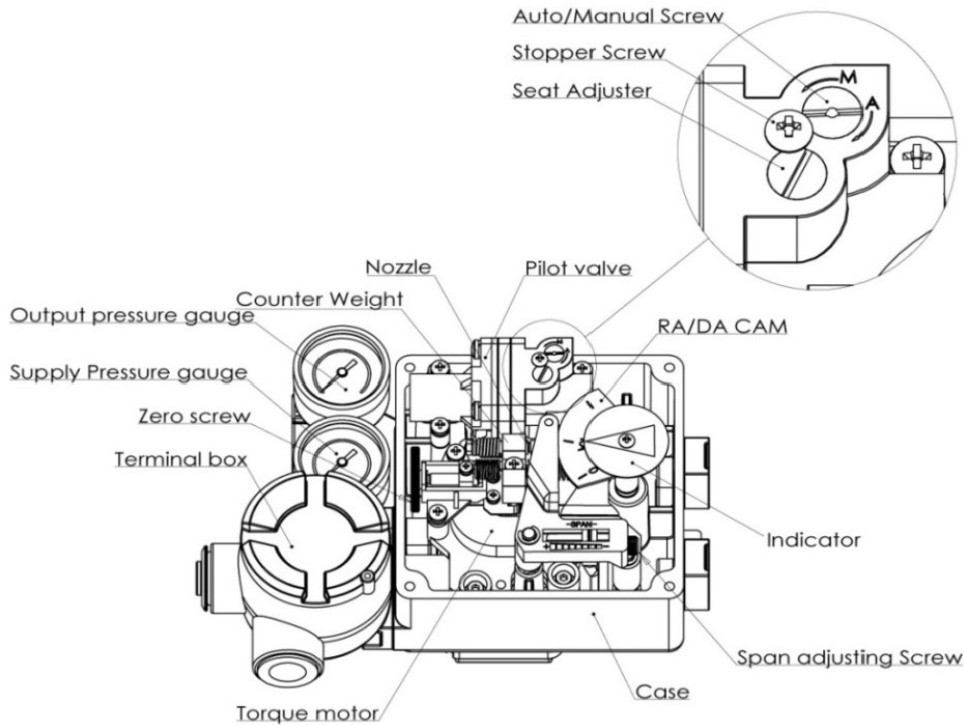
- NOTE: 1) 1/2 split range can be adjusted for 4-12mA or 12-20mA input signal
 2) Stroke can be adjusted to 0° - 60° or 0° - 100°
 3) Feedback lever for up to 150mm is available
 4) ATEX/IECEX flameproof ratings on model EPX-1000 only
 5) ATEX/IECEX intrinsically safe ratings on model EPR-1100 only

5. Internal Views

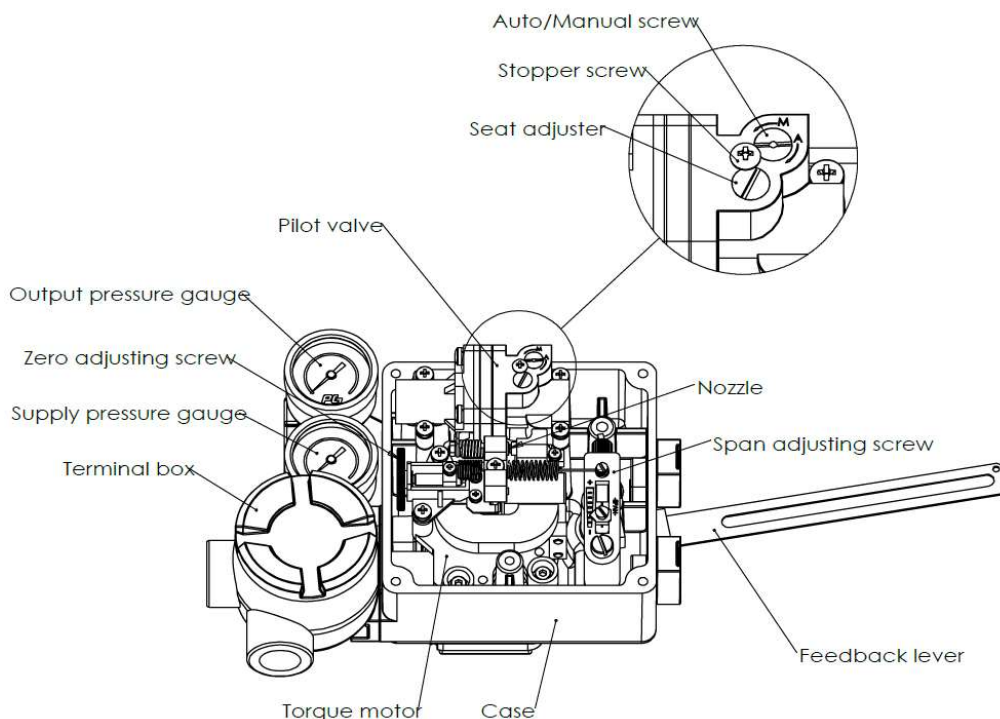


DO NOT change the seat adjuster. This sets the sensitivity and is preset at the factory. If hunting occurs, insert small pilot valve orifices.

5.1. EPR (EPX) Positioner



5.2. EPL Positioner



6. Installation

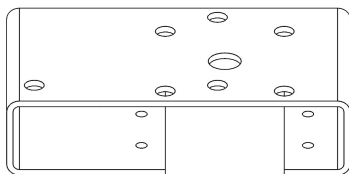


- To reduce the risk of ignition of hazardous atmospheres, disconnect the device from the supply circuit before opening. Keep assembly tightly closed during operation.
- Remove all input signals and air pressure from valve and other surrounding equipment before installing.

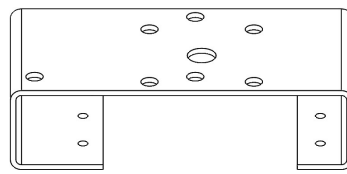
6.1. Mounting EPR (EPX) Positioner

Mounting NAMUR Type

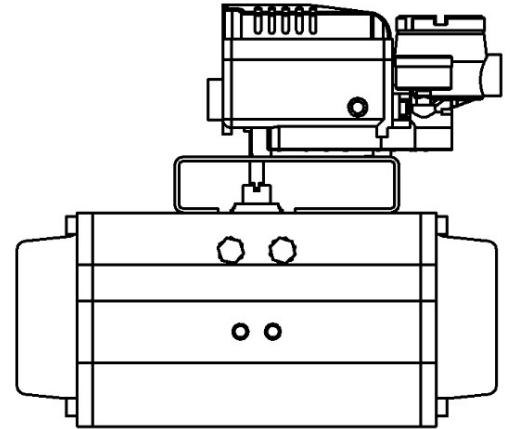
The EPR (EPX) positioner has the NAMUR shaft as standard which can be directly mounted to the top pinion (VDI/VDE 3845) of the pneumatic rotary actuator.



NAMUR Bracket
(80 x 30 x 20)



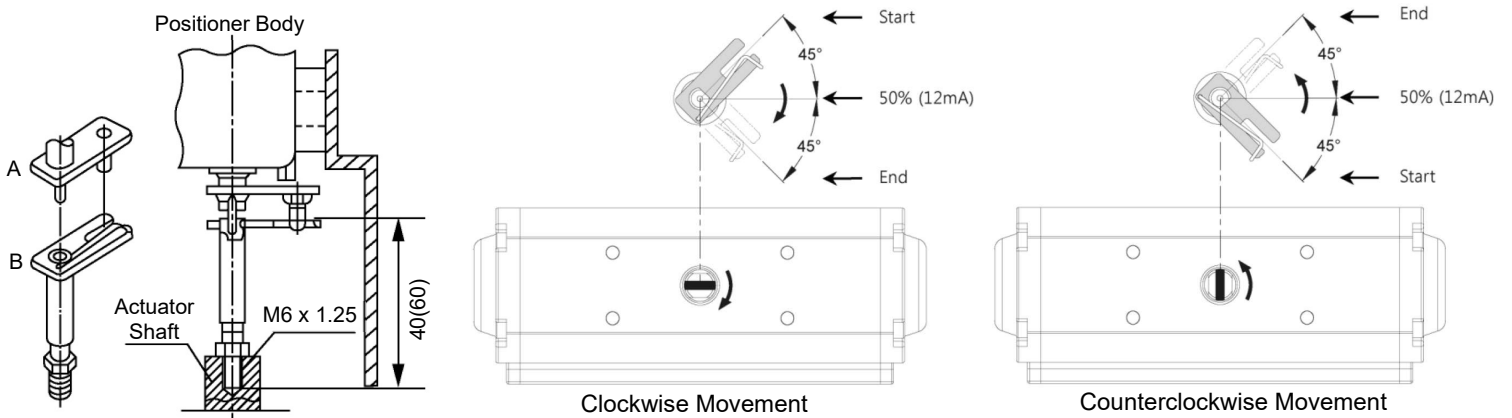
NAMUR Bracket
(130 x 30 x 30)



- 1) Mount the NAMUR bracket to the pneumatic rotary actuator with the enclosed bolts (4 x M5).
- 2) Mount the EPR (EPX) positioner to the bracket and insert the EPR (EPX) positioner feedback shaft into the actuator top pinion.
- 3) Attach the EPR (EPX) positioner to the bracket with the enclosed bolts (4 x M6).

Mounting Fork Lever Type

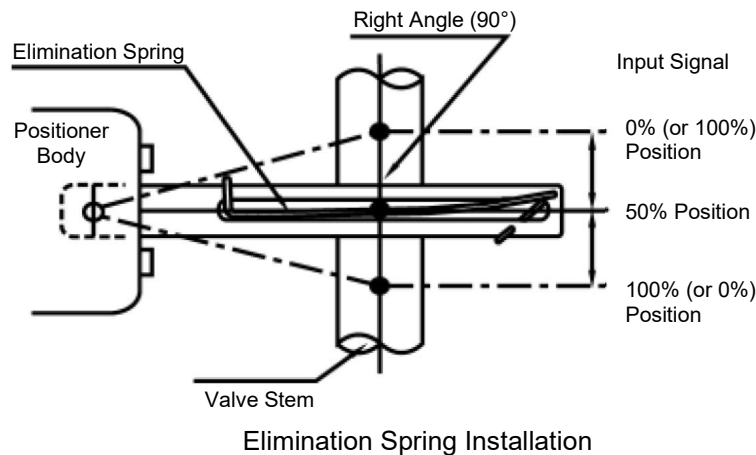
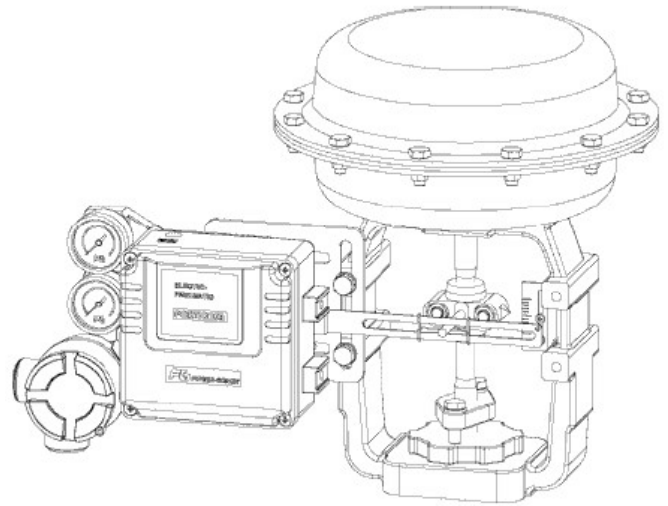
Mount the EPR (EPX) positioner to the actuator with bracket as shown. Ensure the feedback lever shaft "A" is placed in the orifice for the fork lever "B" and that they are in alignment with a rotary actuator output shaft.



6.2. Mounting EPL Positioner

Mounting and Attaching Feedback Lever

- 1) Mount the EPL positioner to the control valve as shown.
- 2) Fix the EPL positioner and the feedback lever to the control valve stem at the position where the angle between the valve stem is at 90 degrees when the input signal is set to 12mA (50%). Ensure the elimination spring is installed.
- 3) Feedback lever A is for stroke between 10-40mm. Feedback lever B is for stroke between 10-80mm. For stroke up to 150mm, connect feedback lever A and feedback lever B together.
- 4) The operation angle of the EPL is between 10° and 30°.

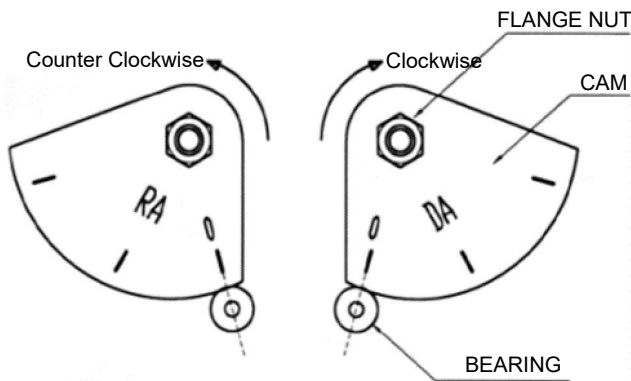


7. Cam and Indicator Adjustment

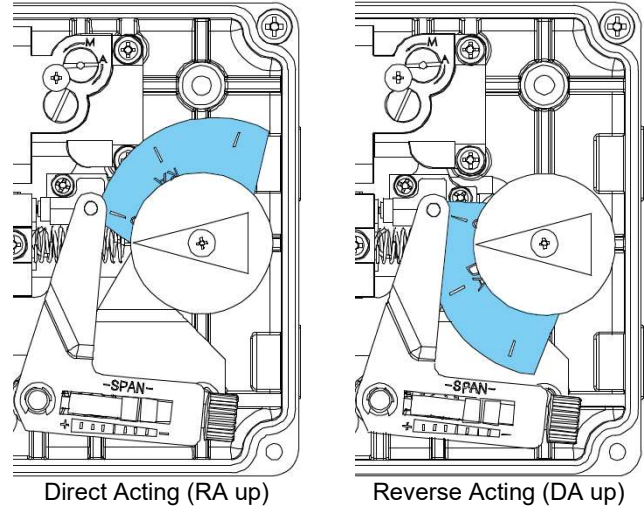


WARNING: When adjusting or replacing cams, ensure the air supply to the positioner is shut off to avoid the positioner suddenly reacting and causing possible damage or injury.

- 1) Loosen the flange nut on the cam. Match the part of the cam with "0" marked on it with the center of bearing as shown. The span adjusting arm unit should now be aligned.



NOTE: Direct Acting (RA up) is the standard factory setting.



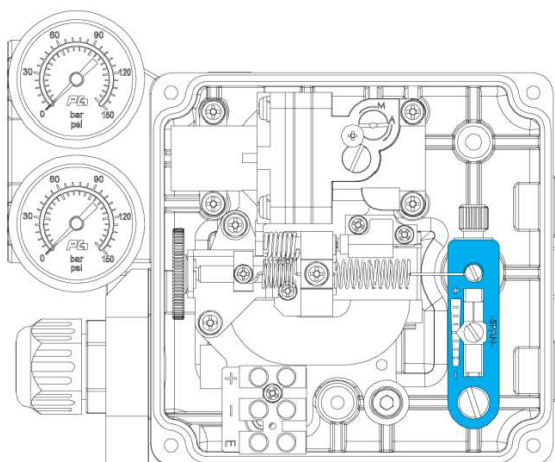
- 2) Tighten the flange nut of the cam after setting the cam.
- 3) After cam installation, proceed to adjust zero and span. Once this is complete, secure the indicator with the bolt (M6) to the feedback shaft according to the actuator type (RA or DA). The position for the indicator should be arranged in the scale (0-90 degrees) shown on the cover.

8. Position Span Adjuster

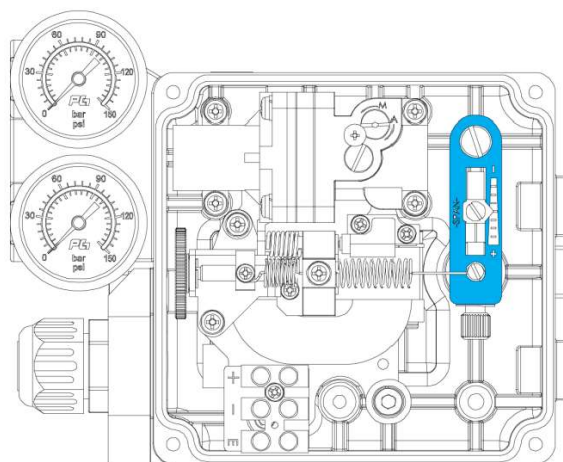


WARNING: When adjusting or replacing span adjuster, ensure the air supply to the positioner is shut off to avoid the positioner suddenly reacting and causing possible damage or injury.

Span adjuster is set to Direct acting as standard factory setting. For Reverse Acting, it is necessary to move the span adjuster as shown below.



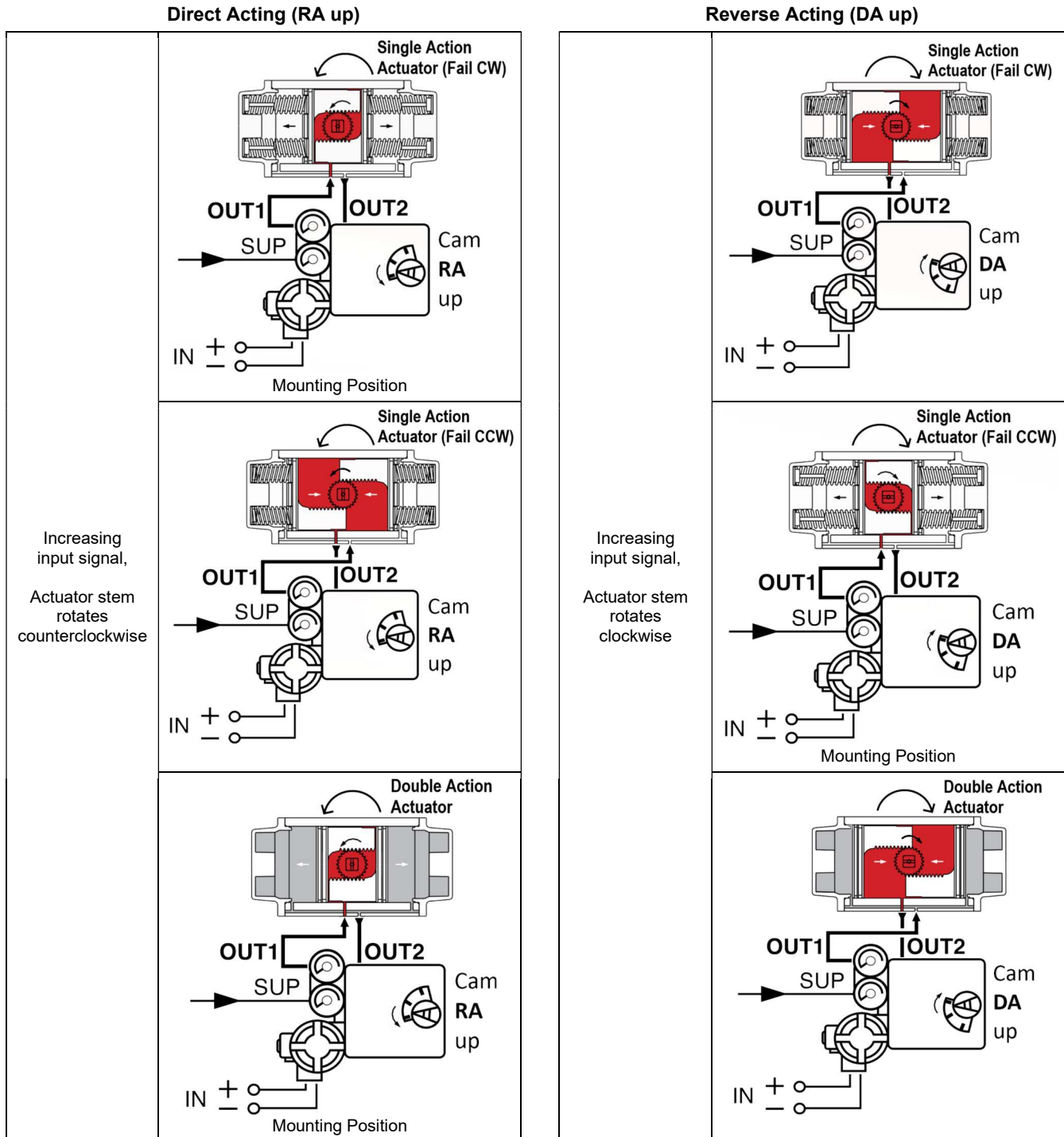
Direct Acting (Factory Setting)



Reverse Acting

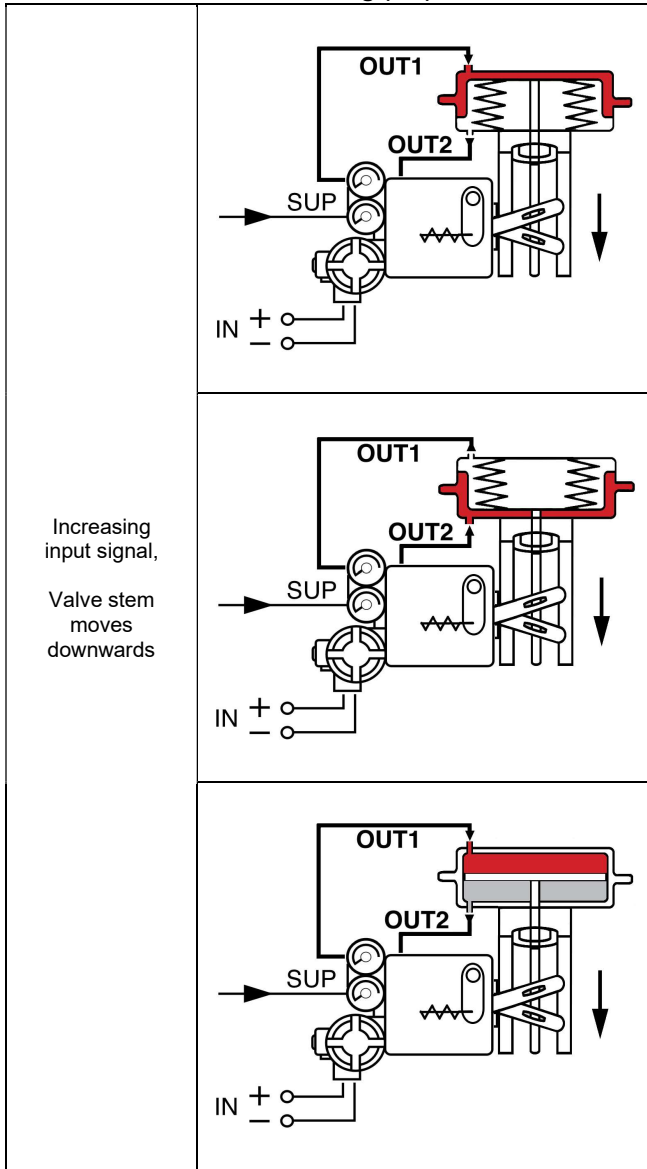
9. Air Connections

9.1. EPR (EPX) Positioner

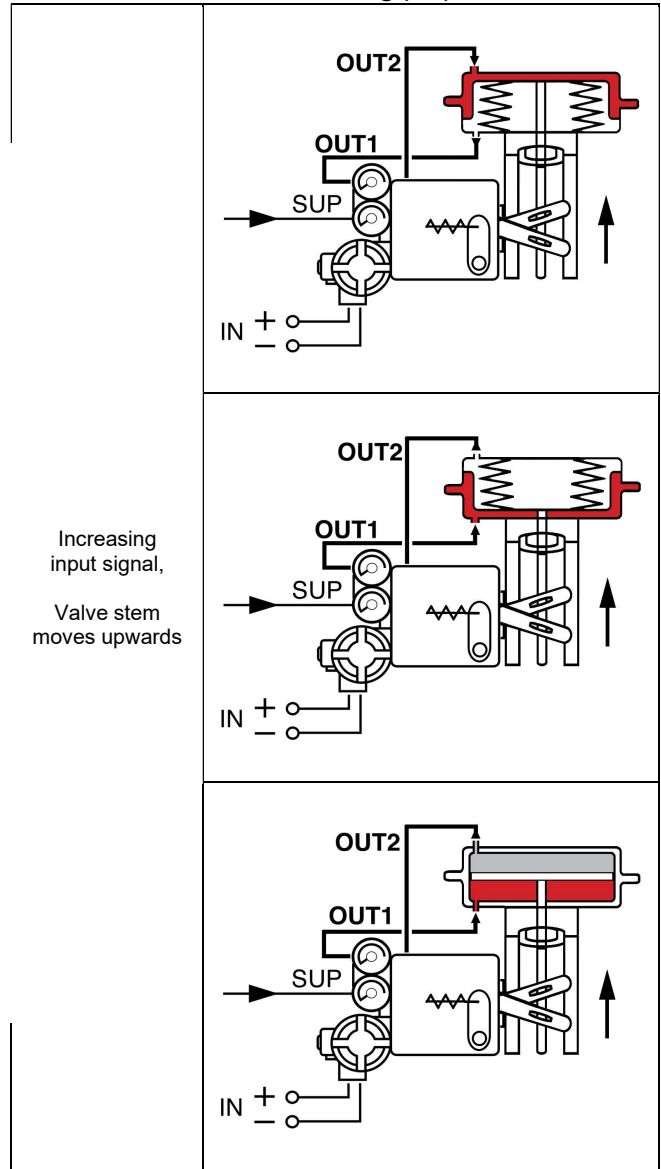


9.2. EPL Positioner

Direct Acting (DA)



Reverse Acting (RA)

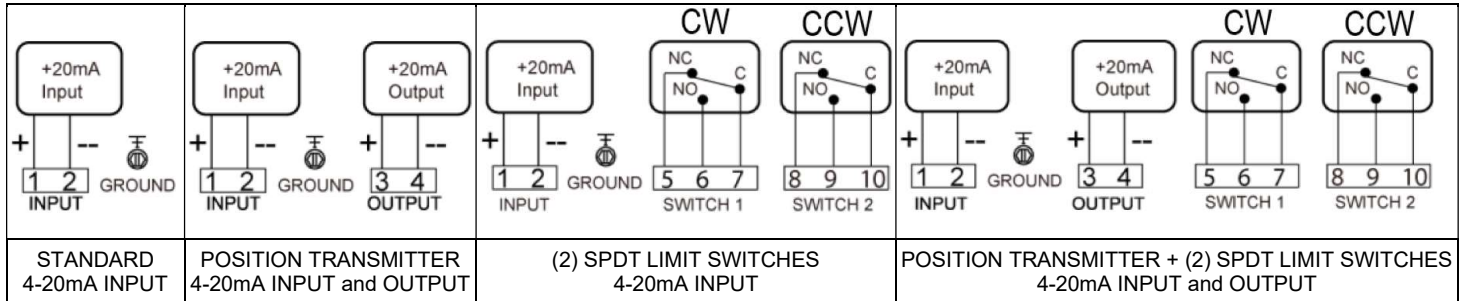


10. Electrical Connections



- Always check that the electrical load is within the range stated on the nameplate. Failure to remain within the electrical ratings may result in damage to, or premature failure of the electrical switches, sensors or transmitter electronics.
- Ensure correct polarity of + and – connections.

10.1. General Wiring



10.1.1. Limit Switches

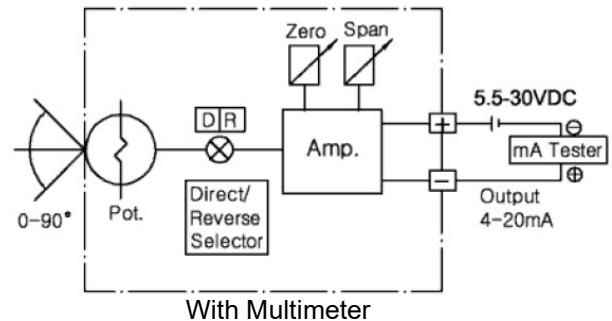
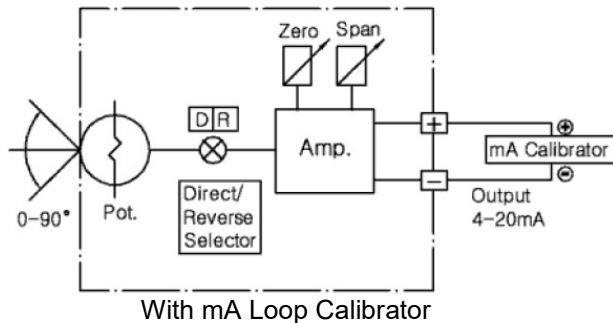
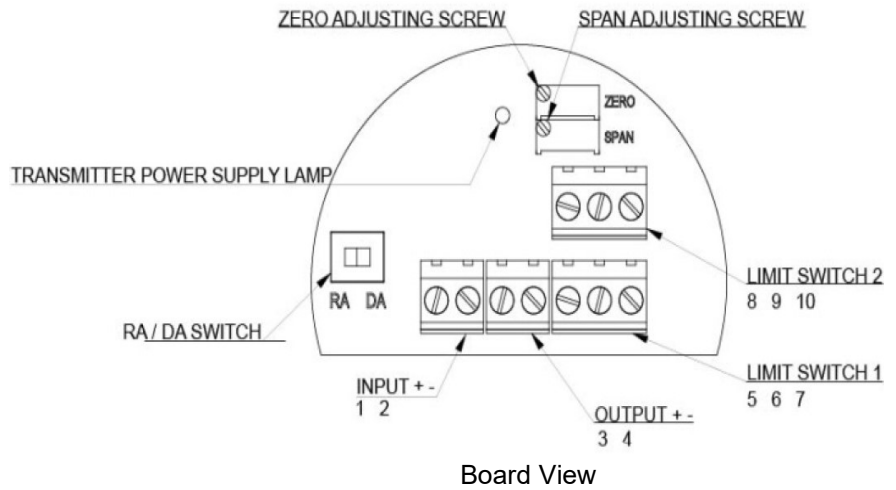
Specifications

Contacts:	SPDT Form C
AC Rating:	16A 1/2HP 125/250 VAC
DC Rating:	0.6A 125VDC / 0.3A 250VDC
Adjustment:	Cams with set screw

10.1.2. Position Transmitter

Specifications

Power Supply Rating:	5.5 – 30 VDC Loop-Powered
Recommended Power Supply:	24 VDC
Output Signal:	4-20 mA
Operating Temperature:	-4° to 158°F
Load Impedance:	0-600 Ohms
Max. Output:	30 mA DC
Linearity:	± 1.0 %
Hysteresis:	1.0 % of full scale
Repeatability:	± 0.5 % of full scale
Adjustment:	Zero and Span in Terminal Box



10.1.3. Transmitter Calibration

- 1) Select RA or DA on the board in the terminal box. RA (Reverse Acting) is standard factory setting.
- 2) Supply 4mA input signal and turn the zero adjusting screw on the board clockwise or counterclockwise until the output signal equals 4mA.
- 3) Supply 20mA input signal and turn the span adjusting screw on the board clockwise or counterclockwise until the output signal equals 20mA.
- 4) Repeat adjusting zero and span until the output approaches the input signal.



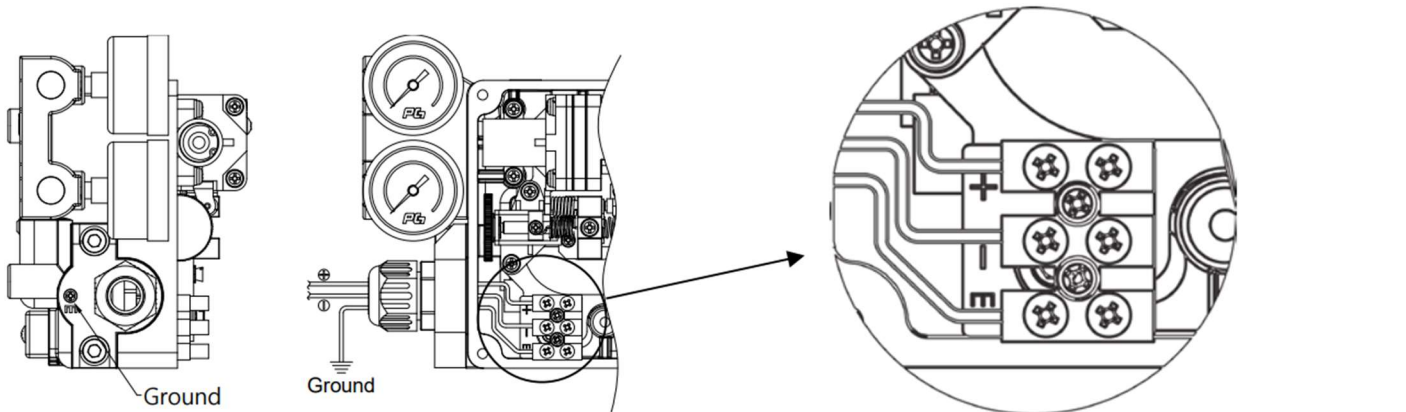
- Be sure the Zero and Span of the positioner is set correctly before adjusting the Zero and Span of the position transmitter.
- Be sure that 5.5V to 30V DC is supplied when using calibrating with multimeter.
- Be sure loop calibrator is sourcing.
- Be sure the transmitter power supply lamp is on.

10.2. Wiring for Intrinsic Safety Ex ia IIC T6

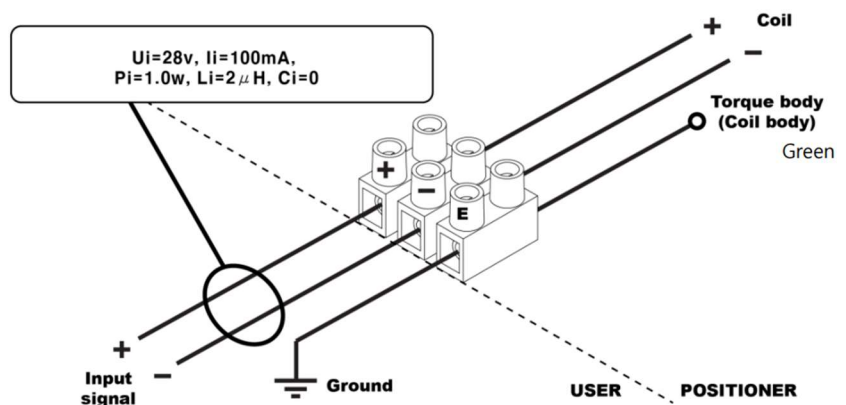
10.2.1. Connection to Terminals



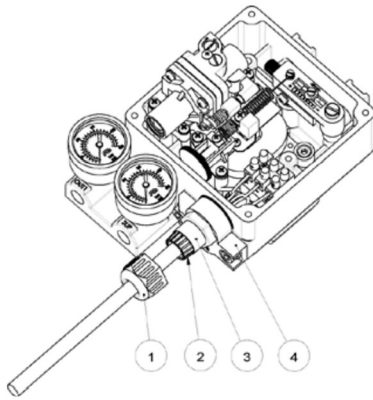
The intrinsically safe EPR model is designed for the intrinsic safety standards of IEC/EN 60079-0, IEC/EN 60079-11, EN 13463, EN 13463-5. Note that it can be influenced by an electrical or magnetic energy from other electronic devices. Therefore, the positioner should not be opened while energized.



- 1) Select a proper safety barrier that can meet parameters of the intrinsically safe EPR positioner, also considering Li and Ci according to cable length.
- 2) Be sure to disconnect power supply before connecting wires to terminals and confirm +/- clearly when connecting wires.
- 3) Tighten fixing screw so that cable cannot be pulled out.
- 4) Protect cables from external damage.
- 5) Ground the intrinsically safe positioner.



10.2.2. Connection to Cable Gland



- 1) Cable gland cover
- 2) Cable gland seal
- 3) Cable gland body
- 4) Junction body

Cable dimensions: .354" - .492" (9mm - 12.5mm)

10.3. Wiring for Flameproof Ex dmb IIC T6/T5, Ex dmb IIB T6, Eex md IIB T5



The EPX series certified to ATEX Eex md IIB T5 must be connected to a fuse with the following ratings:

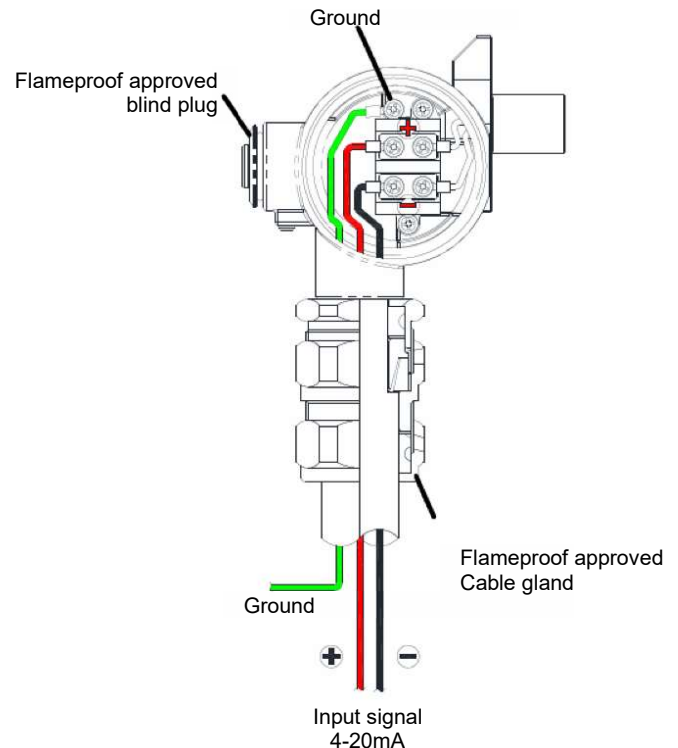
- Max 125mA, breaking capacity 35A
- Suitable 1/2" PF threaded certified Eex d cable glands and plugs must be used.



- Be sure to use the flameproof approved wires and cable glands in the gas area or in the potentially explosive area. Use cables suitable for the diameter of the NBR packing when using the flameproof approved cable glands.
- Cable entries have PF 1/2(G 1/2).
- Do not open the terminal box cover when energized. Disconnect a power supply before opening the terminal box cover and wait until a power supply is cut off completely.
- Use the ring type wire connector so that it cannot be disconnected easily.

10.4. Connection to Cable Gland

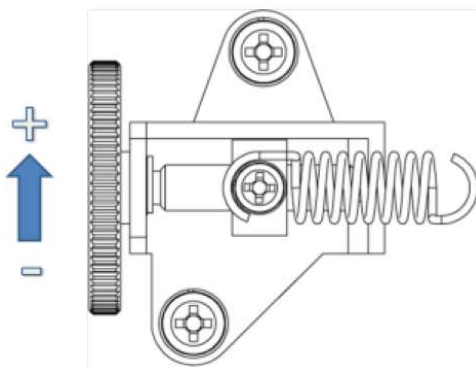
- 1) Open the terminal box cover by loosening the fixing screw on the terminal box cover.
- 2) Install the flameproof approved cable glands tightly and insert a wire into the terminal box. Use and fix the NBR packing tightly so that the inside of the terminal box can be sealed up.
- 3) Connect external (+) to the internal (+) and external (-) to internal (-).
- 4) Fix the terminal screws tightly.
- 5) Close terminal box cover and turn the fixing screw completely.



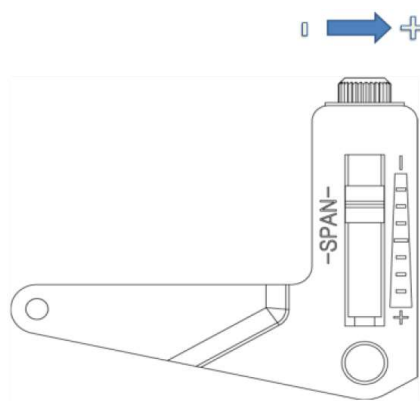
11. Zero and Span Setting

- 6) Check all air connections.
- 7) Set input signal to 4mA (24VDC) while positioner is at the 0% position, or stroke starting point. Turn the zero-adjustment knob clockwise or counter-clockwise to set the 0% position.
- 8) Check the stroke of the actuator by setting the signal to 20mA (24VDC). If the stroke does not meet the 100% position, turn the span adjustment screw clockwise or counterclockwise to set the 100% position.
- 9) Set input signal back to 4mA (24VDC) and adjust the zero-adjustment screw until 0% position is reached.
- 10) Repeat the process until the desired set points are reached.

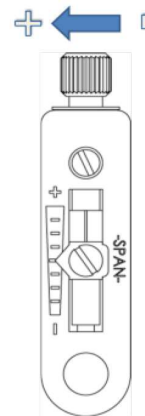
- Adjust into the 0% and 100% position to avoid stopping by the actuator's mechanical stops.
- Due to variations in circuitry and environmental effects, often 0% is set at 4.5mA and 100% is set at 19.5mA to ensure the valve will fully open or fully close.



Zero Adjuster



Span Adjuster (EPR (EPX))



Span Adjuster (EPL)

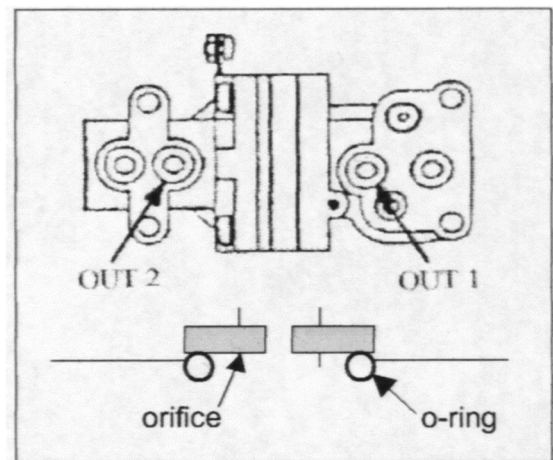
12. Optional Restricted Pilot Valve Orifice



WARNING: Before removing the pilot valve, disconnect the positioner from the signal and compressed air source.

For improved control using smaller actuators, a restricted pilot valve orifice kit is included with the positioner. To install, the pilot valve must be removed from the positioner.

- 1) Remove the four screws holding the pilot in the positioner body.
- 2) Hold the compensation spring in place while the pilot valve is removed.
- 3) Flip the valve to view the bottom side.
- 4) Remove the o-rings from OUT 1 and OUT 2 ports.
- 5) Place the orifice plates in the OUT 1 and OUT 2 ports and replace with new o-rings.
- 6) Reinstall the pilot valve ensuring the compensation spring is in place.

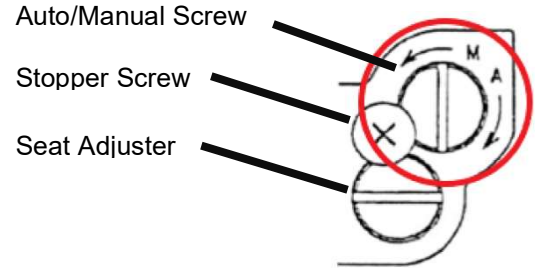


13. Auto / Manual Operation

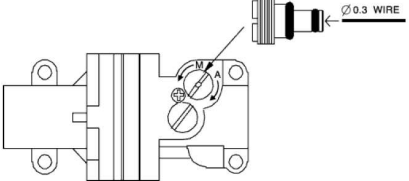
For manual operation using an external air regulator, set the Auto / Manual switch on the pilot valve to M. This will bypass the 4-20mA input signal.



DO NOT change the seat adjuster. This sets the sensitivity and is preset at the factory. If hunting occurs, insert small pilot valve orifices.

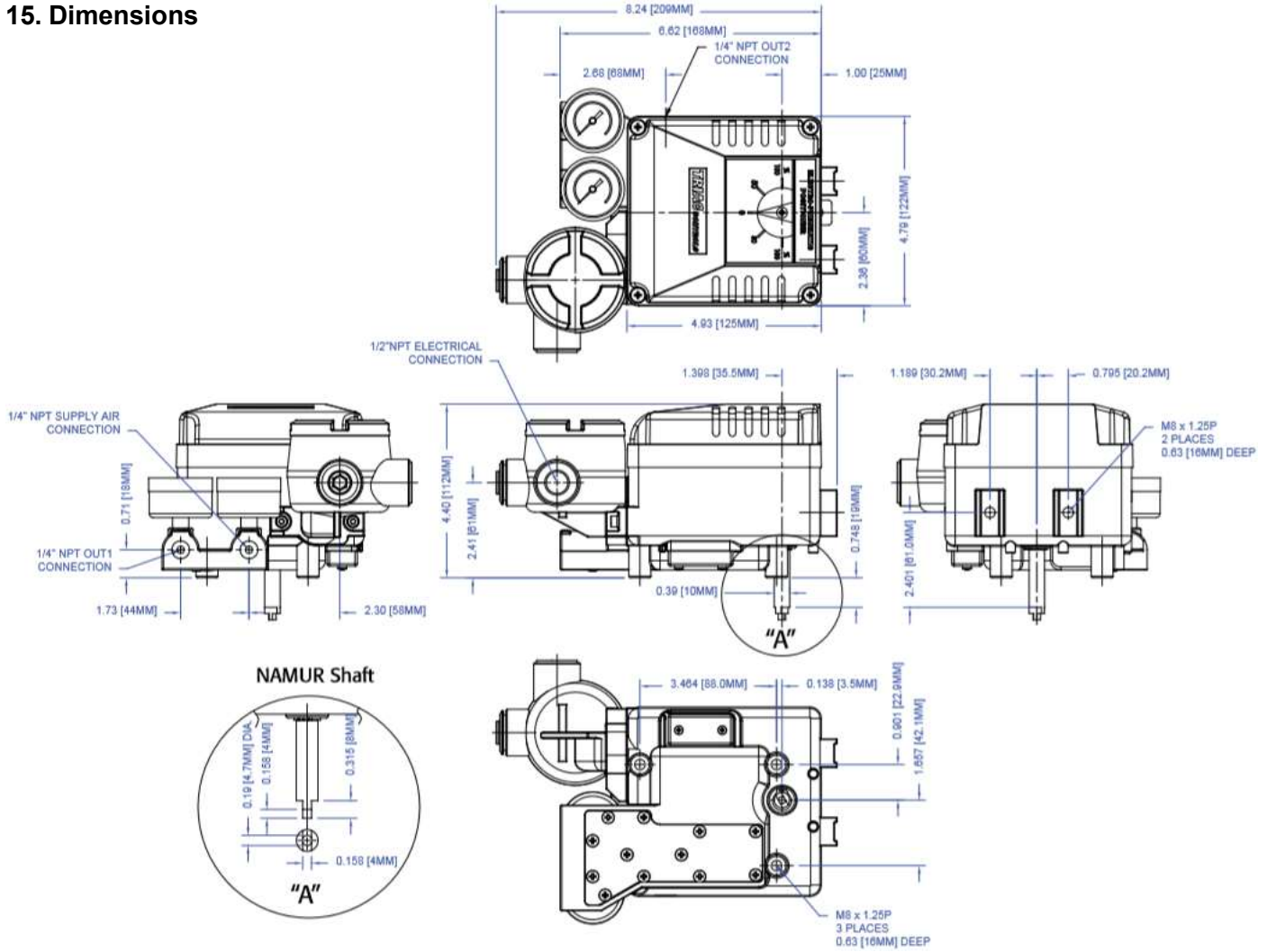


14. Troubleshooting

Trouble	Solution
Valve is hunting.	The actuator is small. Install the small orifice kit in the pilot valve.
	Ensure the position shaft is tightly inserted into the actuator output shaft.
Valve is always open regardless of input signal.	The pilot valve Auto/Manual screw orifice is clogged. Disconnect supply air and clean orifice with a wire (one is provided attached inside the positioner cover). 
	DC loop supply voltage connected directly across input instead of through current loop.

Trouble	Solution
Valve is always open or closed with input signal.	Air connections or cam are not correct. Verify air connections and cam orientation.
Linearity is poor.	<ul style="list-style-type: none"> • Check if positioner and mounting bracket are installed properly and tightly. • Check if zero and span are set properly.
Hysteresis is poor.	Check if mounting bracket is installed tightly.
Valve moves too slowly.	Actuator is too large. Use an air volume booster

15. Dimensions



A-T Controls product, when properly selected, is designed to perform its intended function safely during its useful life. However, the purchaser or user of A-T Controls products should be aware that A-T Controls products might be used in numerous applications under a wide variety of industrial service conditions. Although A-T Controls can provide general guidelines, it cannot provide specific data and warnings for all possible applications. The purchaser / user must therefore assume the ultimate responsibility for the proper sizing and selection, installation, operation, and maintenance of A-T Controls products. The user should read and understand the installation operation maintenance (IOM) instructions included with the product and train its employees and contractors in the safe use of A-T Controls products in connection with the specific application.

While the information and specifications contained in this literature are believed to be accurate, they are supplied for informative purposes only. Because A-T Controls is continually improving and upgrading its product design, the specifications, dimensions and information contained in this literature are subject to change without notice. Should any question arise concerning these specifications, the purchaser/user should contact A-T Controls.

For product specifications go to <http://download.a-tcontrols.com/>

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