

***ICI* Indelac Controls, Inc.**

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Valve Positioner  
Installation, Operation &  
Maintenance Manual

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**INTRODUCTION:**

Thank you for selecting Indelac Controls, Inc. (ICI) for your valve or damper automation requirement. We at ICI are proud of our products and feel confident they will meet or exceed your expectations of quality and reliability.

Every precaution has been taken to insure that your equipment will arrive undamaged; however, accidents do occur. Therefore, the first thing you must do upon receipt of your package is to inspect it for damage. If the box is damaged there is a possibility that the equipment inside the box may be damaged as well. If this is the case **YOU MUST FILE A CLAIM** with the delivering CARRIER. All shipments are F.O.B. our factory and it is **YOUR RESPONSIBILITY** to file a claim for damages.

**STORAGE:**

If the actuators are scheduled for installation at a latter date:

- 1. Store off the floor.
- 2. Store in a climate controlled building.
- 3. Store in a clean and dry area.

**FOR FUTURE REFERENCE RECORD:**

- 1. Actuator model number \_\_\_\_\_
- 2. Actuator enclosure type NEMA 4\_\_\_\_,NEMA 4X\_\_\_\_,NEMA 7\_\_\_\_, NEMA 4 & 7\_\_\_\_\_
- 3. Actuator output torque \_\_\_\_\_ LB-IN
- 4. Motor characteristics, Voltage \_\_\_\_\_ Hertz \_\_\_\_\_ Phase \_\_\_\_\_
- 5. Actuator serial number \_\_\_\_\_
- 6. Date of installation \_\_\_\_\_ Put into operation \_\_\_\_\_
- 7. Valve Data:
  - 7a. Manufacturer \_\_\_\_\_
  - 7b. Style & fig. No. \_\_\_\_\_
  - 7c. Size \_\_\_\_\_
  - 7d. End connection \_\_\_\_\_
  - 7e. Material of construction, Body \_\_\_\_\_ Stem & ball \_\_\_\_\_
  - 7f. Brake away torque \_\_\_\_\_ LB-IN @ \_\_\_\_\_ PSI
  - 7g. Other helpful data \_\_\_\_\_

**MEDIA:**

- 1. System media \_\_\_\_\_
- 2. Temperature, \_\_\_\_\_ deg. F. Maximum, \_\_\_\_\_ deg. F. Minimum \_\_\_\_\_
- 3. Pressure \_\_\_\_\_ PSI

As this information is listed it is important to pay attention to all of the actuator specifications relative to the valve specifications and system requirements. If the actuator is not properly sized for the valve and application the life will be shortened or it may not work at all.

### **ICI's POSITROL POSITIONER:**

ICI's Positrol valve positioner is used for proportional control of our complete line of electric actuators. An external command signal of 0-10V, 1-5V, or 4-20mA can be used to compare to a feedback signal from a potentiometer. The open or closed AC output will energize, which powers the actuator motor rotating the actuator output shaft clockwise or counter clockwise, until the feedback signal matches the command signal, at which time the Positrol2 & 5 AC output is turned off and the actuator motor stops. With a loss of command signal in the 1-5V or the 4-20mA input range, the Positrol offers three useful loss of signal positioning options: fail in place, fail to the open position, or fail to the closed position. All input and output options are easily field configurable with jumper plugs. The only other adjustments consist of Deadband and non-interactive Zero and Span trim potentiometers, which allows for easy field calibration. These controllers are available in versions for 117VAC  $\pm 10\%$ , 234VAC  $\pm 10\%$ , or 24VAC  $\pm 10\%$  power and give the user optical isolation between the input control signal and the AC outputs. The unit includes a red LED indicator (indicates travel toward open position), a green LED indicator (indicates travel towards closed position), an on-board fuse, and two removable screw terminal strips (for easy servicing). Note, that a mounting bracket is required for heatsinking the positioner board.

### **ADDITIONAL FEATURES:**

- Multiple units are easily connected in parallel to a common command signal.
- Built-in utility power supplies for powering a command pot, 4-20mA input or output transmitter, and the feedback potentiometer.
- No external motor resistors are required.

### **DESCRIPTION:**

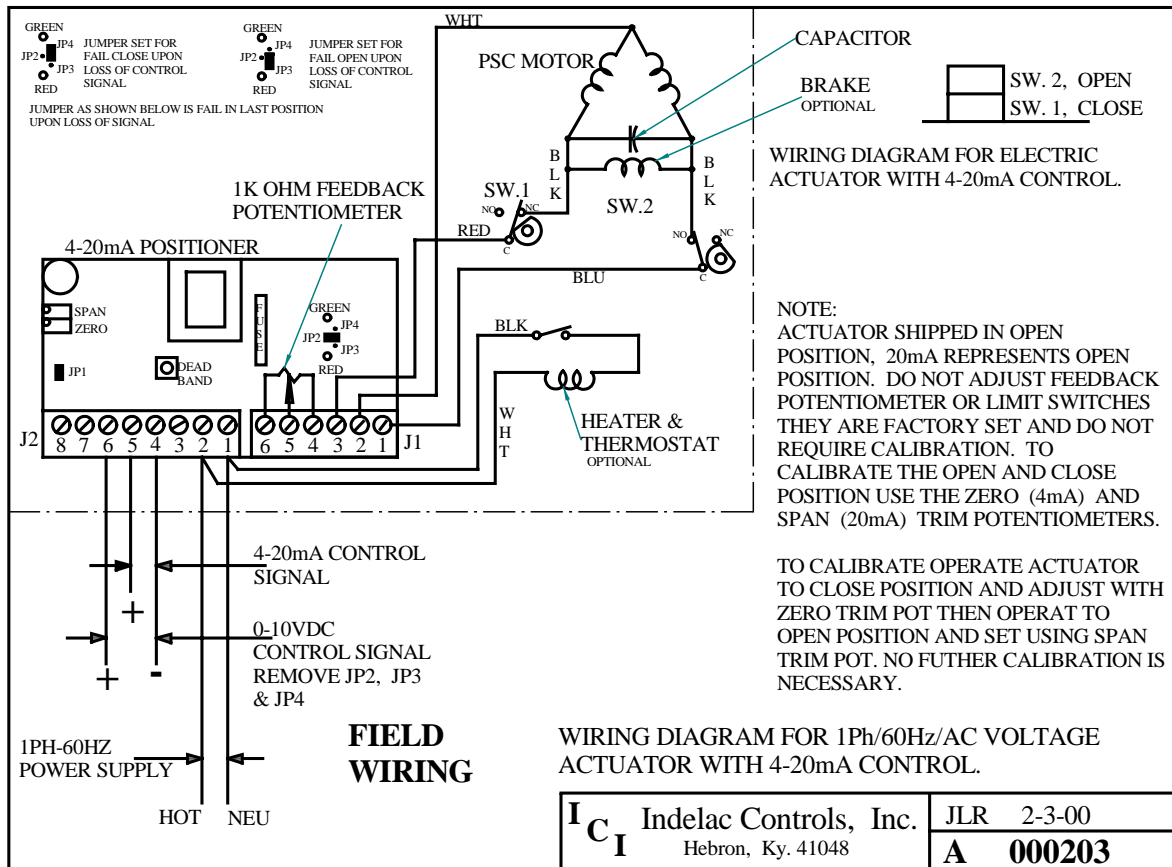
ICI's Positrol actuator controller comes in various configurations to accommodate many applications. Basically two parameters should be considered in selecting the appropriate model for the application: actuator motor current, and operating voltage. Positrol positioners are available in two current capacities, Positrol2 (rated at 2 amps) and Positrol5 (rated at 5 amps).

The Positrol2 controller is rated for 2A motors and is available for 117VAC, 234VAC, or 24VAC operation. ICI's Positrol5 positioner is rated 5A for larger actuators and also come in 117VAC, 234VAC, or 24VAC versions. **CAUTION!** High voltages are present on the outside of the unit when power is applied. AC power should be disconnected prior to any wiring of these units. A heater and thermostat should be used where condensation may occur.

### **POWER / SIGNAL (J2):**

Power is connected to terminals 1, 2, and 3 (3 is ground) as shown in the wiring diagram below. The fuse installed on the unit is rated for maximum output current that can be safely delivered by the AC outputs. Replacement fuses must not exceed these maximum ratings (2A for the Positrol2 positioner and 5A for Positrol5 positioner) to prevent damage to the unit.

An appropriate command signal, either 0-10V, 1-5V, or 4-20mA, should be connected to terminal 5 or 6 (as shown in the wiring diagram) while using terminal 4 as the return *signal ground*. The positioner must be configured for the type of command signal that is to be used - jumper plug JP1 must be installed whenever a 4-20mA or 0-10V input is used. Terminal 7 of J2 provides an auxiliary +10V output, which can be used to connect a command potentiometer. By connecting one end of a potentiometer to terminal 7, the other end to terminal 4, and the wiper to terminal 6, a local control knob can be implemented. Terminal 8 provides an auxiliary +24VDC output, which can be used to power an input or output 4-20mA transmitter.



## WIRING DIAGRAM

### ACTUATOR (J1):

The actuator and feedback potentiometer are connected to terminal block J1 as shown in the wiring diagram. Terminal 1 should be connected to the motor winding that moves the actuator toward the *open* position, and conversely, terminal 3 is connected to the winding that moves the actuator toward the *closed* position. Terminal 2 is the neutral or common wire to the motor windings. The feedback potentiometer wiper must be connected to terminal 5 of J1. One end of the potentiometer is connected to terminal 4, and the other is connected to terminal 6. The potentiometer should be connected so that when the actuator moves towards the *open* position (CCW), the potentiometer's resistance between terminals 4 and 5 will increase. This can also be measured as a voltage - the voltage between terminals 4 and 5 should increase when the actuator moves towards the *open* position (CCW). If the potentiometer is wired incorrectly, the typical response of the unit will be to run the actuator to the full open or closed position (the appropriate open/close indicator will remain on) regardless of the command signal input. The feedback potentiometer should be mounted to provide a proper feedback signal through the entire range between the *open* and *closed* positions. For best results, position the actuator to the midway point between the *open* and *closed* positions; then adjust the feedback potentiometer for approximately 5VDC (or 1/2 of the potentiometer's resistance) between terminals 4 and 5 of J1. Since the feedback potentiometer is crucial for proper operation of the Positrol positioner, the following items should be carefully observed:

- 1 - Potentiometer resistance should be a value from 1K to 10K ohms.
- 2 - The potentiometer should be a linear taper type.
- 3 - The potentiometer must be properly wired to provide the correct feedback signal.
- 4 - The potentiometer must be properly and securely mounted in order to provide a reliable feedback signal.

## OUTPUT INDICATORS:

ICI's Positrol units have on-board indicators that identify when one of the motor outputs is turned on. When the open output is turned on, the red LED indicator will turn on, and when the close output is turned on the green LED indicator will turn on. Many actuators are equipped with limit switches at the *open* and *closed* positions which are intended to disconnect power to the motor to prevent mechanical damage. For this reason, it is possible that the Positrol positioner will indicate that one of the motor outputs is turned on when the actuator is not in motion. However, it should be noted that when the indicator is on, power is applied to the motor output.

## LOSS OF INPUT SIGNAL:

When the 1-5V or 4-20mA type command signal is used, the Positrol can detect that the input signal has been disconnected. The unit can be configured to respond to the loss of command signal in one of three ways: turn both outputs off (leaving the actuator in its last position at the time signal was lost), turn on the open output (to move the actuator to the full *open* position), or turn on the close output (to move the actuator to the full *closed* position). To select the desired response to a loss of input signal, install jumper plug JP2, JP3, or JP4 as shown in the wiring diagram. **CAUTION!** Power must be disconnected when installing or removing these jumpers - damage to the unit may occur if these jumpers are set with power on.

When using this feature, certain precautions should be observed. For applications using the 0-10V input signal, the unit **cannot** detect a loss of signal; **do not** install jumper plugs JP2, JP3, and JP4 for these applications. When JP3 or JP4 are installed, the unit will turn on one of the motor outputs when the input signal is lost; if the actuator does not use limit switches, these selections should not be used.

## CALIBRATION:

The non-interactive zero and span adjustments of the Positrol allow for easy calibration once the unit is installed. After insuring that the feedback potentiometer and motor outputs are wired to provide a proper feedback signal, as described under "ACTUATOR (J1)", follow these steps to calibrate the unit (see wiring diagram for the location of the adjustments):

**1** - Apply AC power to the actuator, and set the command input signal to minimum: 0V for 0-10V input type 1V for 1-5V input type 4mA for 4-20mA input type.

**2** - Adjust the "Zero" adjustment so that the actuator moves to the desired *closed* position. If the desired position cannot be achieved, check that the feedback potentiometer provides a feedback signal as described under "ACTUATOR (J1)"; also, check the position of the limit switches.

**3** - If the actuator is hunting for position, turn the "Deadband" adjustment clockwise until hunting stops. If the actuator is not hunting for position, turn the "Deadband" adjustment counterclockwise until the actuator begins to hunt; then turn the "Deadband" adjustment slightly clockwise until hunting stops. **WARNING!** Actuator failure may occur if the "Deadband" adjustment is set to allow continuous hunting. This can cause excessive wear of motor bearings, geartrain, dynamic brake, and feedback potentiometer. Hunting can also cause the internal temperature of the actuator housing to rise to a level that exceeds the maximum rating of the Positrol, 60 °C.

**4** - Set the command signal input to maximum: 10V for 0-10V input type 5V for 1-5V input type 20mA for 4-20mA type.

**5** - Adjust the "Span" adjustment so that the actuator moves to the desired *open* position. If the desired position cannot be achieved, check the position of the limit switch.

**NOTE:** The "Zero" adjustment is an offset setting rather than an absolute setting. Should the "Zero" adjustment be changed, the "Span" adjustment should be checked for the desired *open* position. Setting of the "Span" adjustment has no effect on the "Zero" adjustment.

**6** - To check proper operation and linearity, set the command signal to halfway: 5V for 0-10V input type 3V for 1-5V input type 12mA for 4-20mA input type. Verify that the actuator's position is midway between the *open* and *closed* positions.

## REVERSE ACTING CALIBRATION (4mA = open & 20mA =closed):

When converting a direct acting actuator to a reverse acting actuator, two changes in wiring must be made and the cams reset:

1 - Reverse the feedback potentiometer wires connected to J1-4 and J1-6.

2 - Reverse the motor output wires connected to J1-1 and J1-3.

NOTE: **DO NOT** reverse the input signal polarity. Also, make sure that both wiring changes are made - if only one is made, the actuator will run to either full *open* or full *closed*. After the wiring changes have been made, refer to **CALIBRATION** for setting the zero and span adjustments.

**To set the open position:**

Operate valve to the open position by applying 4mA signal, the valve will rotate counter clockwise, CCW, viewing top of actuator. **NOTE:** When the actuator is in the open position the setscrew securing the cam to the shaft will be easily accessible.

If valve did not open completely;

1-Loosen 8-32 set screw in top cam.

2-Rotate cam clockwise (CW) until the switch makes contact, listen carefully for a slight click. The valve will begin to rotate CCW, by making small incremental CW movements of the cam the valve can be positioned precisely in the desired position.

3-Securely tighten the setscrew.

If valve traveled too far. **CAUTION!** Valves with mechanical stops may be damaged or cause damage to the actuator if allowed to travel too far.

1-Apply power to terminal connections #1 and #3, the valve will begin to rotate CW, allow it to travel to the mid position.

2-Follow directions in 1a of “To set open position”.

**To set close position:**

Operate valve to the close position by applying 20mA signal, the valve will rotate CW viewing the top of the actuator. **NOTE:** When the actuator is in the close position the setscrew securing the close cam to the shaft will be easily accessible.

If valve did not close completely;

1-Loosen 8-32 set screw in bottom cam.

2-Rotate cam CCW until the switch makes contact, listen for a slight click. The valve will begin to rotate CW, by making small CCW incremental movements of the cam the valve can be positioned precisely in the close position.

3-Securely tighten the setscrew.

If the valve has traveled too far closed. **CAUTION:** Valves with mechanical stops may be damaged or cause damage to the actuator if allowed to travel too far closed.

1-Apply power to terminal connection #1 and #2, the valve will begin to rotate CCW, allow to rotate to the mid position.

2-Follow directions in 1a. of “To set close position”.

## SPECIFICATIONS

### POWER REQUIREMENTS:

Positrol2 & 5: 117VAC  $\pm 10\%$ , 50/60 Hz

234VAC  $\pm 10\%$ , 50/60 Hz

24VAC  $\pm 10\%$ , 50/60 Hz

3.6 VA typical (not including output load)

Fuse Type:

Positrol2: 2A 3AG Slo-Blo

Positrol5: 5A 3AG Slo-Blo

### COMMAND SIGNAL INPUT:

0-10 VDC Input

Input Impedance: 11K ohms minimum

External Command Potentiometer: 1K ohm

1-5 VDC Input

Input Impedance: 1M ohms minimum

*Loss of Command Signal Threshold:  $\approx 0.75V$*

4-20 mA Input

Input Impedance: 250 ohms  $\pm 1\%$

*Loss of Command Signal Threshold:  $\approx 3mA$*

### FEEDBACK SIGNAL INPUT:

Input Voltage: 0 to 10 VDC

External Feedback Potentiometer: 1K ohm to 10K ohms

### POWER SUPPLY OUTPUTS:

Input or Output Transmitter Power (J2-8): 24VDC @ 20mA max

Command Signal Potentiometer Power (J2-7): 10VDC @ 10mA max

**NOTE:** *Do not* connect these outputs to other power supplies.

### AC MOTOR OUTPUTS:

Off-state Leakage Current:  $< 15mA$

Maximum Load Current @ 60 °C:

AMC-100x: 2A

AMC-101x: 5A (when properly mounted)

### CONTROL ADJUSTMENTS:

Zero: adjustable throughout feedback signal range

Span: adjustable throughout command signal range

Deadband: adjustable from 0.12% to 2.4% of span

### ENVIRONMENTAL:

Operating Temperature Range: 0 °C to 60 °C

Storage Temperature Range: -40 °C to 85 °C

Relative Humidity Range: 0 to 90 % (noncondensing)