

## SPECIFICATIONS

### Inputs

Floating Actuator			Control Circuit, Max.		Total Actuator, Max.	
					Powerup Inrush <sup>a</sup>	Running
Series	Action	Vac	mA	VA	VA	VA
AT13A00T	SR N.C.	24 Vac +25%/-15% 50/60 Hz	24	0.6	10	1.9
AT23A00T	SR N.O.		24	0.6		1.9
AT33A000	Non-spring Return		—	—	1.0	1.0
AT33A00T	Non-spring Return		—	—	1.2	1.2

<sup>a</sup> Transformer must be sized for Powerup Inrush.

Proportional Actuator			Control Circuit, Max.	Total Actuator, Max.	
				Powerup Inrush <sup>a</sup>	Running
Series	Action	VAC	Range (Rin)	VA	VA
AP13A000	SR N.C.	24 Vac +25%/-15% 50/60 Hz	b <sub>0</sub> -10Vdc (>200K) or 0-5Vdc (>200K) or 5-10 Vdc (>200K) or 4-20 mA (300)	10	1.7
AP23A000	SR N.O.				
AP33A000	Non-spring Return		1.7		

<sup>a</sup> Transformer must be sized for Powerup Inrush.

<sup>b</sup> Factory supplied. Actual Range is 1-9 Vdc.

### Outputs

#### Electrical:

**Stroke**, 60 Hz: 2 minutes 30 seconds.

50 Hz: 3 minutes.

**Action**, T series: Direct acting. P series: Direct acting (Valve opens B port with increase in signal). Field selectable reverse acting.

#### Mechanical:

**Manual Override**, Allows manual positioning.

**Operating Pressure Limits**, 400 psi (2758 kPa) static pressure.

#### Material:

**Actuator**: High temperature plastic.

**Valve**: Body: forged brass; Stem: chrome-plated brass; Seat: brass; Plug/paddle: high temperature thermoplastic/rubber.

**Flow Characteristic**, 1.0 to 4.0 Cv: Equal percentage. 7.0/8.0 Cv: Linear.

### Environment

#### Ambient Temperature Limits:

**Shipping & Storage**, -40 to 158°F (-40 to 70°C)

**Operating**, 35 to 125°F (1.7 to 52°C).

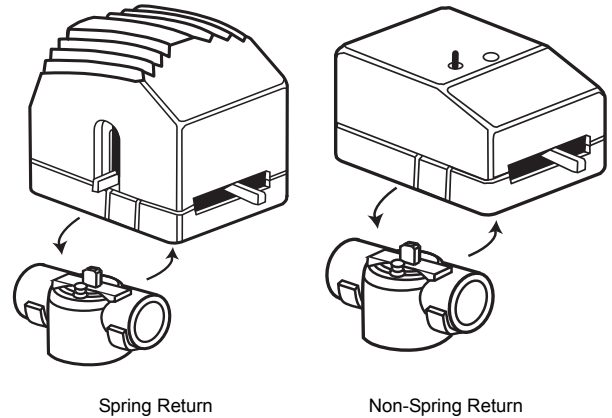
**Fluid**, 32 to 200°F (0° to 93°C) (not steam rated).

**Humidity**: 5 to 95% RH, non-condensing.

**Seat Leakage**: ANSI class IV (0.01%)

**Shipping Weight**: 1.9 lbs (860 g), actuator and valve body.

**Location**: NEMA Type 1.



### Agency Listings

**UL 873**: Underwriter Laboratories (File #E9429 Category Temperature-Indicating and Regulating Equipment), Class 2.

**CUL**: UL Listed for use in Canada by Underwriters Laboratories. Canadian Standards C22.2 No. 24.

**European Community**: EMC Directive (89/336/EEC)

**Australia**: This product meets requirements to bear the C-Tick Mark according to the terms specified by the Communications Authority under the Radiocommunications Act 1992.

### INSTALLATION

#### Inspection

Inspect package for damage. If damaged, notify the appropriate carrier immediately. If undamaged, open package and inspect the device for obvious damage. Return damaged products.

#### Requirements

- Tools (not provided):
  - Wrench 1 to 1-5/8" (if threaded valve)
  - Soldering equipment (if sweat fit)
  - Pipe wrench according to pipe size (if threaded)
  - #1 Phillips head screw driver
  - Volt-ohm multimeter
- Training: Installer must be a qualified, experienced technician
- Other accessories as appropriate

#### Precautions

- Electrical shock hazard! Disconnect power before installation to prevent electrical shock or equipment damage.
- Make all connections in accordance with the electrical wiring diagram and in accordance with national and local electrical codes. *Use copper conductors only.*

#### ◆ CAUTION

- Avoid locations where excessive moisture, corrosive fumes, explosive vapors, or vibration are present.
- Avoid electrical noise interference. Do not install near large conductors, electrical machinery, or welding equipment.

## Mounting

The valves can be mounted in horizontal or vertical piping. When installed in horizontal piping, the actuator must be above the valve body. Refer to Figure-1.

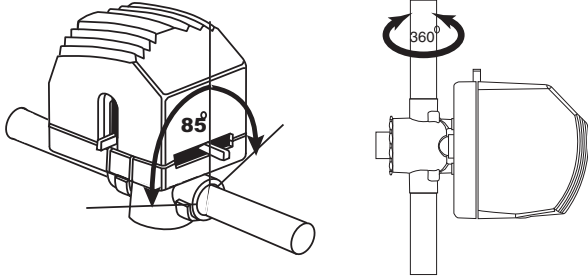


Figure-1 Mounting.

## Piping

Refer to the piping diagrams in Figure-2 for two-way valves. For three-way valves refer to Figure-3.

### NOTE

The 3-way is only configured as B port normally closed. For normally open configuration to the coil turn valve around. For proportional valves, set the control action (direct or reverse) accordingly.

### CAUTION

- The valve should be used in a closed loop system.
- All valves must be piped so the plug closes against the direction of flow. For two-way valves, flow is from port B to port A. For normally closed three-way valves, B is the service port and A is the bypass port. For normally open three-way valves, A is the service port and B is the bypass port.
- Three-way valves must be piped in a mixing configuration, not diverting.

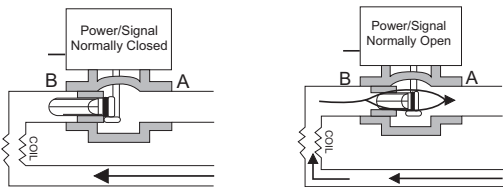


Figure-2 Two-Way Spring Return Valves

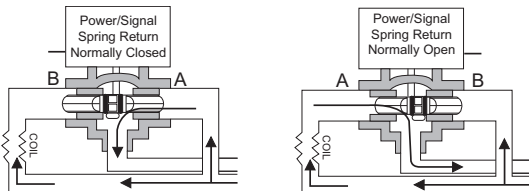


Figure-3 Three-Way Spring Return Valves

## Sweat End Valves

- To manually open the valve so the plug is not in contact with the valve body, slowly position the actuator's manual operating lever (on front of the actuator) to mid-position.

### CAUTION

- The plug inside the valve is made of a plastic material. It may be damaged by heat conducted through the valve body if it remains seated against its port during soldering. Be sure to manually open the valve to mid-position before soldering to prevent damage.
- If the manual operating lever does not move freely for manual positioning, the solenoid may have latched during shipping. Do not force the lever. Instead, first unlatch the solenoid by placing the red manual solenoid lever (on the side of the actuator) in the "Down" position, then place the manual operating lever in the mid-position

- With the valve in mid-position, latch the solenoid by placing the manual solenoid latch lever in the "Up" position. Detach the actuator by depressing the release button and pulling it away from the valve body (Figure-4).

### CAUTION

- To avoid damage to the actuator and to ease the soldering process, be sure to remove the actuator from the valve body before soldering.

### CAUTION

- Use only solder with a melting point below 600°F (315°C).

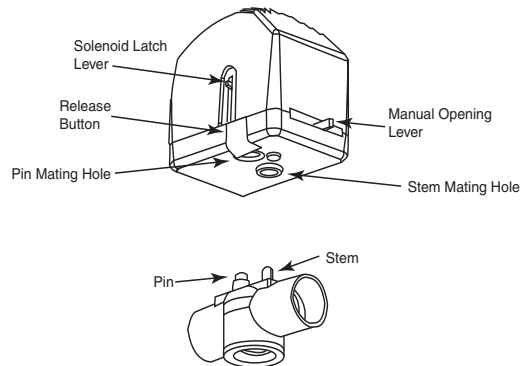


Figure-4 Three-Way Spring Return Valves

- Thoroughly clean the ends of the water supply tubing for a minimum distance of 1 inch (25 mm) from the end, so a good joint can be made in the shortest time and without an excessively large flame.
- Solder the valve body in place, directing the flame tip away from the valve and taking care not to overheat the joint area. When finished, cool the valve quickly with a wet cloth.

### NOTE

The valve body may be submerged in water, or pressurized for leak testing before reattaching the actuator.

- Reinstall the actuator according to "**Reattaching the Actuator to the Valve Body**" on the next page.

## NPT and Rp Threaded Valve

### NOTE

When installing threaded valves, the actuator should be detached from the valve body to ease installation. To do so, first slowly move the actuator's manual operating lever (on the front of the actuator) to mid-position. Latch the solenoid by placing the red manual solenoid latch lever on the side of the actuator to the "Up" position. Finally, detach the actuator by depressing the release button and pulling the actuator away from the valve (Figure-4).

1. Apply Teflon tape to all but the last two threads on the end of a properly threaded, reamed, and cleaned pipe. Make sure pipe chips, scale, etc. do not get into the pipe since this material may lodge in the valve seat and prevent proper closing and opening of the valve.
2. Start the joint by hand-screwing the pipe to the valve. If the thread engages normally, turn the pipe by hand as far as it will go.
3. Use a wrench to fully tighten the valve to the pipe using the flats located on the valve body ports. Take care not to over-tighten or strip the threads.
4. Re-install the actuator according to "Reattaching the Actuator to the Valve Body" below.

### Reattaching the Actuator to the Valve Body

1. Before reinstalling the actuator, be sure that its manual operating lever is in mid-position, and that the solenoid is latched. The solenoid is latched when the manual solenoid latch lever is in its "Up" position.
2. Depress the release button.
3. Align the valve body with the actuator to ensure the stem is inserted into the large mating hole on the bottom side of the actuator (Figure-4).
4. Engage the actuator on the body and release the button.

### Wiring

#### CAUTION

- Multiple actuators may be connected to a single controller up to the current rating of the controller and transformer. Do not exceed the maximum current draw of the controller.
- Use of a properly sized, inherently limited, Class 2 transformer is recommended.
- Use only 18 to 24 AWG copper wire for all connections.
- If a conduit fitting is used, remove plastic bushing prior to installation and use two nuts to prevent fitting from pushing against the actuator circuit board.
- The return spring feature allows the valve to return to a normal position upon loss of power. The spring return feature should not be used for routine, normal operation.

### Three-Wire Floating

#### NOTE

The three-wire floating spring return valve includes a time-out feature that automatically turns off the control signal to the valve after a pre-determined period of continuous operation. This time period is three minutes at 60 Hz and 3.6 minutes at 50 Hz.

Spring return valves feature a two second time delay upon power loss to prevent the loss of valve position during brief outages. There is a three second delay at power-up.

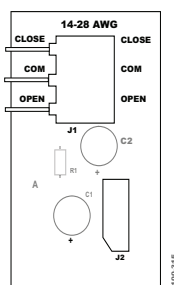


Figure-5 Typical Wiring of 3-Wire Floating Non-Spring Return Actuator

1. Remove the cover from the actuator, then connect the power and control wiring to the terminal block (Figure-5, Figure-6, Figure-7).
2. Reinstall the cover onto the actuator.

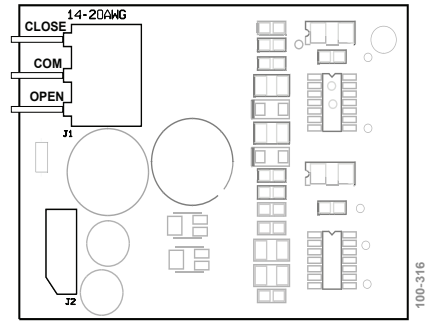


Figure-6 Typical Wiring of 3-Wire Floating Non-Spring Return Valves with Time-Out

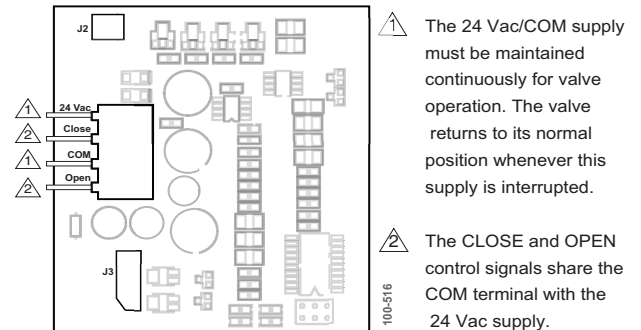


Figure-7 Typical Wiring of 3-Wire Floating Spring Return Valves with Time-Out

### Proportional

#### NOTE

If multiple proportional valves are used on a single 4 to 20 mA loop, each valve must have its own isolation transformer

1. Remove the cover from the actuator, then connect the power and control wiring to the terminal block (Figure-8 and Figure-9).

#### NOTE

All units are shipped with the actuator in the direct-acting 0 to 10 Vdc mode, which means that the valve opens the B port upon receiving an increasing Vdc signal. To change the action to reverse-acting (valve closes with an increase in control signal), simply remove the action jumper J2 and relocate it to the reverse-acting pins. See Figure-8 and Figure-9.

2. Reinstall the cover onto the actuator.

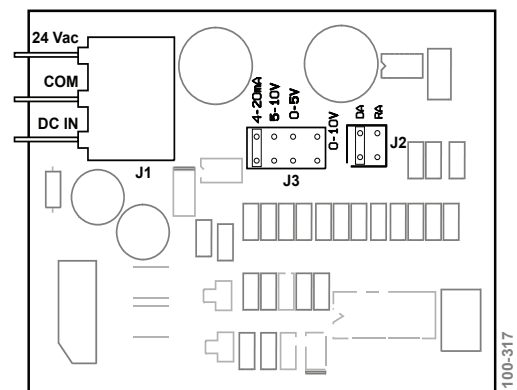


Figure-8 Typical Wiring of 3-Wire Proportional Non-Spring Return Valves

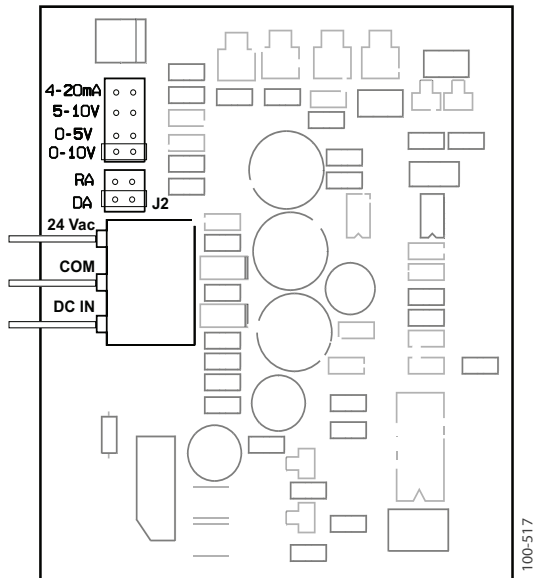


Figure-9 Typical Wiring of 3-Wire Proportional Spring Return Valves

## Application Notes

The valves are designed for application to closed hydronic heating and cooling systems. Use in systems which have substantial make-up water (open systems) is not recommended. High levels of dissolved oxygen, chlorine, and debris that may be found in open systems can attack the valve materials and result in premature failure.

### Three-Wire Floating “T” Type Actuator

The controller or thermostat used to operate the three-Wire floating actuator must be configured to turn off the control signal after being on continuously for three minutes.

### Three-Wire Floating Time-out “T” Type Actuator

If the control system does not have the ability to limit the running time, then the time-out option must be utilized. This automatically cuts off the control signal to the valve after three minutes of continuous operation. This is standard on the spring return actuator, and is an option on the non-spring return actuator.

### Proportional “P” Type Actuator

Multiple proportional valves may be connected to a single controller up to the current rating of the controller and transformer. For 4 to 20mA control, a separate isolation transformer must be used with each valve. The actuator is also provided with a jumper to allow the action to be reversed. All units are shipped with the actuator in the DA (direct acting) mode. This means the valve opens the B port upon receiving an increasing control signal. To change the action to reverse acting (valve closes upon receiving an increasing control signal), simply remove the action jumper and relocate it to the RA (reverse acting) pins.

## CHECKOUT

1. Make sure the valve operates freely before installing the valve.
  2. If the stem does not operate freely, it may indicate that the stem was damaged and may require that the valve be repaired or replaced.
  3. After the piping is under pressure, check the valve body and the connections for leaks.
  4. After the valve and actuators are installed, power the actuator and check operation.
- **Two-way Model:**  
Power the valve to the close position (per label), and the “B” port should be closed.
  - **Three-way model**  
Power the valve to the open position (per label) and the “A” port should be closed.

## THEORY OF OPERATION

The PopTop Series floating or proportional valves are modulating valve actuator assemblies. The modulating valves are designed to control the flow in the circuit by making incremental adjustments to the flow path within the valve.

The spring return PopTop Series modulating valves, when powered, move the actuator to the desired position, at the same time tensing the spring return system. When power is removed for more than two seconds, the spring returns the actuator to the normal position.

## MAINTENANCE

The modulating PopTop Series valves require no maintenance. Regular maintenance of the total system is recommended to assure sustained, optimum performance.

## FIELD REPAIR

Replace any damaged or failed components with complete body or actuator replacements.