

# CIRCLE SEAL CONTROLS

## ATKOMATIC SOLENOID VALVES

### INSTALLATION, MAINTENANCE, AND OPERATION INSTRUCTIONS

#### 35000 SERIES Stainless, Externally Pilot Operated

#### Installation Instructions

**WARNING: These instructions should be read, understood, and followed before installation. Failure to do this can be extremely dangerous and cause valve malfunction.**

1. An adequate filter system must be installed in the line ahead of each valve to prevent foreign matter from damaging the seal faces and/or obstructing the valve orifices causing operational failure and leakage. A maximum rating of such a filter is 40 microns to provide adequate protection.
2. Pipe thread sealing compounds and tape must be prevented from entering the valve.
3. New systems must be adequately flushed to remove all pipe scale, weld slag, thread burrs, etc. It is typically necessary to flush new systems several times, removing contamination lodged in filters and other components, until no debris is present.
4. Valves must be installed in a horizontal line with the coil oriented up (within +/- 10 degrees).
5. Check the nameplate and provide the specified voltage to the coil. Voltages must be as specified at the coil rather than the power supply. This is particularly important with DC applications due to their typically high voltage drop through supply lines. All AC coils are for single phase use only.
6. Coil housings may be rotated as required to match up with supply wiring. This is done by loosening the nut at the top center of the coil housing, rotating the coil housing assembly, and re-tightening the coil housing nut. Do not splice the lead wires inside the coil housing.

Note: On valves equipped with combination explosion proof and waterproof housings, the silicone seal bead must be replaced after adjusting the housing to maintain the integrity of the waterproof housing.

7. Use the valve only on the fluid, voltage, and pressure specified on the nameplate.
8. On normally closed valves the pilot line is plumbed to the 1/4" male pipe port at the top of the valve in the center of the nameplate.

**CAUTION: Valves should be handled carefully during installation with care taken to prevent damage to the cylinder cap tube inside the coil housing. Do Not tighten the valve in the line by applying pressure or torque to the coil housing. Use the hex at either end of the valve body.**

## Maintenance Instructions

**CAUTION: Only qualified maintenance personnel should work on the valve. If the valve is within the warranty period, do not disassemble without approval from the factory Returned Materials Department.**

**WARNING: Normal coil operating temperatures are high enough to cause severe burns – DO NOT TOUCH HOT COILS OR COIL HOUSING WITHOUT ADEQUATE PROTECTION.**

### **Coil Replacement**

**WARNING: Turn off electrical power to the coil**

1. Disconnect the coil's electrical leads.
2. Loosen the housing nut, remove the nameplate and coil housing cover (explosion proof housing covers are threaded).
3. Pull the coil and can assembly off of the cylinder cap tube.
4. On DC valves only, remove the upper end plate.
5. Lift the coil out of the coil can.
6. On AC valves only, remove the coil from the laminated steel yoke.
7. Replace the coil and reinstall the parts in their original order.

**CAUTION: Do not apply voltage to the coil until it is installed in the completely assembled housing.**

**CAUTION: Be certain that all coil housing parts are reinstalled. Failure to install end plates, coil can, or yoke will result in coil burn-out.**

**Note: AC coils can be replaced with DC coils by removing and discarding the coil yoke and adding a upper end plate p/n 61104 (13029) above the coil.**

**Note: DC coils can be replaced with AC coils by removing and discarding the upper end plate above the coil and adding the coil yoke p/n 61041 (13100) around the coil. See the caution below.**

**CAUTION: When changing from DC to AC operation it is also necessary to install shading rings in the plunger and magnetic stop in the cylinder cap. This requires the use of special tools at the factory. Without this modification the valve will produce a loud AC hum and will eventually wear the plunger.**

### **Cleaning or Replacement of Internal Parts**

**WARNING: Turn off electrical power to the coil and reduce the line pressure to 0 psi before beginning disassembly.**

1. Remove the housing nut and lift the entire coil housing off of the body & cylinder cap.
2. Unscrew the cylinder cap from the valve body and lift it from the body. This will expose the plunger assembly which can then be removed.
3. Inspect all components.
4. Clean and replace components as required

**Warning: Inspect all o-rings. Worn o-rings should be replaced and all Teflon o-rings (white in color) should be replaced as they are not reusable. Failure to do this can result in external valve leakage and be extremely dangerous.**

**CAUTION: When cleaning seat screw orifices, do not ream the out to larger diameters as prevent the valve from opening.**

**CAUTION: Attempting to take apart the plunger assembly is not recommended. The threaded parts are not re-usable and building the plunger assembly requires the use of special tools at the factory.**

**CAUTION: Pay particular attention to the orientation of the lip seals in the piston (and bonnet in the 2" size) when replacing seals in the valve.**

**Note: Repair kits contain the complete plunger assembly.**

## Troubleshooting

### 1. Valves has trouble opening or closing

- Is the fluid clean and free of contamination?
- Is the valve installed in the proper flow direction as indicated by “in” and “out” stamps?
- Is the voltage applied correct?
- Is the voltage within +/- 10% of the nominal?
- Is the voltage measured at the coil and with the valve energized? This is particularly important on DC applications.
- Is the ambient temperature above 104 F?
- Is there an audible click when the valve is energized? This indicates plunger operation. If no click is audible, check for contamination and/or bent or dented pilot tube.
- Is the fluid the same as that indicated on the nameplate?
- Has either flow orifice become clogged with contaminates?
- Is the valve actually not closing or closing very slowly or leaking excessively?
- Is there foreign matter lodged in the valve seat?
- Is the fluid more viscous than 150 SUS?
- Is there 100% back pressure ( downstream piping shutoff ) on the valve or does the downstream system pressure exceed the valve's inlet pressure?
- Has the valve stem become worn or damaged?

### 2. Valve is leaking internally

- Is there any contamination in the fluid?
- How much is the leakage and at what pressure? If the leak is excessive it could be caused by a bent or dented pilot tube. If the leak is small, how does it compare with the factory leakage standard?
- Is the fluid chemically compatible with the seat material?
- Is the temperature of the fluid within the limits of the seat material?
- Is there foreign matter lodged in the valve seat?
- Has the valve stem become worn or damaged?

### 3. Coil has burnt out

- Is the voltage applied correct?
- Is the voltage within +/- 10% of the nominal?
- Is the ambient temperature above 40 C (104 F)?
- Is adjacent equipment or piping radiating excessive heat to the valve or raising the air surrounding the coil above 104F?
- Is the fluid temperature above that for which the valve is rated?
- Is the valve's coil housing assembled correctly? Has the customer opened up the coil housing? Are the end plates installed and oriented correctly? Has the coil hold-down spring been reinstalled?
- Have the coil leads been cut or damaged in handling or installation?
- Is contamination or physical binding preventing the plunger from actuating? This will cause an AC coil to burn out. Monitoring the AC current draw and comparing the measured value to the holding current given in the catalog can check the presence of this condition.
- Is the cycle rate excessive?
- Is the valve mounted in an enclosure that prevents free circulation of the ambient air?
- Was the coil failure immediate or did the burnout take hours or days? If immediate, the coil may have been defective or damaged and have shorted internally.

4. Valve leaks externally

- Has the valve been disassembled? The body o-rings are frequently Teflon and may require replacement to reseal.
- Is the bonnet nut or cylinder cap adequately torqued?
- Is the fluid chemically compatible with the seal material?
- Is the temperature of the fluid within the limits of the seat material?
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5. Valve wears out quickly

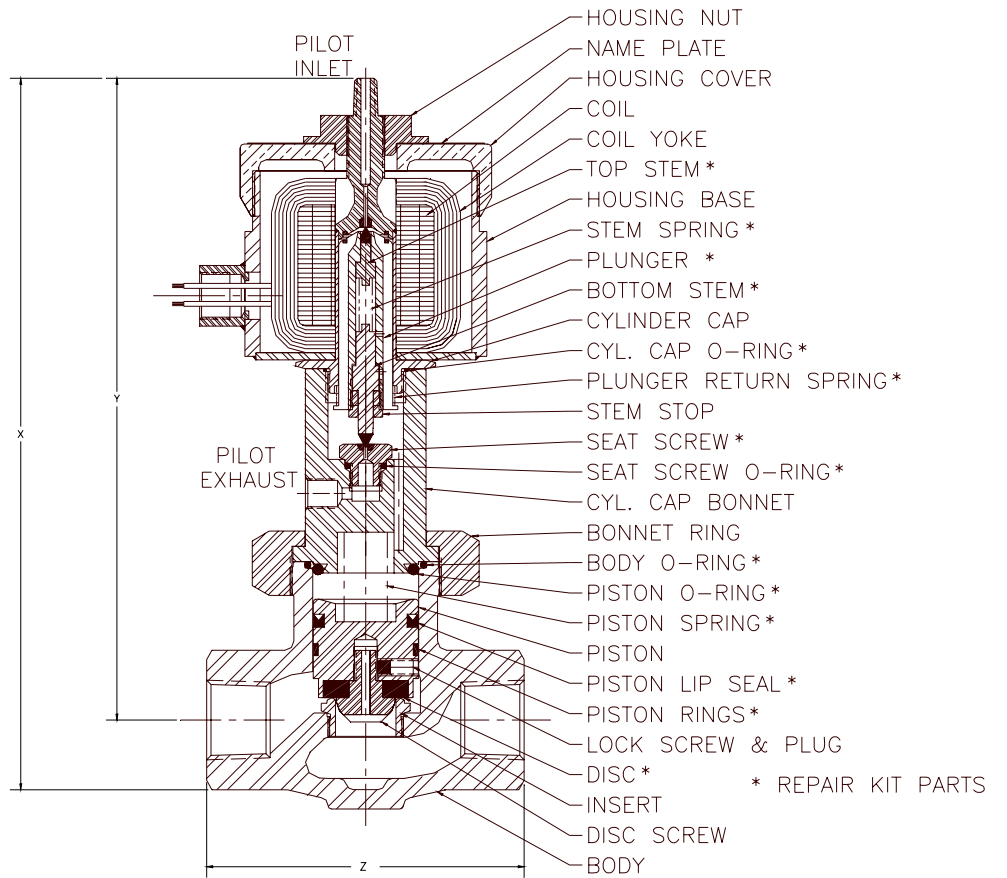
- What is the cycle rate?
- Is the valve chattering or internal pilot stem & seat wearing rapidly (gas application)?
- Is the fluid contaminated with an abrasive material?
- Is the ambient or fluid temperature excessive?
- Is the fluid chemically compatible with the seal material?
- Is the temperature of the fluid within the limits of the seat material?
- What is the customer's definition of premature wear?

Contamination in fluid systems is the largest single cause of operational problems. Frequently contamination is present in new systems from sources such as pipe sealant, pipe scale, weld slag, and metallic particles from the assembly of pipe fittings. Flushing of new systems is important to reduce the occurrence of problems, however often even through flushing will not eliminate all contaminants that will break loose during the initial operation of a new system. Filters are an essential component in many systems to prevent valve problems. It is important to locate filters immediately upstream of the valves and to size the filter rating correctly. A maximum micron rating to provide adequate protection is 40 microns. Note that strainers or screens are generally not capable of providing this degree of filtration and a filter with a depth type of element is necessary.

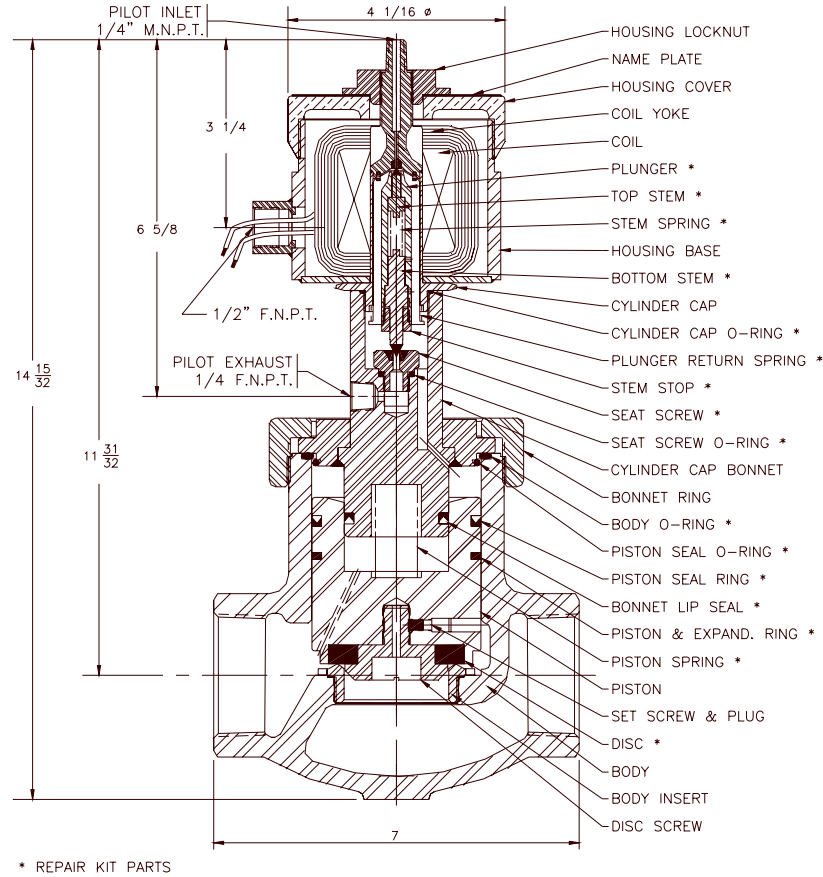
**Standard Available Coils**

Class H coils for 35,000 Series Valves

<u>Voltage</u>	<u>Part Number</u>	<u>Resistance +/-10%</u>	<u>Inrush Amps</u>	<u>Holding Amps</u>	<u>Volt-Amps</u>
100 VAC 60 Hz	62213-10	7.36	4.3	0.75	430
110 VAC 50 Hz	62213-11	9.91	3.6	0.65	396
115 VAC 60 Hz	62213-1	9.17	3.7	0.66	426
200 VAC 60 Hz	62213-9	28.43	2.5	0.42	500
220 VAC 50 Hz	62213-12	41.50	1.5	0.26	330
230 VAC 60 Hz	62213-5	27.00	2.2	0.38	506
460 VAC 60 Hz	62213-7	111.4	1.05	0.20	483
12 VDC	62216-1	3.10		4.0	48
24 VDC	62216-2	11.53		2.0	48
48 VDC	62216-6	47.82		1.1	53
125 VDC	62216-8	238.4		0.5	63
250 VDC	62216-10	961.8		0.25	63



Shown is a Model 35840 1" Valve with an Explosion Proof  
NEMA 7 Coil Housing



Shown is a Model 35871 2" Valve with an Explosion Proof NEMA 7 Coil Housing

Parts that comprise standard repair kits are identified in the cross section above. Repair kit numbers are the valve model number preceded by a K/. For instance the repair kit for a 35840-002PJAA1E valve is K/35840-002PJAA1E. All other valve parts are available for repair purposes. When ordering specify the parts desired by description the complete 14 digit catalog number. If the catalog number is unavailable, and specify: 1) the valve base model, 2) the pipe size, 3) fluid, 4) operational pressure (minimum and maximum), voltage and frequency, 5) temperature if different from ambient, and 6) any special requirements.

Dimensions, Shipping Weights, and Cv Flow Factors

35,800 Series Normally Closed or Normally Open Stainless Steel

Catalog Number Prefix	Pipe Size	Main Seat Orifice Dia	X	Y	Z	Shipping Weight (lbs.)	Cv
35820	½"	¾"	11 11/16"	10 ¼"	4 5/8"	15	5.1
35830	¾"	¾"	11 11/16"	10 ¼"	4 5/8"	15	7.5
35840	1"	1"	12 1/8"	10 15/16"	5 ¼"	21	12.5
35851	1 ¼"	1 ½"	12 9/16"	10 5/16"	5 7/8"	25	21.0
35861	1 ½"	1 ½"	12 9/16"	10 5/16"	5 7/8"	25	21.5
35871	2"	2"	14 7/8"	12 3/8"	7"	34	45.0

Operation

35,000 series valves can be either normally open or normally closed depending on how the pilot is plumbed. The internal make-up of the valve is identical for both normally open and normally closed valves.

The normally closed valve has the pilot inlet attached to the ¼" MNPT port at the top of the valve ( in the center of the nameplate ). The pilot exhaust port is the ¼" FNPT port in the side of the bonnet ( the cylinder between the valve body and coil housing ).

The normally open valve has the pilot inlet plumbed to the ¼" FNPT port in the side of the bonnet ( the cylinder between the valve body and coil housing ). The pilot exhaust is the ¼" MNPT port at the top of the valve ( in the center of the nameplate ).

Opening

When voltage is applied across the coil leads a current is produced in the coil windings which generates a magnetic field. The magnetic field attracts the plunger and causes it to move toward the magnetic stop. Initially the plunger slides freely on the stem until it impacts the nut or shoulder at the end of the stem. The plunger's momentum is then transferred to the stem and the stem is lifted off the seat screw orifice. Plunger assembly motion continues until the top stem seals off the orifice at the top of the cylinder cap thus shutting off pilot flow. Pressure above the piston is bled off through drilled passageway in the bonnet and the seat screw to the pilot exhaust port. Inlet pressure acting around the annular area outside of the main valve seat at the bottom of the piston then pushes the piston up, thus initiating flow through the valve.

For the valve to operate two conditions must be met:

- 1) The inlet pressure (or separate pilot pressure ) must be at least 25 psig.
- 2) Pilot pressure must always be greater than the inlet pressure.

**Closing**

When voltage is removed from the coil leads, the magnetic field collapses. Gravity and the plunger return spring pulls both the plunger and stem assembly down until the top stem opens the orifice at the top of the cylinder cap and the bottom stem seals off the orifice in the stationary seat screw. Fluid flow from the pilot supply then flows directly into the cavity above the piston and charges this volume to a pressure equal to the valve's inlet pressure ( assuming that the inlet pressure is being used as the pilot supply ). Since the pilot pressure acts over the entire area of the piston and the downstream pressure is acting only against the center portion of the bottom of the piston, the pressure forces acting on the piston are unbalanced and act to push the piston to the closed position ( gravity assists in the closing ).

Note that the time to charge the volume above the piston and thus affect valve closure is considerably less than with flow bleeding through a timing orifice in the piston as in other pilot operated valves.

**We manufacture a complete line of rugged dependable solenoid operated valves for pressure ranging from 0 to 10,000 psi.**

**Download a complete catalog of the Atkomatic Valve Product Line from <http://www.circle-seal.com/Atkomatic.html>**

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