

Installation & Maintenance Instructions

**HYDRAMOTOR® PUSH-TYPE LINEAR ACTUATOR
WITH USER SETTABLE LOW FIRE SETTING AND
GENERAL PURPOSE OR WATERTIGHT ENCLOSURE**

**SERIES
AH4E**

⚠ WARNING

To prevent the possibility of death, serious injury or property damage, the Hydramotor® Actuator must be installed and serviced only by a qualified service technician avoiding the following hazards:

- **Electrical hazard.** Turn off all electrical power to Hydramotor® Actuator.
- **Risk of electric shock –** More than one disconnect switch may be required to de-energize the device for servicing.
- **Pressure hazard.** Depressurize valve and vent hazardous or combustible fluid to a safe area before inspection or removal of the actuator or valve from service.
- **Explosion, fire or toxic gas hazards.** Extinguish all open flames and avoid any type of sparking or ignition during leakage testing.

Service Notices

See separate V710 Gas Valve Installation and Maintenance Instructions for information on: Operation, Positioning, Mounting, Piping, Strainer or Filter Requirements, Flow Controls, Preventive Maintenance, and Cause of Improper Operation.

Do not install an actuator with General Purpose Enclosure in a location subject to weather, wash down, or other sources for water ingress. Use AH actuators with watertight enclosure for these locations.

DESCRIPTION

AH4E Hydramotors are self-contained linear, push-type actuators which extend when powered and retract by spring force upon power interruption.

The AH actuator is typically used for control of gas-fired heating equipment, commonly to open and close a valve or both a valve and damper. AH4E actuators position V710 Series gas valve assemblies.

OPERATION

Application of electrical power simultaneously drives an electric pump and closes a normally-open dump valve and control valve, resulting in up to 250 pounds of force on the actuator stem. This extends the actuator stem and attached valve poppet, to open the valve and/or damper.

On reaching the low fire setpoint, a low fire switch interrupts power to the motor while maintaining power to the dump and control valves, thus stabilizing hydraulic pressure to hold shaft position.

Closing the external high fire switch causes the actuator to extend beyond the low fire point.

Upon reaching the fully extended position, a travel limit switch interrupts power to the electric motor while maintaining power to the dump valve and control valves, thus stabilizing hydraulic pressure to hold shaft position.

Opening the high fire switch de-energizes the control valve allowing the gas valve to return smoothly to the low fire position.

Position indicators on both sides of the actuator show the actual position of the valve stem.

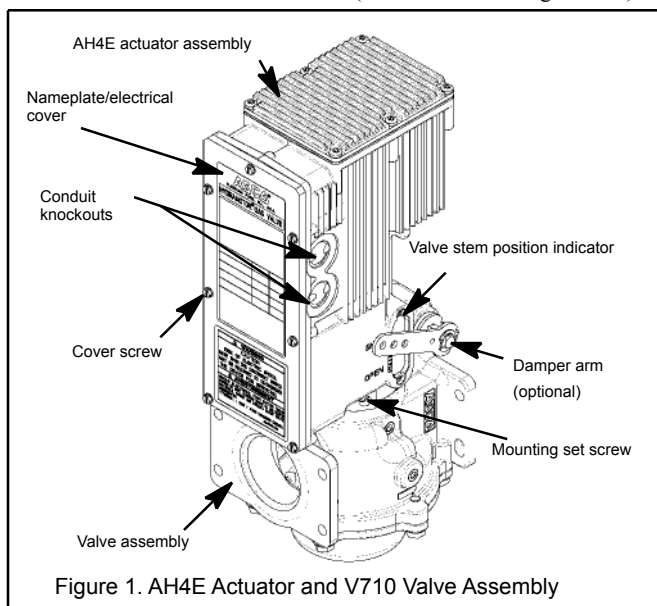
Upon power interruption, the dump valve opens releasing hydraulic pressure, and allowing the return spring to retract the stem and close the valve fully. Closing time is one second or less.

ACTUATOR / VALVE COMPATIBILITY

The AH4E series actuator is designed for use only with ASCO V710 valves having V15 or V25 suffix in catalog number.

OPTIONAL FEATURES

- **Damper Shaft Arm** Is factory-mounted on RH side. The arm is field-adjustable to 8 positions and can be switched to the LH side.
 - » **Damper Arm Rating:** Drives damper in one direction only. 20 lb maximum at 2.85 in. radius at 20°F to 150°F (-7°C to 65°C) and 10 lb maximum at -40°F to 20°F (-40°C to -7°C). Damper spring and linkage must provide sufficient return force.
 - » **Damper Arm Travel:** 2"
- **Auxiliary Switch** One integral SPDT switch, field adjustable to actuate at any position of stroke. This is not a safety switch.
- **Overtravel Proof-of-Closure Switch** A single factory set non-field adjustable SPDT switch to be used in conjunction with V710 Series Gas Valves with overtravel seal (V25 suffix in catalog number).



Specifications

Force Output: 250 lbs

Stroke: 1 1/8" maximum

Electrical Characteristics:

Operating Voltage / Frequency	Current, in Amperes*		
	Inrush	Opening	Holding
120/60	3.6	2.2	0.18
240/60	1.9	1.2	0.09

*Current increases by 20% for 50Hz operation.

Opening Time: Fast Opening: 14 seconds max.
Slow Opening: 26 seconds max.

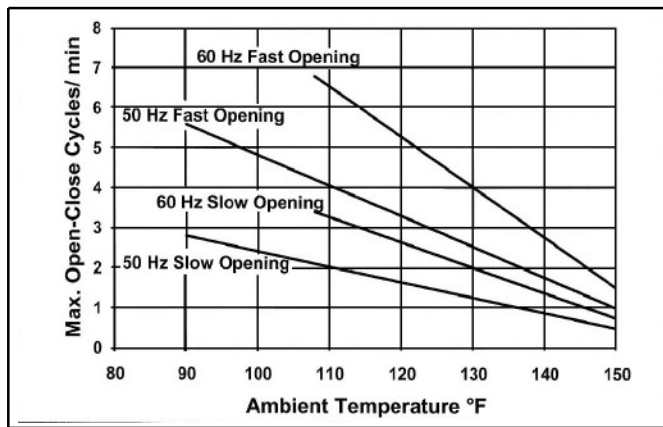
Note:

- Opening time doubles below -30°F (-34°C).
- 50Hz operation increases opening time by 20%.
- Opening time is not field adjustable.

Maximum Closing Time: One second

Ambient Temperature and Duty Cycle Limitations

The actuator may be operated in ambient temperature conditions from -40°F to 150°F (-40°C to 65°C). Actuator can be cycled open / close continuously below 108°F (42°C) for 60Hz and below 90°F (32°C) for 50 Hz. See chart below for limitations (open / close cycles) at elevated temperatures.



NOTICE

The AH4E actuator is fitted with a self-resetting thermal cutout device. If the recommended temperatures and duty cycles above are exceeded, the thermal cutout may trip causing the actuator to stop in its current position during valve opening. The valve closing time remains one second or less regardless of thermal cutout trip. Once the actuator cools, the cutout will self-reset and the actuator will resume operation. If the cutout trips repeatedly, verify that the application is within the ambient temperature and the duty cycle limits of the actuator. If the application is within the specified operating limits and the cutout continues to trip, replace actuator.

INSTALLATION

Positioning/Mounting

Follow the V710 Series Gas valve and/or damper manufacturer’s instructions when installing the Hydramotor .

1. AH4E actuators can be installed to operate in any position.
2. Check to ensure that the mounting gasket, if applicable, is in the proper position, clean and without damage. Position the actuator to operate the valve **(and damper if appropriate)**. Secure actuator with the three mounting set screws. Tighten set screws to 80 ± 5 in-lbs [9,0 ± 0,5 Nm] using a 5/32 hex key wrench. (See Figure 1)

Wiring (Refer to Figure 2)

⚠ WARNING: Electrical hazard. To prevent the possibility of death, serious injury or property damage, open all circuits before inspection, service or disassembly.

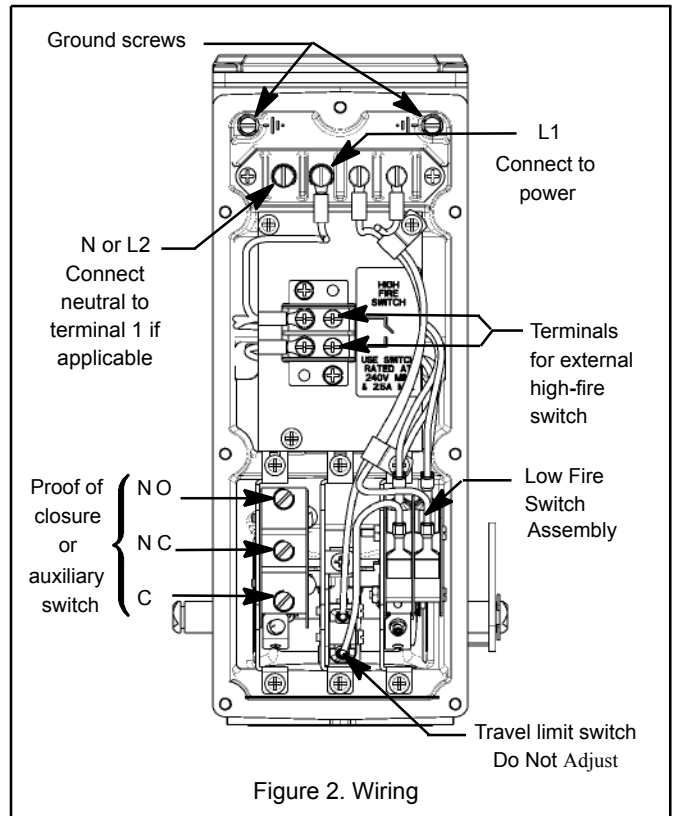


Figure 2. Wiring

Wiring must comply with local codes and the National Electrical Code. Limit controls must conform with actuator rating (voltage, amperage, hertz). Wiring to meet NEC Class I, suitable for 90 C. Wire limit controls to the hot side of power supply.

1. Check the nameplate and confirm that the appropriate power is being supplied to the unit. Remove the front cover (with nameplate) and set aside to access electrical connections taking care not to damage the cover gasket if supplied. A diagram is located on the inside of the cover to aid in making electrical connections.
2. Remove the desired electrical knock out and install appropriate electrical fittings. Type 4 fittings must be used with watertight units. Route wiring through the fitting. Take care not to scratch or otherwise damage the cover sealing surface when working on watertight enclosure.
3. Connect the power to terminals 1 and 2. The neutral wire, if applicable, should be connected to terminal 1. Connect the ground wire to the grounding screw provided on the housing next to the terminal strip.
4. Torque terminal screws: 8 to 12 in-lbs [0.9 to 1.3 Nm]. Torque ground screw: 20 to 25 in-lbs (2.3 to 2.8 Nm)
5. Connect wiring from an external high-fire switch (not supplied) to the 2-way terminal block. The switch must be rated at 240V minimum and 2.5A minimum. Torque terminal screws to 8 to 12 in-lbs [0.9 to 1.3 Nm].

6. If a proof of closure or auxiliary switch is being used make those electrical connections. **Use the markings located on the insulators to determine normally open and normally closed terminals.** Torque electrical connection screws 8 to 12 in-lbs (0.9 to 1.3 Nm). Refer to auxiliary switch adjustment section on page 3 for instructions on adjusting switch. Proof of closure switches are set at the factory. **Do not adjust proof of closure switches.**
7. Install the cover. Be certain that the gasket (if applicable) and sealing surfaces are clean and there is no damage to the surfaces or gasket. Snug down all screws before tightening. Torque screws 20 to 25 in-lbs (2.3 to 2.8 Nm) evenly using a crisscross pattern starting in the middle and not in the corner.
8. If the damper arm is being used, connect linkage and adjust as needed for proper operation of the damper.

Damper Arm Adjustment: To reposition the damper arm, remove the e-ring retainer and damper arm then reposition arm and reinstall e-ring. When repositioning arm onto the opposite side, remove e-rings on both sides and reposition and install on opposite sides. **DO NOT** remove the square damper shaft.

9. Operate actuator (with valve) through five cycles to verify proper operation of valve and damper/ linkage system prior to use.

Auxiliary and Overtravel Proof-of-Closure Switch Ratings

120VAC: 15 Amps, 1/3 HP
240VAC: 7.5 Amps, 1/2 HP

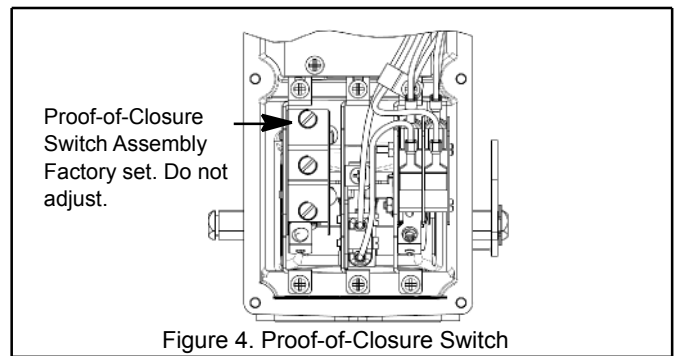
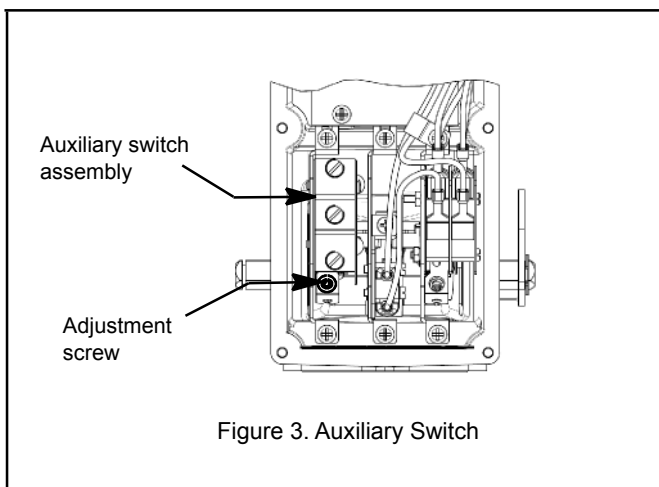
Total connected load of auxiliary and overtravel proof-of -closure switches not to exceed 1800VA.

CAUTION: Overtravel Proof-of-closure switch must only be used with V710 Series Gas Valves having an overtravel seal (V22 or V25 Suffix in catalog number).

Overtravel Proof-of-Closure Switch

The optional valve overtravel proof-of-closure switch is set at the factory to provide both a mechanical and electrical means of proving valve closed position interlock to the primary control. **This switch is not to be field adjusted.**

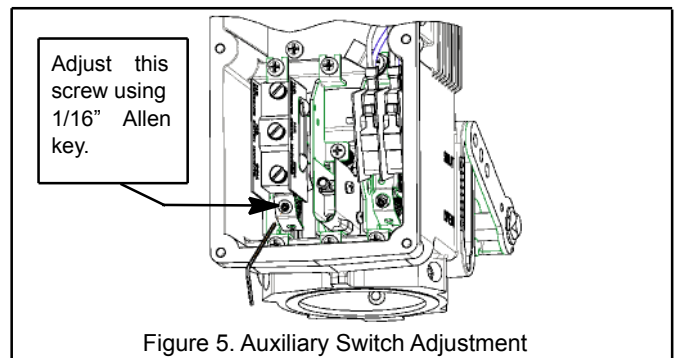
Optional Auxiliary or Overtravel Proof-of-Closure Switch (Partial Views)



Auxiliary Switch Adjustment (Refer to Figure 5)

Note: The Auxiliary switch is not a safety switch.

1. **Before removing the cover, review WARNING statements on page 1.** Remove cover screws and nameplate/electrical cover (with gasket if fitted). Take care not to damage the sealing surfaces and cover gasket if supplied.
2. Insert 1/16" Allen key into adjusting screw on auxiliary switch assembly.
3. Turn screw clockwise to move set point towards beginning of actuator stroke. Turn screw counterclockwise to move setpoint toward the end of the actuator stroke. (approximately 8.5 turns from 0 to 100% travel)
4. Cycle the actuator to verify the switch setting and readjust as required.
5. Install the cover. Be certain that the gasket (if applicable) and sealing surfaces are clean and without damage. Snug down all screws before tightening. Torque screws 20 to 25 in-lbs (2.3 to 2.8 Nm) evenly using a crisscross pattern starting in the middle.



Low Fire Switch Adjustment (Refer to Figure 6)

1. **Before removing the cover, review WARNING statements on page 1.** Remove cover screws and nameplate/electrical cover (with gasket if fitted). Take care not to damage the sealing surfaces and cover gasket if supplied.
2. Insert a 7/64" Allen key into the adjusting screw on low fire switch assembly.
3. The AH4E actuator is supplied with the low fire switch set at approximately 50% of the valve stroke. Turn screw clockwise to move setpoint towards the beginning of actuator stroke. Turn screw counterclockwise to move setpoint towards the end of the actuator stroke. (One turn = approximately 20% of valve stroke). **Note: Do not apply excessive force to the low fire adjustment screw while setting.**

Attention: Under some operating conditions, when the low fire set screw is adjusted to less than 15% of the valve stroke, the AH4E unit may not open when energized from the closed position. Please unscrew the low fire set screw in 1/8th turn counterclockwise increments until the unit opens when energized. Then further apply 1/2 turn counterclockwise.

4. Cycle the actuator several times to verify the switch setting and readjust as required.
5. Install the cover. Be certain that the gasket (if applicable) and sealing surfaces are clean and without damage. Snug down all screws before tightening. Torque screws 20 to 25 in-lbs (2.3 to 2.8 Nm) evenly using a crisscross pattern starting in the middle.

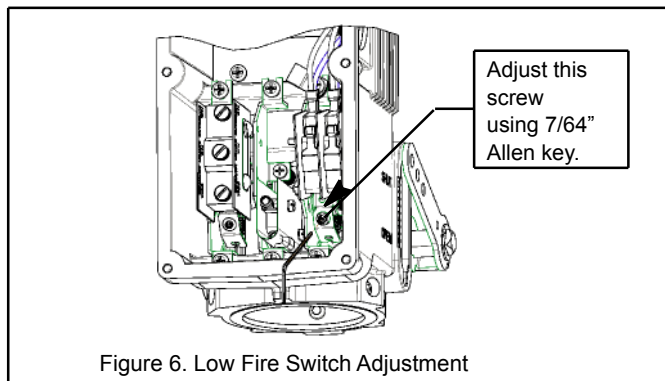


Figure 6. Low Fire Switch Adjustment

MAINTENANCE

Before inspection, maintenance or rebuild, review WARNING statements on page 1. Maintenance should include annual inspection and cleaning. Use a mild cleaning fluid, not aggressive solvents to remove dirt and oil. Organize a maintenance schedule based on environment and frequency of use. Check for loose electrical and mechanical connections and replace damaged parts. Do not remove the top cover for maintenance. There are no serviceable parts contained inside the actuator housing.

Field Service Notice

Field service replacement kits are limited to the following:

1. Auxiliary Switch Replacement Kit 296804
2. Proof of Closure Switch Replacement Kit 296806
3. Travel Limit Switch Replacement Kit 296807
4. Gasket and Screw Replacement Kit 296808

Kit contains:

- Front cover gasket and screws
- Window o-ring and screws
- Mounting gasket and set screws

5. Low Fire Switch Replacement Kit 425981

To order, specify the kit or part number, as well as the actuator model number.

Auxiliary Switch Replacement(Refer to Figure 7)

Note: The Auxiliary switch is not a safety switch.

1. **Before removing the cover, review WARNING statements on page 1.** Remove the front cover (with nameplate) and set aside. Take care not to damage the cover gasket if supplied or sealing surfaces. A diagram is located on the inside of the cover to aid in making electrical connections.
2. Disconnect auxiliary switch wiring.
3. Remove two mounting screws and the auxiliary switch.
4. Install new auxiliary switch in the actuator making sure that the fork of the switch actuation lever engages the indicator arm as shown in Figure 7.
5. Torque mounting screws 20 to 25 in-lbs (2.3 to 2.8 Nm).
6. Reconnect switch wiring and torque terminal screws 8 to 12 in-lbs (0.9 to 1.3 Nm).
7. See instructions on page 3 for auxiliary switch adjustment, starting at Step 2.

Proof of Closure Switch Replacement(Refer to Figure 7)

Same as auxiliary switch replacement except switch must NOT be adjusted.

Low Fire Switch Replacement(Refer to Figure 7)

Same as auxiliary switch replacement. Make a note of terminal connections before disassembly. Ensure terminals are replaced in the same positions.

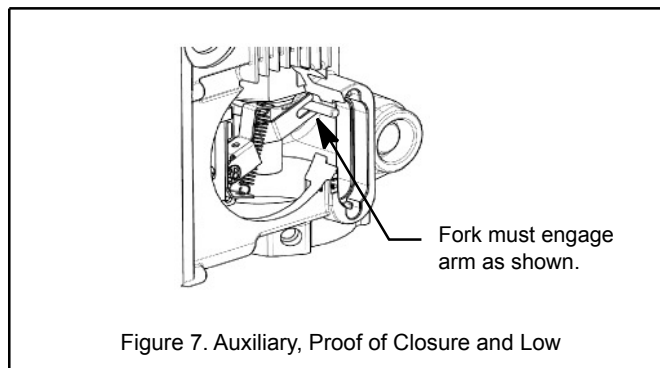


Figure 7. Auxiliary, Proof of Closure and Low

Travel Limit Switch Replacement(Refer to Figure 8)

1. **Before removing the cover, review WARNING statements on page 1.** Remove the front cover (with nameplate) and set aside. Take care not to damage the cover gasket if supplied or sealing surfaces. A diagram is located on the inside of the cover to aid in making electrical connections.
2. Remove the two mounting screws.
3. Disconnect wiring from the travel limit switch taking care not to strain the wire connection at the terminal.
4. Install new travel limit switch. Torque mounting screws 20 to 25 in-lbs (2.3 to 2.8 Nm). Travel limit switches are set at the factory. **DO NOT** adjust.
5. Plug terminal connections to travel limit switch.
6. Install the cover. Be certain that the gasket (if applicable) and sealing surfaces are clean and without damage. Snug down all screws before tightening. Torque screws 20 to 25 in-lbs (2.3 to 2.8 Nm) evenly using a crisscross pattern starting at the middle.
7. Operate actuator (with valve) through five cycles to verify proper operation prior to use.

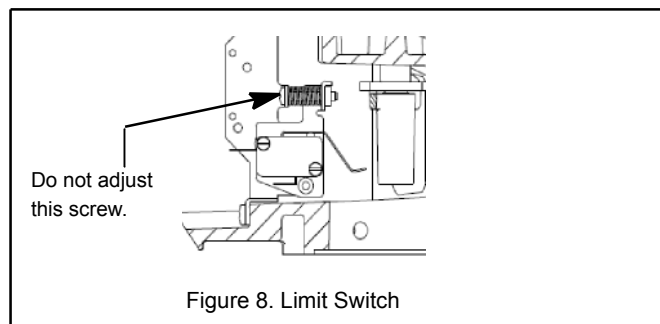


Figure 8. Limit Switch

Gasket replacement

The gaskets have an adhesive attachment. Use a nonmarring tool to peel off the old gasket. Remove backing from new gasket and stick on in the same location as the old gasket.