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**WARNING: FAILURE TO FOLLOW THESE INSTRUCTIONS
MAY RESULT IN SERIOUS INJURY OR DEATH.**

INSTRUCTION MANUAL FOR HAYWARD CONTROLS EJM SERIES ELECTRIC ACTUATORS (110, 220 or 24 VAC & 12 or 24 VDC)

This Instruction manual contains important information regarding the installation, operation and troubleshooting of EJM Series Electronic Actuators. Please read these instructions carefully and save them for future reference.

DESCRIPTION

EJM Series Electric Actuators are designed to provide reliable and efficient operation of final control elements, such as 1/4 turn valves, with torque requirements up to 3500 inch pounds.

EJM Series actuators are available as AC models with duty cycles of 25% or 75% and DC models with a 100% duty cycle.

GENERAL TECHNICAL INFORMATION

EJM Series AC voltage actuators use a split phase motor which internally steps up the applied 115 AC voltage and feeds it back to the off terminal. For example, when 115 VAC power is applied at terminals 1 and 4, 230 volts will be fed back to terminal 3. This can create a problem for controllers with solid state outputs rated for less than 230 VAC. It is suggested that the "clean" contacts provided be used for solid state device feed back. **Additionally, due to this feed back, multiple actuators cannot be wired in parallel, and individual leads (isolated contacts) must be run to each actuator.**

It is important to verify that the output torque of the actuator is appropriate for the torque requirements of the valve and that the actuator duty cycle is appropriate for the intended application.

DUTY CYCLE

Exceeding the actuator's rated duty cycle may cause the thermal overload switch to temporarily shut off power to the motor. A 25% duty cycle means that for every operating cycle that the actuator is ON (to open or close the valve), the actuator must be OFF for a time equal to three operating cycles. For example, an operating cycle time of 5 seconds ON, it must be OFF for 15 seconds before it is again operated. A 75% duty cycle means that for every operating cycle that the actuator is ON, the actuator must be OFF for 1/3 of a cycle.

TEMPERATURE LIMITS

Low ambient temperatures: The minimum recommended ambient temperature is -23°F. Care should be used in selecting actuators for valves for services below 40 °F as lower temperatures can affect valve torque. Please consult factory for actuator sizing.

High ambient temperatures: The maximum recommended ambient temperature is 140°F with the actuator shaded from direct sunlight.

POWER REQUIREMENTS

Model	TORQUE - IN/LBS	Speed 90° Seconds	Current (Amp) 120VAC		Current (Amp) 220VAC		Current (Amp) 240 VAC 3 phase	
			Run	Stall	Run	Stall	Run	Stall
EJM2S2T	150	8	0.5	0.6	0.3	0.5		
EJM3S2T	300	12	0.5	0.6	0.3	0.5		
EJM8S2T	800	15	1.0	1.8	0.5	0.9	0.6	1.1
EJM13S2T	1300	22	1.0	1.8	0.5	0.9	0.6	1.1
EJM35S2T	3500	16	1.0	3.6	0.5	1.8	1.0	3.5

Model	TORQUE - IN/LBS	Speed 90° Seconds	Current (Amp) 12 VDC		Current (Amp) 24 VDC		Current (Amp) 24 VAC	
			Run	Stall	Run	Stall	Run	Stall
EJM2S2T	150	8	0.5	3.0	0.3	1.8	0.3	1.8
EJM3S2T	300	12	0.5	3.0	0.3	1.8	0.3	1.8
EJM8S2T	800	15	3.4	8.5	2.0	5.0	2.0	5.0
EJM13S2T	1300	22	3.4	8.5	2.0	5.0	2.0	5.0
EJM35S2T	3500	16	5.0	10	3.0	6.0	3.0	6.0

INSTALLATION

CAUTION: Dangerous voltages are present inside the actuator cover unless the power supply to the actuator has been shut off or disconnected. Use extreme caution whenever working on the actuator with the cover removed.

TOOLS REQUIRED:

1/16 inch hex wrench
Small flat blade screwdriver
Philips head screwdriver

MOUNTING THE ACTUATOR

The actuator may be mounted in any position. In outdoor applications the actuator should not be installed upside down.

It is mandatory that the actuator be firmly secured to a sturdy mounting bracket. A minimum of four bolts with lock washers; should be used to secure the actuator to the bracket. Flexibility in the bracket is not allowed, and backlash, or "play", in the coupling should be minimized. The actuator output shaft must be in line (centered) with the valve shaft to avoid side-loading the shaft.

WIRING

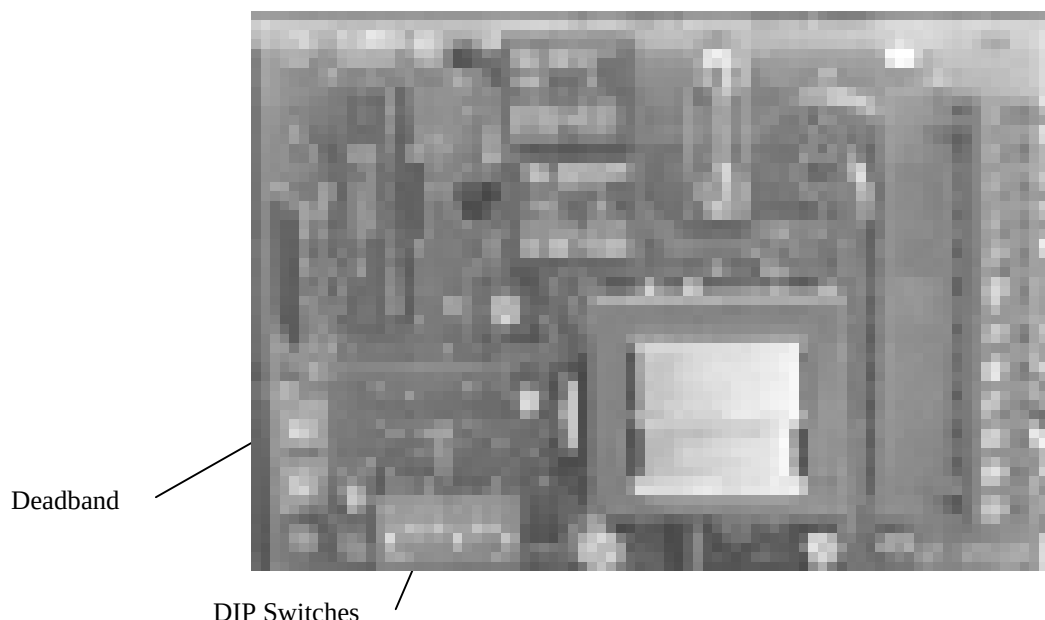
For 115 VAC actuators, 18 or 20 gauge wire may be used for short runs. At least 16 gauge wire is recommended for longer runs. Be sure to follow local wiring codes.

To operate an electric actuator, power (which may be 24, 115, or 230 VAC dependent on the actuator - please match before wiring as the wrong voltage will destroy the motherboard) from the user is wired directly to the actuator's motor through two limit switches. The limit switches control the actuators mechanical travel limits, usually 90 degrees.

To drive the actuator counterclockwise (CCW), apply power to terminals 1 and 3. To drive the actuator clockwise, apply power to terminals 1 and 4. The actuator can be driven fully open (CCW) or closed (CW) by maintaining power to the motor until the actuator trips the internal limit switches. Power can also be disconnected at any point during travel to position the actuator.

WATERTIGHT ACTUATORS are not watertight until final installation is complete with conduit entry sealed and actuator cover in place.

MODULATING CONTROL BOARD SETUP



DIP Switch Settings

Disconnect power from unit when making the following DIP Switch adjustments.

Input Signal:

- For 4-20 mA, set 1 **“on”** and 2 **“off”**
- For 1-5 Vdc, set 1 **“off”** and 2 **“off”**
- For 2-10 Vdc, set 1 **“off”** and 2 **“on”**

Output Signal:

- For 4-20 mA, set 3 **“off”**, 4 **“on”** and 5 **“off”**
- For 2-10 Vdc, set 3 **“on”**, 4 **“off”** and 5 **“on”**

Fully Open:

- For the valve to be fully open with an input signal of 4 mA, 1 Vdc or 2 Vdc; and the valve to be fully closed with the input signal of 20 mA, 5 Vdc, or 10 Vdc, (Increasing signal closes) –**set 6 “on”**
- For the valve to be fully closed with an input signal of 4 mA, 1 Vdc or 2 Vdc; and the valve to be fully open with an the input signal of 20 mA, 5 Vdc, or 10 Vdc, (Increasing signal opens) –**set 6 “off”**

Loss of Signal (LOS)

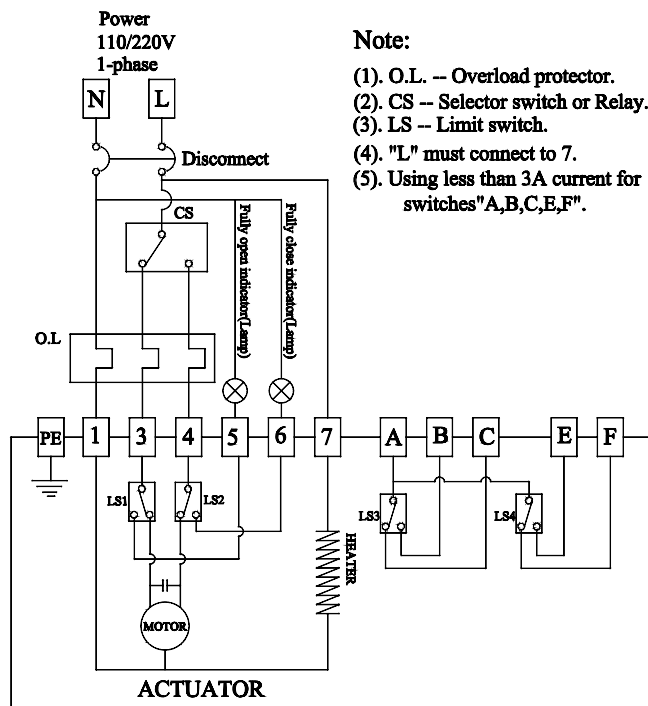
- Valve “closes” fully on LOS, set 7 **“off”** and 8 **“on”**
- Valve “opens” fully on LOS, set 7 **“on”** and 8 **“off”**
- Valve locks in place on LOS, set 7 **“on”** and 8 **“on”**

Deadband Setting

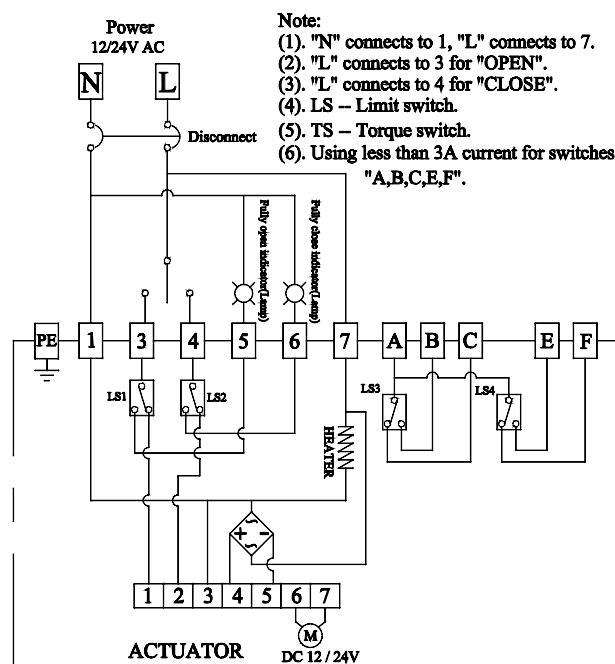
- Adjust SW1 clockwise to increase deadband.
- Adjust SW1 counterclockwise to decrease deadband.

WIRING DIAGRAMS

120/220 VAC, Single Phase

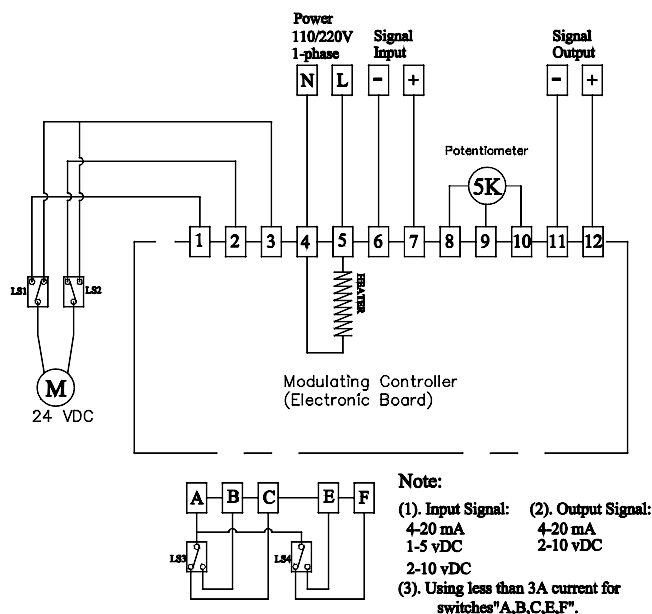
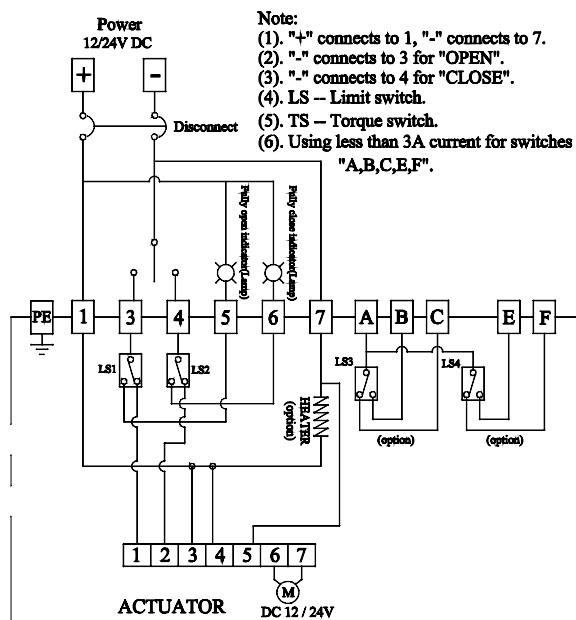


12/24 VAC



120/220 VAC Single Phase with Positioner

12V / 24V DC



CAUTION: Dangerous voltages are present inside the actuator cover unless the power supply to the actuator has been shut off or disconnected. Use extreme caution whenever working on the actuator with the cover removed.

ADJUSTMENT OF LIMIT SWITCHES

The two limit switches operating off the cams on the output shaft determine the exact positions where the actuator will stop at the end of each cycle. The first limit switch (lowest) determines the OPEN position (CCW rotation). The second limit switch (from bottom) determines the CLOSED position (CW rotation). The limit switches can be adjusted from 5 to 320 degrees of actuator rotation. If an adjustment of any of the positions is required, proceed as follows:

A. Remove Actuator Cover

Remove the actuator cover by removing the screws securing the cover to the base.

B. Adjust the OPEN limit switch cam

1. Using a 1/16 hex wrench, loosen the setscrew in the OPEN limit switch cam (the bottom switch).
2. Apply power to terminals 1 and 3 (See Figures 3) to drive the actuator to the open position (counterclockwise rotation).
3. Remove the power from the actuator.
4. Rotate the cam toward the limit switch arm just until the switch clicks closed.
5. Re-tighten the setscrew on the limit switch cam (Be careful not to over-tighten the screw).

C. Adjust the CLOSED limit switch cam

1. Using a 1/16 inch hex wrench, loosen the set screw in the CLOSED limit switch cam (the second from the bottom).
2. Apply power to terminals 1 and 4 (See Figures 3) to drive the actuator to the closed position (clockwise rotation).
3. Remove the power from the actuator.
4. Rotate the cam toward the limit switch arm just until the switch clicks closed.
5. Re-tighten the setscrew on the limit switch cam (Be careful not to over-tighten the screw).

STANDARD ADDITIONAL LIMIT SWITCH WIRING

The actuator's travel limit switches may be used to indicate the open and closed status of the actuator. Power at terminal 3 is switched to terminal 5 when the actuator is fully CCW. Power at terminal 4 is switched to terminal 6 when the actuator is fully CW. Two "Additional" limit switches are provided to allow "clean" contact closure at the end of travel. They are adjusted utilizing the above procedure with the top switch as the closed switch and the second from the top the open switch.

TROUBLESHOOTING GUIDE

TROUBLE	POSSIBLE CAUSE	REMEDY
Motor does not operate	No Power to actuator	Check source, fuses, wiring
	Motor burned out	Replace motor and determine cause of failure
	Thermal overloaded, (Over heated)	Wait for motor to cool down and reset.
	Actuator output shaft stalled	Check drive load for mechanical jam and correct cause
Motor stops running	Power Supply short circuit	Check wiring
	Jammed, damaged power gearing	Repair gearing
	Object caught in valve	Check and clean valve
Not able to fully open or close	Traveling cam screw loose or out of position.	Reset cam and Tighten screw
	Distortion of mounting or valve stem.	Replace valve stem
Motor runs, but output shaft does not rotate	Broken or worn power gearing.	Repair power gearing
Valve stops operating while motor is running	Worn out gear	Replace gear
	Worn or broken actuator to valve coupling	Replace coupling

If the actuator fails to operate:

Check that the proper voltages are present at the actuator's terminal connections.

If the motor is hot the actuator may have gone in to thermal over load protection (the motors are equipped with internal thermal overload protection). Let the motor cool and check the following:

Are the limit switches properly set?

Is the actuator's duty cycle correct for the application?

Is the actuator's output torque within the required range?

If the actuator's motor hums or turns slowly:

Check the actuators motor capacitor to see if it is broken or cracked.

Make sure power is applied only to one terminal, either 3 or 4 but not both.

Check for a bad connection at motor socket S3.

LIMITED WARRANTY:

Hayward Industrial Products Inc. extends a limited warranty that products manufactured by Hayward shall be free from defects in material and workmanship for a period of two (2) year from the date of factory shipment. Hayward will repair or replace, at its option, Hayward products proven to be defective within such limited warranty period. This limited warranty does not cover shipping costs to and from the factory, any labor or other costs associated with product removal, or any other costs of any nature without prior written consent by Hayward.

Proper assembly of our products is necessary to insure expected performance and safety. This limited warranty shall not apply to products, which in Hayward sole discretion, have been subject to improper assembly, installation or operation, or other than normal application, use or service. This limited warranty shall not apply to defects caused by acts of God, nor shall it apply to products which in Hayward's sole discretion; have been subject to negligence, abuse, accident, misapplication, tampering or alteration.

This limited warranty is exclusive and in lieu of all other warranties, expressed or implied, including but not limited to implied warranties of merchantability and fitness for a particular purpose. Hayward shall not be liable for any consequential, incidental or contingent damages of any kind.