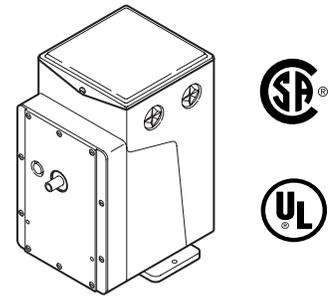


## Applications

For two-position operation of dampers or valves in heating, ventilating and air-conditioning systems and similar applications where return to normal position is not required.

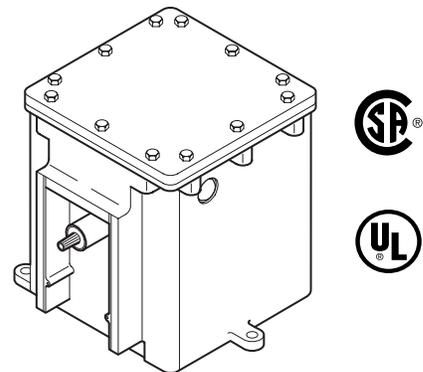
These unidirectional actuators (clockwise rotation) require a three-wire control circuit; SPDT snap-acting switch or its equivalent such as a thermostat, pressure switch or relay. A built-in cam operated, snap-acting, adjustable SPDT auxiliary switch is standard. It is factory set to make at mid-stroke. One contact closes at end of stroke; other contact closes at end of next stroke.



MC-xxx  
(Standard Actuator)

## Features

- 24, 120, and 240 Vac models
- Equipped with SPDT auxiliary switch
- Actuator has a rugged die cast aluminum housing with two 1/2" conduit openings
- Hazardous location actuator housing has two 3/4" pipe taped openings for rigid metal conduit connection
- Oil immersed gear train
- Requires a three wire control circuit SPDT snap-acting or equivalent



MC6-3xx, MC6-4xx, MC7-4xx,  
(Hazardous Location Actuator)

## Options

Available 24, 120, 208, 240 Vac; 50 or 60 Hz. 50 Hz specify MC5-xxx. For hazardous locations, specify MC6-xxx (60 Hz), MC7-xxx (50 Hz). Actuators factory assembled, UL listed, CSA certified.

## Applicable Literature

- *AV-390 Series, Valve Linkage for Gear Train Actuators, General Instructions, F-24376*
- *TAC Electric/Electronic Products Catalog, F-27382*

- *Apparatus for Hazardous Locations EN-56-2 F-18451*
- *AV-29x Series Hazardous Location Valve Linkage for Geartrain Actuators General Instructions F-27441*

## SPECIFICATIONS

**Control Circuit:** Three Wire SPDT snap-acting switch or equivalent.

**Shaft Rotation:** Unidirectional clockwise 180° when power is applied.

**Auxiliary Switch:** Adjustable SPDT is standard. Factory set to make (or break) at mid stroke.

**Running** , 5.8A at 120 Vac, 2.9 at 240 Vac

**Locked Rotor:** 34.8 at 120 Vac, 17.4 at 240 Vac

**Non-inductive**, 12A at 120 Vac, 6 at 240 Vac.

**Environment:**

**Ambient temperature limits:** Shipping and storage -40 to 136 °F (-40 to 58 °C)

Operating -40 to 136 °F (-40 to 58 °C).

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

**Locations:** NEMA 1. Optional NEMA 4 with AM-363 gasket, or hazardous service locations N.E.C., Class 1, Groups C and D, and Class 2, Groups E, F, and G.

**Connections:** Coded screw terminals.

**Options:** Hazardous locations specify MC6-351, 421, or 431 (60 hz), MC7-4311 (50 hz).

**Agency Listing:** UL File #E9429 standard models.

UL File #29291 Hazardous location models. Temperature code T6 for hazardous housing.

Table-1 Model Chart.

Part No. Standard Service	Part No. Hazardous Location <sup>a b</sup>	Input				No Load Timing (Sec./180x)	Rated Torque Lb.-in. (N-m)	Nominal Damper <sup>c</sup> Area Sq. Ft. (m <sup>2</sup> )	
		Volts	Hz	Watts	VA Rating			Parallel Blade	Opposed Blade
MC-351	MC6-351	24	60	28	53	70	220 (25)	122 (11)	157 (15)
MC-421	MC6-421	120	60	50	96	20	175 (20)	97 (9)	125 (12)
MC-431	MC6-431	120	60	50	96	30	220 (25)	122 (11)	157 (25)
MC-4311	—	240	60	50	96	30	220 (25)	122 (11)	157 (15)
MC5-4311 <sup>d</sup>	MC7-4311 <sup>d</sup>	240	50	50	96	36	220 (25)	122 (11)	157 (15)

<sup>a</sup> Class 1, Groups C & D, and Class 2, Groups E, F, and G hazardous locations; refer to EN-56-2, F-18451. Hazardous location valve actuators can also be used for hazardous location damper applications.

<sup>b</sup> Models for hazardous locations are only available as factory-built enclosure/actuator assemblies.

<sup>c</sup> Damper ratings are nominal and based on standard (not low leakage) dampers at 1" (25.4 mm) W.C. static pressure and 2000 FPM (10 ml/S) velocity.

<sup>d</sup> Not CSA approved.

## ACCESSORIES

### Damper Linkage Accessories (See Figure-1)

AM-111	Crank arm for 5/16" diameter damper shaft
AM-112	Crank arm for 3/8" diameter damper shaft
AM-113	Crank arm for actuator or 1/2" diameter damper shaft
AM-115	Crank arm for 7/16" diameter damper shaft
AM-116	Splined crank arm for actuator
AM-122	Linkage connector straight type
AM-123	Damper clip
AM-125	5/16" diameter x 20" damper rod
AM-125-048	5/16" diameter x 48" damper rod
AM-132	Ball joint connector
AM-161	Damper linkage kit
AM-161-1	Damper linkage kit
AM-301	90 degree mounting bracket

### Valve Linkage Accessories (See Figure-4)

AV-330	Valve linkage for 2-1/2" & 3" VB-9323
AV-352	Valve linkage for 2-1/2" to 6" VB-9213 or VB-9313 valve bodies and 4" to 6" for VB-9323
AV-393	Valve linkage for 1/2" to 1-1/4" VB-92x3 or VB-93x3
AV-394	Valve linkage for 1-1/2" & 2" VB-92x3 or VB-93x3
AV-396	Valve linkage for 2-1/2" to 4" VB-9213 or VB-9313

### Valve Linkage Hazardous Location Accessories (See Figure-5)

AV-293	Valve linkage for 1/2" to 2" VB-7xxx series for hazardous locations
AV-296	Valve linkage for 2-1/2" and 3" VB-9xxx (bronze) series for hazardous location

## Miscellaneous Actuator Accessories

Standard models only.

AM-321	Two step switch kit
AM-341	Four step switch kit
AM-363	NEMA 4 rated gasket kit

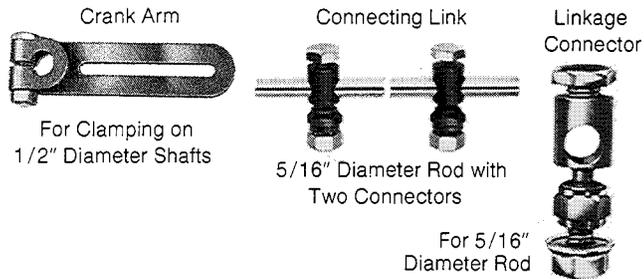


Figure-1 Damper Linkage Accessories.

## TYPICAL APPLICATION (Wiring Diagram)

Make all electrical connections in compliance with the job wiring diagram and the national and local electric codes. Typical connections are shown in (Figure-2).

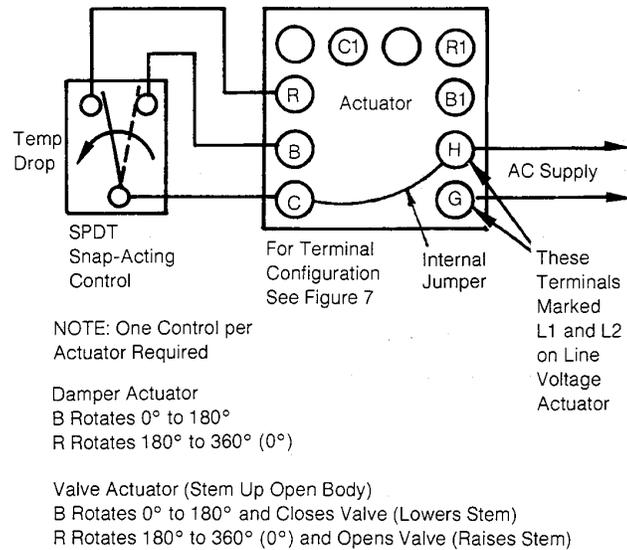


Figure-2 External Wiring for Heating Application.

## PRE-INSTALLATION

The MC actuators are shipped without mounting hardware or linkage. In damper applications, crank arms (AM-113), connectors (AM-122 or AM-132), link rods (AM-125) and mounting brackets (AM-301) will be required. In valve applications, a valve body and AV type linkage will be required.

Before installing the actuator, check for bent or broken parts or oil leaks. Actuators may be connected to power supply to check operation prior to installation.

## INSTALLATION

### Requirements

Preferred mounting for the actuator is in the upright position, but other positions are acceptable. Adjustable speed units should never be mounted upside down or with the output shaft pointing upward. Allow six inches clearance above the actuator wiring compartment. If an AM type mounting bracket is not used, the base of the actuator may be used as a template for marking mounting holes.

### Procedure

Actuator may be used in damper and valve control applications. Figure-3 illustrates linkage operating an arm through a 90° arc. To fasten damper linkage proceed as follows.

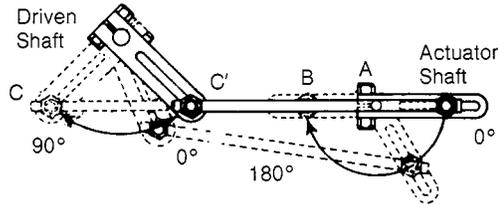


Figure-3 180° Actuator Rotation Driving a Damper Rotation of 90°.

### Damper Installation

1. Fasten linkage connector at end of damper crank arm.
2. Fasten linkage connector at punch mark on actuator crank arm (about .707 of the radius).
3. Move damper to normal position and clamp connecting link to connectors.
4. Check adjustment for proper operation by running actuator and driven shaft between limits of travel.

---

**Caution:** If crank arm does not provide proper travel, reset connecting link in linkage connector. Never attempt to turn the actuator shaft with a wrench or a crank. This may damage the gears.

---

### Valve Installation

Install all valves with pressure under seat. Refer to flow arrow on body or piping information on valve body tag. Three way mixing valves should be installed with two inlets and one outlet. Three way diverting valves should be installed with one inlet and two outlets.

To assemble an actuator to a valve, refer to detailed instructions on *AV-3xx General Instruction Sheet*, F-19068 or *AV-29x Series Hazardous Location Valve Linkage for Geartrain Actuators General Instructions*, F-27441.

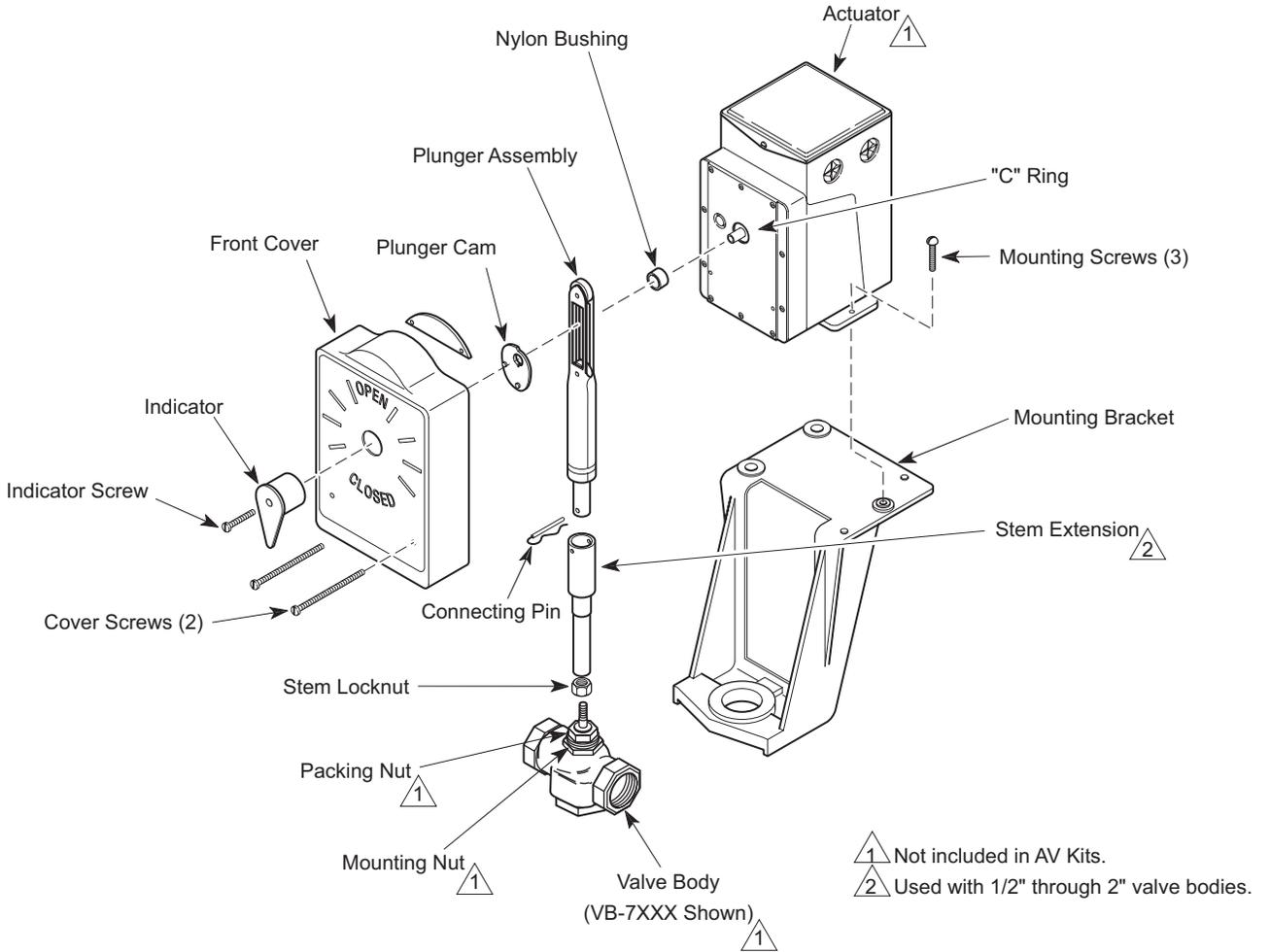


Figure-4 Components for Valve Installation of Standard Actuator.

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**Note:** See AV-390 Series, Valve Linkage for Gear Train Actuators, General Instructions, F-24376 for detailed instructions when used as a valve actuator.

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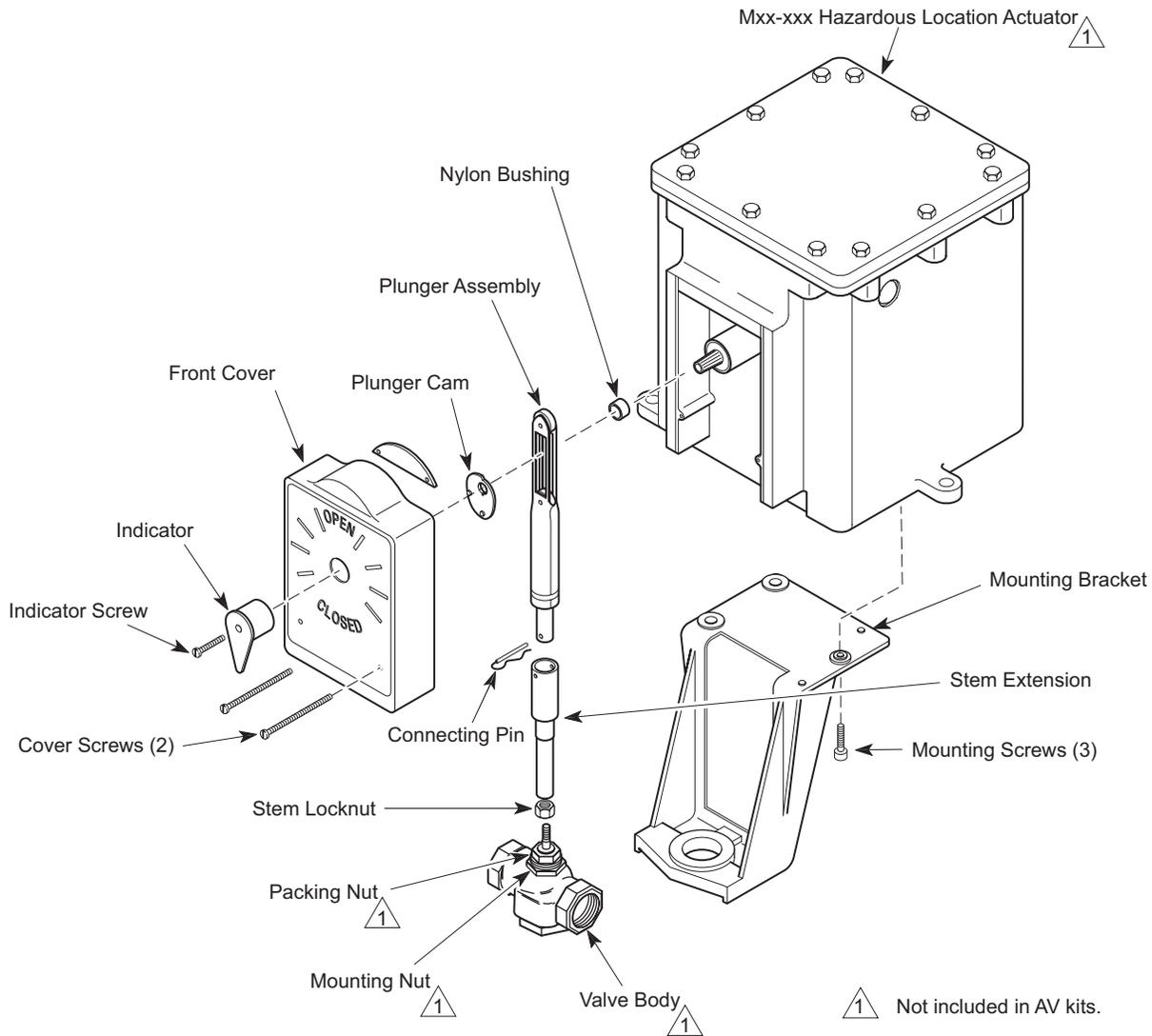


Figure-5 Components for Valve Installation 1/2" to 2" VB-7xxx and VB-9xxx-xxx-4-xx 2-1/2" and 3" Globe Valves for Hazardous Location Actuators.

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**Note:** See AV-29x Valve Linkage for Hazardous Location Gear Train Actuators General Instructions, F-27441 for detailed instructions when used as a valve actuator.

---

## WIRING

For control and power wiring on low voltage actuators (H, G, R, B AND C terminals), use No. 14 wire on runs under 140 feet and No. 12 wire on longer runs. On line voltage units (L1, L2, R, B, and C terminals), use No. 14 wire on runs up to 1300 feet.

Class I circuits must be used for connections to the control and power terminals (L1, L2, R, B, and C terminals) on line voltage actuators. Class II circuits may be used for connections to the control and power terminals (H, G, R, B, and C terminals) on 24 Vac actuators. Connections to the auxiliary switch terminals (R1, B1, and C1) may be per Class II circuits except when the switch is used on line voltage applications in which case Class I circuit must be used. When powering actuators from a common transformer, the G terminals must all connect to the same side to prevent transformer damage.

### Hazardous Location Models

Make all electrical connections to the assembly in accordance with the job wiring diagram, the National Electric Code Article 500, and in compliance with the local electrical codes.

Two 3/4" pipe tapped openings are provided in the housing for rigid conduit connections. It is recommended to insert a chase nipple from inside of the housing to prevent threads from cutting or damaging wiring.

When wiring, take care to lay all leads in the wiring channel located just under the housing cover to protect the leads from any sharp edges which may be in the vicinity.

The housing and the edge of the cover are stamped with the letter "O." When replacing the cover, the letters must be aligned with each other.



---

**Warning:** The cover-to-housing orientation must be maintained in order to preserve the integrity of the seal. Failure to observe this warning can result in injury or death.

---

1. Remove twelve cover screws and cover. Place cover, machined surface up, in a protected location to avoid damage to machined surfaces.
2. Make all wiring connections to actuator taking care to lay all leads in the wiring channel provided.
3. Before enclosing the actuator, wipe machined surfaces of housing clean with a lint free cloth and apply one of the UL approved compounds. See Note below.



---

**Warning:** Failure to observe these warnings can result in injury or death.

- Do not scrape, scratch, or use abrasives on the machined surfaces.
  - Ensure the surfaces are clean.
  - Use only the approved compounds listed below.
- 

4. Secure cover tight against the enclosure in the same position before removal with the twelve screws provided.

---

**Note:** Underwriters Laboratories has sanctioned the use of the following compounds on hazardous location ground joints: Crouse-Hinds type OSL lubricant, Crouse-Hinds type STL lubricant, or "No-OXID" oil, grade "D."

---

Two 1/2" conduit knockouts are provided on the actuator case.

Refer to Figure-6 for terminal locations.

## CHECKOUT

After the entire system has been installed, the following checks for proper operation must be made.

1. Be sure that the system power is connected, and on.
2. Turn thermostat to call for cool. Actuator should rotate clockwise from 0° to 180°, turning off the heating media. (View actuator from output shaft end (front).)
3. Turn thermostat to call for heat. Actuator should rotate clockwise from 180° to 360° (also 0°), and turn on heating media.
4. If the room temperature varies excessively, see System Repair.

## Actuator Checkout

Turn power off and connect terminals as follows:

1. Connect terminal C to B and actuator should run clockwise (when energized) to end of travel (usually 180°).
2. Connect terminal C to R and actuator should run clockwise (when energized) from 180° to 360° (0°).

## RUN/ADJUST

### Theory of Operation

### Unidirectional Three-Wire, Two-Position Actuators

The motor, gear-train assembly with limit switches to stop the movement (usually at the end of 180° CW travel) is built in two types. The damper actuator output shaft gives rotary motion. The valve actuator has a cam-operated plunger which transforms rotary motion to linear motion to operate the valve stem. Three-wire actuators require a SPDT switching action in the controller.

“R” contact of the thermostat is made on a call for heat; “B” contact is made on a call for less heat; “C” terminal is common. “R” of the actuator (assume on valve) is a starting switch that starts to open the valve; “B” starts to close the valve; and “C” is the limit switch. Auxiliary cam-operated switches are available for the operation of additional valves, actuators, relays, etc.

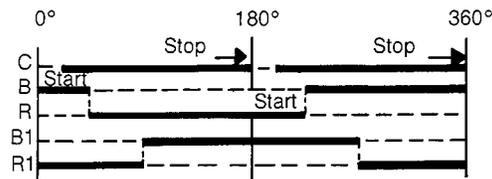
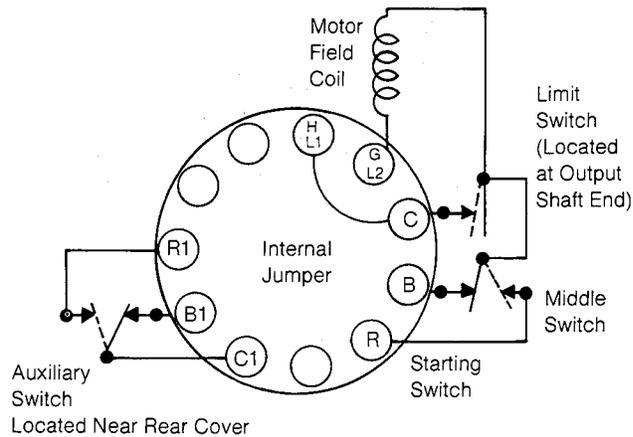


Figure-6 Internal Wiring Diagram and Cam Chart.

## Auxiliary Switch Adjustment

The adjustable built-in SPDT auxiliary switch is actuated by the cam nearest to the back of the actuator. Although it can be adjusted to operate at any point in the actuator rotation, it is factory set to operate at approximately mid-stroke. This operating point may be changed by inserting a screwdriver through the opening in the top plate directly behind the terminal block, and engaging the screwdriver with the gear-like plastic disc. Turning the disc clockwise causes the switch to operate nearer the counterclockwise end of actuator travel. Each click of the switch actuating cam represents approximately 3 angular degrees change in operating point.

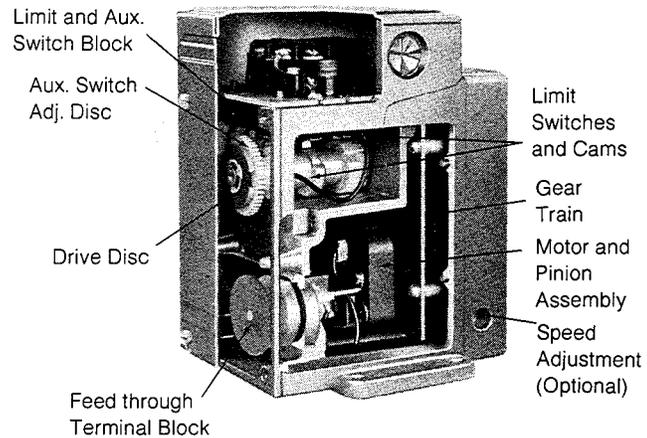


Figure-7 Cut-a-way of Actuator.

## MAINTENANCE

A minimum of maintenance is required since the motor and gear train are submerged in oil (BYZP-195) for continuous lubrication and cooling. If necessary to refill with oil, always use TAC immersion oil, available in one quart cans (refill capacity - 1 to 1-1/4 pints). Oil level (with the actuator upright) should be up to the edge of the oil fill hole which is located just left of the output shaft.

## REPAIR

None. Replace an inoperable actuator with a functional unit.



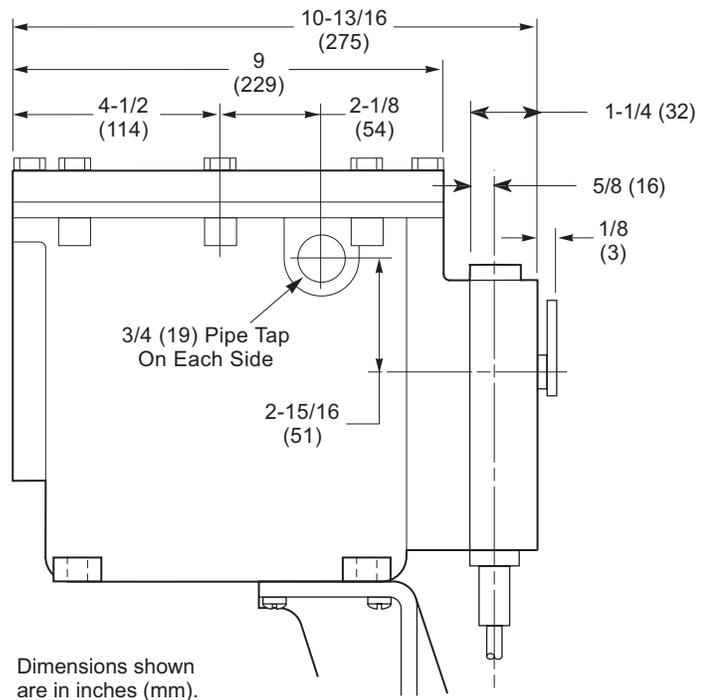


Figure-10 Hazardous Location Actuator Side Dimensions.

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