CYCLEMASTER® BALL VALVES

SERIES II & III ACTUATOR AND WEATHERPROOF ENCLOSURE INSTALLATION INSTRUCTIONS

ACTUATOR/HUB REMOVAL

1. Disconnect Actuator (10) from all electrical sources.
2. Remove Actuator from Sealed Hub Stem (3) by:
   a) Loosening the screw on the Shaft Coupling (9)
   b) Slide the Actuator off the Sealed Hub Stem.
3. Remove Hub Assembly (2-8) from Ball Valve (1) by
   a) Loosening the Set-Screws (5) on Hub (7)
   b) Remove Hub by placing wrench on flats of the Sealing Mechanism (8) and turn counter-clockwise.
   c) Unscrew Hub Assembly from valve
   d) Confirm that the Seal Cap Gasket (2) remains with the Hub Assembly.

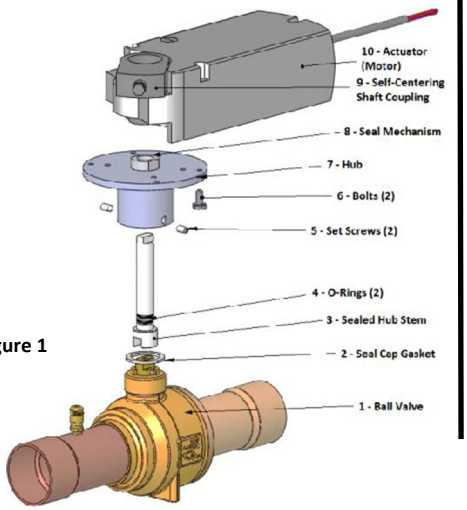


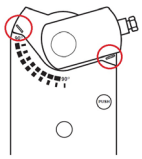
Figure 1

HUB INSTALLATION

1. Remove Seal Mechanism (8) from Hub Assembly (2 -8). Sealed Hub Stem (3) should remain partially installed in the Seal Mechanism. Ensure Stem and O-Ring Seals are well lubricated.
2. Reinstall the Seal Mechanism into the Hub (7), hand-tight. Apply a small amount of lubricant to the threads if necessary.
3. Assemble the hex-head Bolts (6) onto the Hub to go into actuator. Align Bolts with holes on underside of Actuator (10).
4. Partially install the Set-Screws (5) into the Hub.
5. Make sure the brass sealing surface on top of the Ball Valve (1) is clean and free of debris.
6. Confirm that the PTFE Seal (2) is in place, then install the entire Hub Assembly (2-7) onto the valve neck, taking care that the slot in the Stem (3) aligns properly with the valve stem and the Seal is in place between the Seal Mechanism (8) and the top of the valve neck.
7. Thread the Hub over the Seal Mechanism (8) and onto the valve as far as possible, stopping just short of bottoming out.
8. Align the Hub so that the Actuator orientation will be as desired. With an Allen wrench, tighten the Set Screws (5) (Torque: 60-65 lb. –in.) on either side of the Hub so that Set Screws secure the Hub against the ball valve body.
9. While holding the larger diameter, tighten the Seal Mechanism portion with a wrench approximately 1/4 to 1/2 turn until secure.
10. Pull Stem upward away from Ball Valve to remove slack,

ACTUATOR INSTALLATION (No Enclosure)

1. Get the Actuator (10), Self-Centering Shaft Coupling (9) and Locking Clip required for installation.
2. Assemble the Shaft Coupling (9) onto the Actuator as shown in Figures 1 & 2. Depress the manual override button on top of the Actuator and manually cycle the Shaft Coupling back-and-forth through the full 90° cycle to confirm that each actuator operates within the full range between the left and right raised stops. Reposition if necessary.



3. Attach Locking Clip to the underside of the Shaft Coupling to secure it in the Actuator as shown in Figure 3.
4. Depress the manual override button on top of the Actuator and match the full counter-clockwise position of the Shaft Coupling to the full counter-clockwise rotation of the Ball Valve (1).
5. Pull Stem (3) upward, away from Ball Valve until no additional space is between the Hub Assembly's Stem and Seal Mechanism (8).
6. Place Actuator against the Hub (7), over the Stem taking care that the flange Bolts (6) align with the holes on the underside of the Actuator housing. Bottom of Actuator should be flush against the top of the Hub.
7. While holding manual override switch the motor, align the Shaft Coupling and tighten against Stem. Series II –Torque ≈ 90-108 lb.- in. (10-12 N -m), Series III – Torque ≈ 100-130 lb. –in. (12-15 N- m).

Figure 2 Shaft Coupling

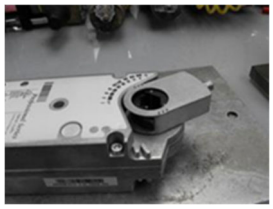


Figure 3 Shaft Coupling

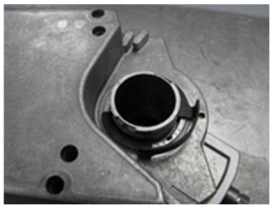


Figure 4 Locking Clip

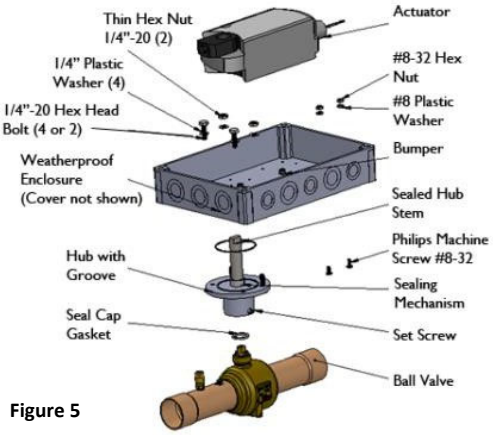
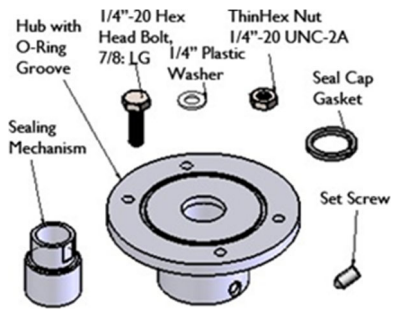
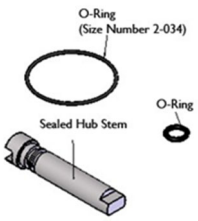
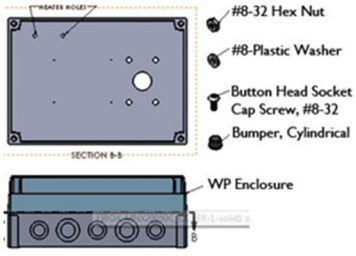


Figure 5







ACTUATOR INSTALLATION (with Enclosure)

Warning: Enclosures will not provide protection if water can intrude due to incorrect mounting.

1. Take the Enclosure and accessories out of the kit (In case of Act.- BV-Hub-Encl. kit, the kit includes the Ball Valve and the Actuator as well).
2. Disassemble cover by loosening plastic screws on enclosure.
3. Follow steps 4 through 10 of "HUB INSTALLATION". DO NOT REMOVE SEAL MECHANISM (already installed) or thread sealant between Hub and Seal Mechanism will be damaged.
4. Install O-Ring into Hub Groove. (Figure 6) If Hub does not have groove, use Hub from the new Enclosure Kit. Apply small amount of lubricant to O-Ring, if necessary.
5. Assemble **two** of the hex-head bolts onto the Hub (Figure 7). Align Bolts with holes on underside of Enclosure and Actuator.
6. Place enclosure over Stem and on Hub. Align flange bolts with holes on the underside of Enclosure. Tighten Enclosure onto the flange bolts (onto the Hub) using the two thin hex nuts and two plastic washers (Assembly Torque ≈ 70 lb. –in). Bottom of Enclosure should be flush against top of Hub.
7. From top of Enclosure, assemble the other two bolts (in case of series III, use the two cap screws), using the plastic washer, in the remaining 2 holes and tighten down the Enclosure onto the hub. (The heads of the bolts should be on the topside and the shaft of the body of the bolt protruding out of the underside of the hub – see Figure 5)
8. Before installing the actuator into the enclosure, follow steps 1-5 of the "Actuator (Motor) Installation" stated above. **NOTE: When installed in a Weatherproof Enclosure, the Shaft Coupling of the Actuator needs to be installed on the bottom side of the Actuator (Figure 10) instead of the top side (as mentioned in Step 2 – Figure 3).**
9. Place Actuator against Enclosure, over the Stem. Align Flange Bolts with the holes on the underside of the Actuator housing. Bottom of Actuator should be flush against top of Enclosure.
10. While holding manual override switch on Actuator, align Shaft Coupling and tighten against the Stem. Series II, Torque ≈ 90-108 lb.

–in (10-12 N-m), Series III, Torque ≈ 100-130 lb. – in (12-15 N-m) – see standard Commissioning Instructions.

11 Install Enclosure using cover screws. (Torque ≈ 10 lb.-in/1.2 N-m)

Notes:

1. Do not over-tighten the motor clamp.
2. Hub is tightened to Seal Mechanism, not to bottom of the valve neck. Seal Cap Gasket should be tight enough to seal valve surface.

Figure 6

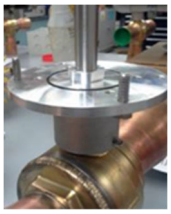


Figure 7

Figure 8*

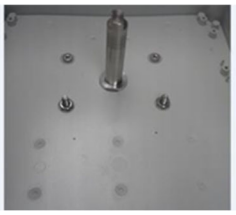


Figure 9
(Thin Hex Nuts)

Figure 10 *

*** Illustrations using a Series III Enclosure**

Series II

Series III

Actuator Features:

- Synchronous motor technology with stall protection
- Unique self-centering Shaft Coupling
- Manual override
- cUL and UL Listed, CE Certified
- Independently adjustable dual auxiliary switches available

Service Warnings/Cautions	
⚠	DO NOT OPEN THE ACTUATOR. IF THE ACTUATOR IS INOPERATIVE, REPLACE THE UNIT.
⚠	Do not wire different types of actuators in parallel with these models.
⚠	All six outputs of the dual auxiliary switch (A and B) must only be connected to: Class 2 voltage (UL/CSA), Separated Extra-Low Voltage (SELV) or Protective Extra Low Voltage (PELV) (according to HD384-4-41) for installations requiring CE conformance. You must use a CE certified plenum actuator.
⚠	Installations requiring CE Conformance: All wiring for CE certified actuators must only be separated extra low voltage (SELV) or protective extra low voltage (PELV) per HD384-4-41. Use safety isolating transformers (Class III transformer) per EN61558. They must be rated for 100% duty cycle. Overcurrent protection for supply lines is maximum 10A.
⚠	Mixed Switching operation is not permitted to the switching outputs of both auxiliary switches (A and B)
⚠	Personal injury/loss of life may occur if a procedure is not performed as specified.
⚠	Not for use in condensing or wet applications.
⚠	Equipment damage or loss of data may occur if the user does not follow a procedure as specified.
⚠	To avoid injury or loss of life, pay attention to any hazardous voltage when performing checks.

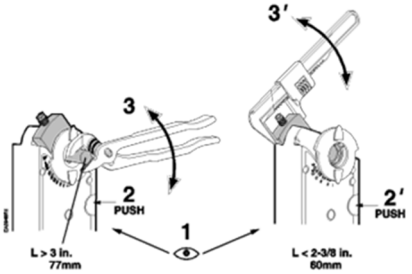
Manual Override

To move the valve and lock the position with no power present:

1. Hold down the PUSH button.
2. Make adjustments to the valve position.
3. Release the PUSH button.

NOTE: If there is no load, the actuator will hold the new position. If load conditions exist, the actuator might not be able to hold.

Once power is restored, the actuator returns to the automatic control.



Standard Actuators

Wiring

All wiring must conform to NEC and local codes and regulations.

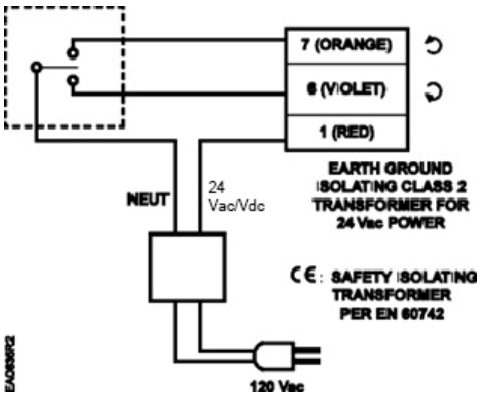


Figure 1. Standard Models

Use earth ground isolating step-down Class 2 transformers. Do not use auto transformers.

The sum of the VA ratings of all actuators and all other components powered by one transformer must not exceed the rating of the transformer. It is recommended that one

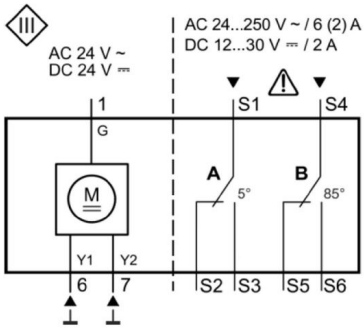


Figure 2. Auxiliary Switch Models

Standard Symbol	Function	Terminal Designation	Color
1	Supply (SP)	G	Red
6	Control signal clockwise	Y1	Violet
7	Control signal counterclockwise	Y2	Orange
FACTORY INSTALLED OPTIONS			
S1	Switch A Common	Q11	Gray/Red
S2	Switch A N.C.	Q12	Gray/Blue
S3	Switch A N.O.	Q14	Gray/Pink
S4	Switch B Common	Q21	Black/Red
S5	Switch B N.C.	Q22	Black/Blue
S6	Switch B N.O.	Q24	Black/Pink

START UP/COMMISSIONING STANDARD ACTUATORS

1. Verify the power supply type required, 24 AC or 24 AC/DC, shown on the actuator label. For AC/DC, the actuator will automatically adjust for either.
2. Connect wires 1 (red) and 6 (violet) to a Digital Multimeter (DMM) with the dial set at Vac or Vdc, depending on power supply. Apply a control signal (24 Vac) to wires 1 and 6 to verify that the operating voltage is within range.
3. Check that the direction of the rotation switch matches the rotation of the valve ball.
4. Check the operation.
   a) Connect wire 1 (red) to the actuator.
   b) Apply a control signal (24 Vac) to wires 1 (red) and 6 (violet).
   c) Allow the actuator shaft coupling to rotate from 0 to 90°.
   d) Stop applying a control signal to wires 1 (red) and 6 (violet).
5. Check the Auxiliary Switch
   a).Set the DMM dial to Ohms (resistance) or continuity check.
   b) Connect wires S1 and S3 to the DMM. The DMM should indicate an open circuit or no resistance.
   c) Apply a control signal (24 Vac) to wires 1 (red) and 6 (violet). The DMM should indicate contact closure as the actuator shaft coupling reaches the setting of switch A.
   d) Stop applying a control signal to wires 1 (red) and 6 (violet).
   e) Connect wires S1 and S2 to the DMM. The DMM should indicate an open circuit or no resistance.
   f) Apply a control signal (24 Vac) to wires 1 (red) and 7 (orange). The DMM should indicate contact closure as the actuator shaft coupling reaches the setting of switch A.
6. Check the Auxiliary Switch B.
   a) Set the DMM dial to Ohms (resistance) or continuity check.
   b) Connect wires S4 and S6 to the DMM. The DMM should indicate an open circuit or no resistance.
   c) Apply a control signal (24 Vac) to wires 1 (red) and 6 (violet). The DMM should indicate contact closure as the actuator shaft coupling reaches the setting of switch B.
   d) Stop applying a control signal to wires 1 (red) and 6 (violet).
   e) Connect wires S4 and S5 to the DMM. The DMM should indicate an open circuit or no resistance.
   f) Apply a control signal (24 Vac) to wires 1 (red) and 7 (orange). The DMM should indicate contact closure as the actuator shaft coupling reaches the setting of switch B.

Modulating Actuators

Wiring

All wiring must conform to NEC and local codes and regulations.

Use earth ground isolating step-down Class 2 transformers. Do not use auto transformers.

The sum of the VA ratings of all actuators and all other components powered by one transformer must not exceed the rating of the transformer. It is recommended that one transformer power no more than 10 actuators.

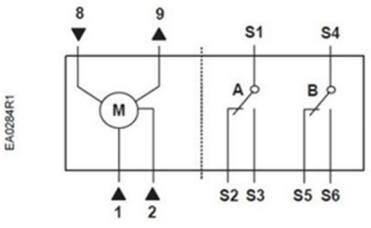


Figure 1 Wiring Designations for Modulating Actuators

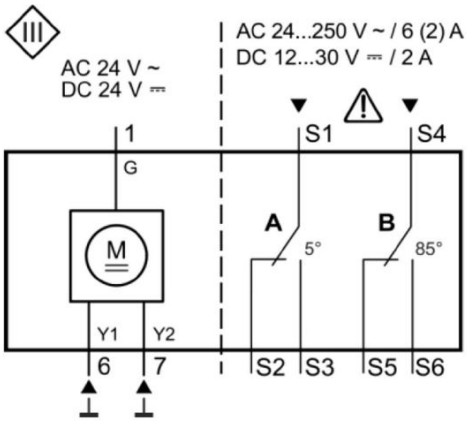
Standard Symbol	Function	Terminal Designation	Color
1	Supply (SP)	G	Red
2	Neutral (SN)	G0	Black
8	Control Signal: 0 to 10 Vdc	Y	Gray
9	Output for 0 to 10 Vdc position indication	U	Pink
FACTORY INSTALLED OPTIONS			
S1	Switch A Common	Q11	Gray/Red
S2	Switch A N.C.	Q12	Gray/Blue
S3	Switch A N.O.	Q14	Gray/Pink
S4	Switch B Common	Q21	Black/Red
S5	Switch B N.C.	Q22	Black/Blue
S6	Switch B N.O.	Q24	Black/Pink

START UP/COMMISSIONING MODULATING ACTUATORS

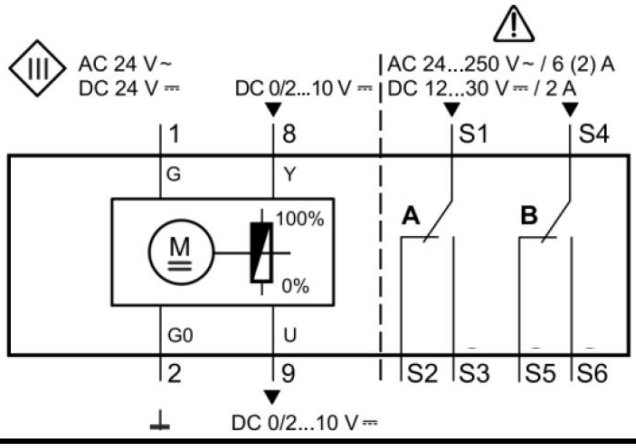
1. Verify the power supply type required, 24 AC or 24 AC/DC, shown on the actuator label. For AC/DC, the actuator will automatically adjust for either.
2. Check that the wires are connected correctly.
3. Connect wires 1 (red) and 2 (black) to the actuator. Apply a drive voltage of 24 Vac to wires 1 and 2 and with the help of a Digital Multimeter (DMM) and dial set at Vac, verify that the operating voltage is within range.
4. Check that the direction of the rotation switch matches the rotation of the valve ball.
5. Check the operation.
   a) Connect wire 1 (red) and 2 (black) to the actuator.
   b) Set the DMM dial to Vdc
   c) Connect wires 2 (black) and 8 (gray) to a Digital Multimeter (DMM).
   d) Apply a full scale input signal (10 Vdc) to wire 8 (gray).
   e) Allow the actuator Shaft Coupling to rotate from 0° to 90°.
   f) Disconnect the wire 8 (gray) and the Shaft Coupling returns to the “0” position.
6. Check the Feedback
   a) Set the DMM dial to Vdc.
   b) Attach wires 2 (black) and 9 (pink) to the DMM.
   c) Apply a full scale input signal to the wire 8 (gray). The DMM reading should increase.
   d) Remove the signal from wire 8 (gray). The reading at the DMM should decrease and the actuator Shaft Coupling returns to the “0” position.
7. Check the Auxiliary Switch A.
   a) Set the DMM dial to Ohms (resistance) or continuity check.
   b) Connect wires S1 and S3 to the DMM. The DMM should indicate an open circuit or no resistance.
   c) Apply a full scale input signal (10 Vdc) to wire 8 (gray). The DMM should indicate contact closure as the actuator Shaft Coupling reaches the setting of switch A.
   d) Connect wires S1 and S2 to the DMM. The DMM should indicate an open circuit or no resistance.
   e) Stop applying a control signal to wire 8 (gray). The DMM should indicate contact closure as the actuator Shaft Coupling reaches the setting of switch A.
8. Check the Auxiliary Switch B.
   a) Set the DMM dial to Ohms (resistance) or continuity check.
   b) Connect wires S4 and S6 to the DMM. The DMM should indicate an open circuit or no resistance.
   c) Apply a full scale input signal (20 Vdc) to wire 8 (gray). The DMM should indicate contact closure as the actuator Shaft Coupling reaches the setting of switch B.
   d) Connect wires S4 and S5 to the DMM. The DMM should indicate an open circuit or no resistance.
   e) Stop applying a control signal to wire 8 (gray). The DMM should indicate contact closure as the actuator Shaft Coupling reaches the setting of switch B.

Wiring Diagrams

Standard Actuators

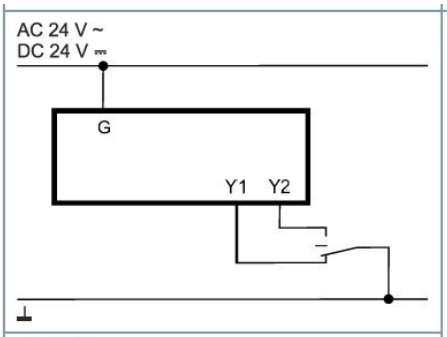


Modulating Actuators

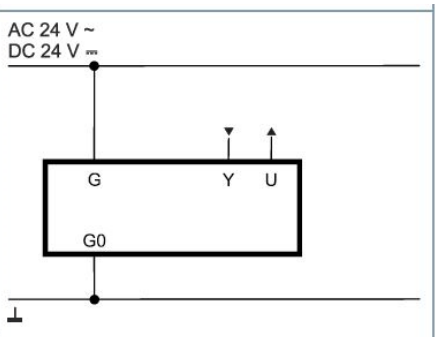


Connection Diagrams

3-position control (Standard)



Modulating control



Additional functions of Modulating Actuators P-36714 , P-36889, P-37796

NOTE: Most Actuated Ball Valve applications will use the factory default settings of the Actuator.

For tandem actuator operation, both actuators must be rated for the same power supply: either 24V AC or 24V AC/DC.

DIP Switch Functions

DIP switches are located under a protective cover near the middle of the actuator.

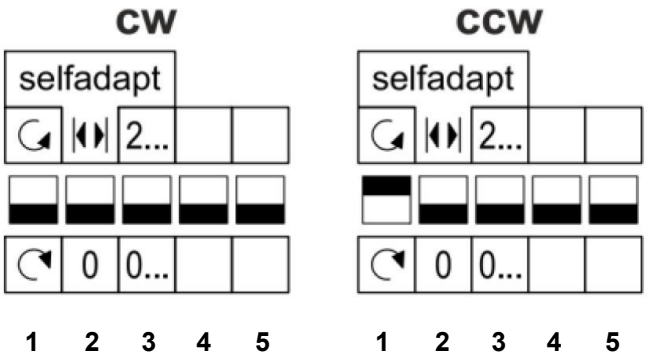
Switch 1 controls the rotation direction of the actuator. Factory default is CW (clockwise).

Switch 2 controls the self-adapt mode. When switched on, the actuator will automatically determine the end positions of the rotation angle range. Factory default is “Off” (0).

Switch 3 will adjust the actuator for controller input voltage of 0VDC to 10VDC or 2VDC to 10VDC. Factory default is 0VDC to 10VDC.

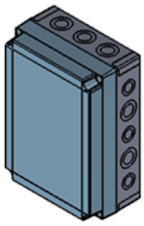
The DIP switch settings must be the same for both actuators for proper function.

EXAMPLE



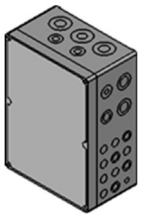
Weatherproof Enclosure Kits - Series II

Includes Enclosure, O-Ring (1), Bolts (4), Hex Nuts (2), Gaskets (4)



Weatherproof Enclosure Kits - Series III

Includes Enclosure, O-Ring(1), Bolts(2), Cap Screws(2), Hex Nuts(2), Gaskets(4)



PRODUCT HAS BEEN MANUFACTURED TO BE CONSISTENT WITH NEMA3R SPECIFICIATIONS.

Assemble the kit in compliance with the Installation instructions provided, in order for the enclosure to perform its function.

Notes

The conduit hubs are to be connected to the conduit before being connected to the enclosure.

Weatherproof Enclosure Features:

All the Enclosures have drilled holes to accommodate the Heater kit and wiring conduit holes.

Encl. Material: Polycarbonate (PC)

NON-METALLIC ENCLOSURE DOES NOT PROVIDE GROUNDING BETWEEN CONDUIT CONNECTIONS. USE GROUNDING BUSHINGS AND JUMPING WIRES.

AMBIENT TEMPERATURE: -25°F to 125°F (-40°F TO 125°F, IF USED WITH A HEATER KIT)

Enclosures will not provide protection if water can intrude due to incorrect mounting.

Specifications		Series II Actuator	Series III Actuator
Sizes		1 1/8 – 1 5/8	2 1/8 – 3 1/8
Power Supply	Operating Voltage	24 Vac ±20%	24 Vac ±20%; 24 VDC ±20%
	Frequency	50/60 Hz	
	Power Consumption- *Floating* *Modulating*	3 VA / 3W 1.9 VA / 1.2 W	2.6 VA / 1.8W 2.7 VA / 1.9W
Control Signal (Only for Modulating)	Voltage Input Input resistance	0 to 10 Vdc > 100K ohms	
Feedback Signal (Only for Modulating)	Voltage Output Maximum output current	0 to 10 Vdc DC 1mA	
Equipment Rating	Rating	Class 2 according to UL, CSA	
		Class III per EN60730	
Auxiliary Features	Dual Auxiliary Switch Contact Rating	6A resistive, 2A general purpose	4A resistive, 2A general purpose
	Dual Auxiliary Switch Voltage Rating	24 to 250 Vac/ 12 to 30 Vdc	24 Vac/ 12 to 30 Vdc
	Switch Range		
	Switch A	0 to 90° with 5° intervals	
	Recommended Range Usage	0 to 45°	
	Factory Setting	5°	
	Switch B	0 to 90° with 5° intervals	
	Recommended Range Usage	45 to 90°	
	Factory Setting	85°	
	Switching Hysteresis	2°	
Function	Torque	177 lb.-in (20 Nm)	310 lb.-in (35 Nm)
	Runtime for 90° Opening or Closing	125 sec. @ 60 Hz 150 sec. @ 50 Hz	
	Nominal Angle of Rotation	90°	
	Maximum Angular Rotation	95°	
Actuator Housing	Enclosure	NEMA Type 1	NEMA 2 in vertical position to 90° to the left and right of vertical
		IP54 according to EN60529	
	Material	Die Cast Aluminum Alloy	
	Gear Lubrication	Silicone Free	
Ambient Conditions	**Ambient Temperature**		
	Operation	-25°F to 130°F (-32°C to 55°C)	
	Storage and Transport	-40°F to 158°F (-40°C to 70°C)	
	Ambient Humidity (non-condensing)	95% rh	
Agency Certification	UL Listing	UL60730 (to replace UL873)	UL listed to UL873
	Canadian Conformance	C-UL certified to Canadian Standard C2.2 No. 24-93	
CE	**In Accordance With the Directive Set Forth by the European Union For**		
	Electromagnetic Compatibility (EMC)	2004/108/EC	
Conformity	Low Voltage Directive	2006/95/EC	
Miscellaneous	Pre-Cabled Connection	18 AWG	
	Cable Length	3 feet (0.9 m)	
	Life Cycle	50,000 Full Strokes at rated Torque and Temperature	
	Dimensions	8 3/8 H x 3 1/4 W x 2 2/3 D (213 H x 83 W x 68 D)	11 13/16 x 3 15/16 x 2 11/16 (300 x 100 x 68)
	Weight	2.2 lbs. (1 kg.)	4.4 lbs. (2 kg.)
Operation (Floating Control)	A floating control signal controls the actuator. The actuator's angle of rotation is proportional to the length of time the signal is applied. A 24 Vac or 24 Vdc control signal to wires 1 and 6 (G-Y1) causes the actuator coupling to rotate clockwise. A 24 Vac or 24 Vdc control signal to wires 1 and 7 (G-Y2) causes the actuator coupling to rotate counterclockwise. To reverse the direction of rotation, the wires 6 and 7 (Y1 and Y2) can be interchanged. In the event of a power failure or with no control voltage, the actuator holds its position.		
Operation (Modulating Control)	A continuous 0 to 10 Vdc signal from a controller to wire 8 (Y) operates the damper actuator. The angle of rotation is proportional to the control signal. A 0 to 10 Vdc position feedback output signal is available between wire 9 (U) and wire 2 (G0) to monitor the position of the damper motor. In the event of a power failure, the actuator holds its position. In the event that only the control signal is lost, the actuator returns to the "0" position.		
Overload Protection	In the event of a blockage in the damper, the actuator is overload protected over the full range to prevent damage to the actuator.		
Life Expectancy	An improperly tuned loop will cause excessive repositioning that will shorten the life of the actuator.		