



D(M)24-70, 140, 210, 280 Series — Installation Instructions

09/25/15

Installation

IMPORTANT: Use the D(M)24-70, 140, 210, 280 Series Electric Non-Spring Return Actuator only to control equipment under normal operating conditions. Where failure or malfunction of the actuator could lead to personal injury or property damage to the controlled equipment or other property, additional precautions must be designed into the control system. Incorporate and maintain other devices, such as supervisory or alarm systems or safety or limit controls, intended to warn of or protect against failure or malfunction of the actuator.

Mounting

IMPORTANT: The actuator is intended for indoor mounting only, with no direct exposure to water beyond NEMA 2 conditions. Use an appropriate shield or enclosure where the environment exceeds NEMA 2 specifications.

Mount the D(M)24-70, 140, 210, 280 Series actuators in any convenient orientation. Install the actuators on a 3/8 to 3/4 in. (9.5 to 19 mm) round shaft or a 3/8 to 5/8 in. (9.5 to 16 mm) square shaft, 2 in. (51 mm) or longer. If the shaft is less than 2 in. (51 mm) long, install an extension recommended by the damper or valve manufacturer. Use the 1 in. Jackshaft Coupler Kit for 1 in. (25.4 mm) outside diameter shafts.

To mount the actuator, proceed as follows:

1. Press and hold the gear release lever, and rotate the coupler to the 0 or 90° position. Release the gear release lever. (See Figure 1.)

Table 1: Shaft Sizes and Distances from the Anti-Rotation Bracket to Shaft Center

Shaft Diameter	5/8 in.	1/2 in.	3/8 in.
A Dimensions	6-1/8 in.	6-3/16 in.	6-1/4 in.
(See Figure 1.)	(155 mm)	(157 mm)	(159 mm)

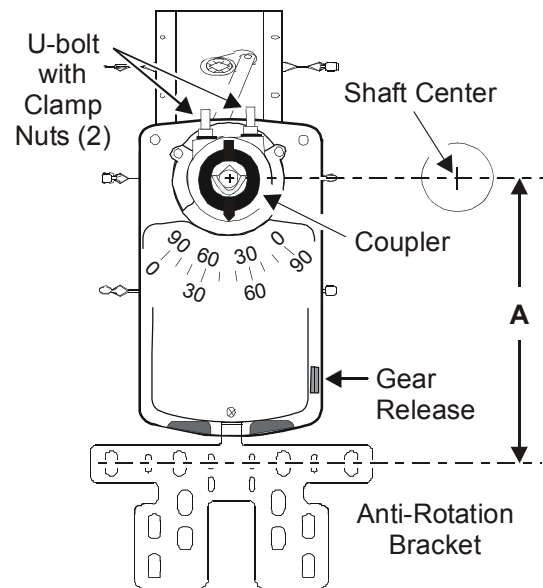
2. Bend or cut the anti-rotation bracket to fit the damper frame or duct as shown in Figure 2.

Parts Included

- One electric non-spring return actuator with M3 screw terminals
- Anti-rotation bracket
- Two No. 12-24 x 1/2 in. self-tapping hex washer-head screws

Special Tools Needed

- torque wrench with 10 mm socket



Note: A is the distance from the center of the holes in the anti-rotation bracket to the center of the shaft. (See Table 1.)

Figure 1: Mounting Positions

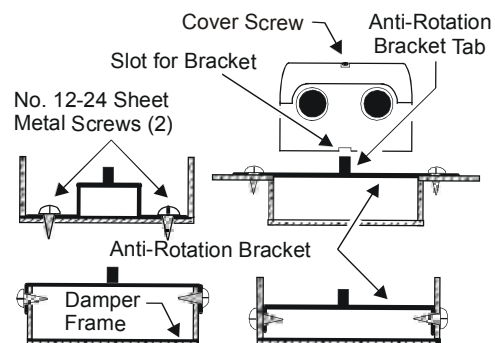


Figure 2: Anti-Rotation Bracket Positions



Mounting - Continued

3. Close the damper.

4. Insert the anti-rotation bracket tab into the slot at the bottom of the actuator (shown in Figure 2), and slide the actuator onto the shaft.

IMPORTANT: The tab on the anti-rotation bracket must fit midpoint in the actuator slot to prevent actuator binding and premature wear.

5. Use the anti-rotation bracket as a guide, and drill the holes in the damper frame or duct for the bracket (using dimension A shown in Figure 1 and the measurements in Table 1).

6. Attach the anti-rotation bracket to the damper frame or duct with the two self-tapping screws provided, using a 1/4 in. (7 mm) flat-blade screwdriver or 5/16 in. (8 mm) nut driver.

IMPORTANT: Do not overtighten the mounting screws to avoid stripping the threads.

7. Slide the actuator onto the damper shaft, positioning the tab on the anti-rotation bracket midway into the slot at the bottom of the actuator.

8. Hold the actuator in place, and evenly hand tighten each clamp nut onto the U-bolt. Secure the U-bolt to the damper shaft to achieve a torque of 100 to 125 lb·in (11 to 14 N·m).

9. Press and hold the gear release. Rotate the coupler fully closed to fully open to verify that the damper and actuator rotate freely throughout the range.

Rotation Range

The actuator is factory set for 0 to 90° rotation. To change the rotation range to less than 90°, use the top scale on the actuator cover, refer to Figure 3, and proceed as follows:

1. Press and hold the gear release, and rotate the actuator coupler Counterclockwise (CCW) to the 0° position. Release the gear release.

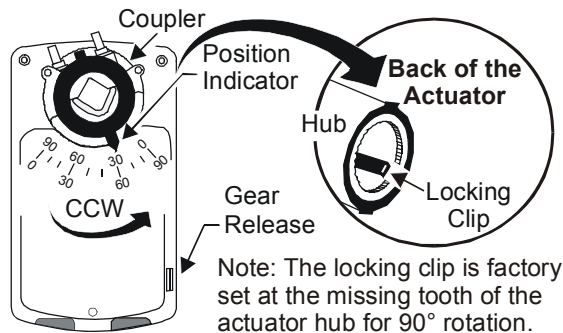


Figure 3: Actuator Components

2. Turn the actuator over. Use a flat-blade screwdriver to release the locking clip, and remove the coupler from the front of the actuator.

3. Reinsert the coupler into the front of the actuator, and align the position indicator with the starting point of the desired rotation range.

IMPORTANT: Advancing the coupler 90° from the factory setting prevents the actuator from driving in either the Clockwise (CW) or CCW direction.

4. Push the coupler into the actuator until the locking clip snaps over the hub, securing it in place.

Note: To change the rotation range on:

-(A) models with auxiliary switches, one or both of the switches may need adjustment. Reference auxiliary switches section.

Feedback Signal

For the modulating models, changing the rotation range changes the feedback signal and the operating range proportionally. (See Figure 4.)

		Rotation Range						
		Coupler Adjustment						
		90°	75°	60°	45°	30°	15°	0°
		0°	15°	30°	45°	60°	75°	90°
Direct Acting (DA)	0-10 V Feedback	10.0 V	8.3 V	6.7 V	5.0 V	3.3 V	1.7 V	0.0 V
	2-10 V Feedback	10.0 V	8.7 V	7.3 V	6.0 V	4.7 V	3.3 V	2.0 V
Reverse Acting (RA)	0-10 V Feedback	0.0 V	1.7 V	3.3 V	5.0 V	6.7 V	8.3 V	10.0 V
	2-10 V Feedback	2.0 V	3.3 V	4.7 V	6.0 V	7.3 V	8.7 V	10.0 V
Direct or Reverse Acting	0-135 ohms Feedback	135 Ω	113 Ω	90 Ω	68 Ω	45 Ω	23 Ω	0 Ω
	0-1000 ohms Feedback	1000 Ω	833 Ω	667 Ω	500 Ω	333 Ω	167 Ω	0 Ω

Note: 0 to 10 V or 2 to 10 V feedback is available on all modulating models.

Figure 4: Nominal Feedback Signal Relative to the Rotation Range



Auxiliary Switches (-A Models)

The -A models have two built-in auxiliary switches that allow setting at any angle between 0 and 90° (factory set for 10 and 80°, nominal). Refer to the Technical Specifications section for auxiliary switch ratings.

The following procedures serve as examples to change the position of the auxiliary switch angles:

Switch S1

To change the angle of Switch S1 to 20°, refer to Figure 9 and proceed as follows:

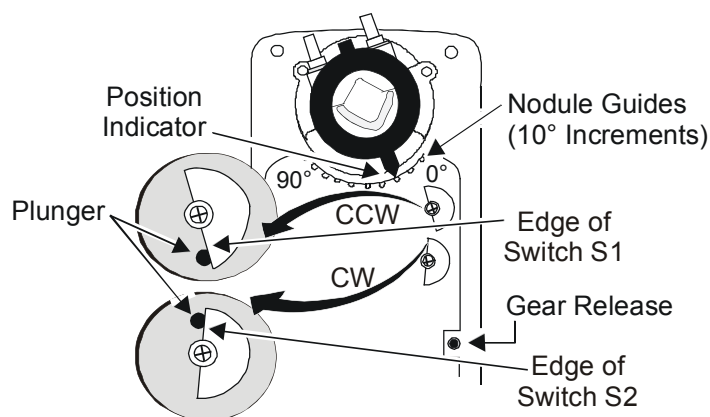


Figure 9: Switch Angle Settings

1. Depress the gear release, and using the 0 to 90° nodule guides, rotate the coupler until the position indicator is at 20°.

2. Loosen the screw on Switch S1 with a Phillips No.1 screwdriver.

3. Rotate Switch S1 CCW, and align the edge of the switch with the plunger until the plunger rises.

Note: The normally closed contact closes, and the normally open contact opens. (See Auxiliary Switches in Terminal Block 2 of Figure 5.)

4. Retighten the Phillips-head screw on Switch S1, while holding it in the designated position.

Switch S2

To change the angle of Switch S2 to 70°, refer to Figure 9 and proceed as follows:

1. Depress the gear release, and using the 0 to 90° nodule guides, rotate the coupler until the position indicator is at 70°.

2. Loosen the screw on Switch S2 with a Phillips No. 1 screwdriver.

3. Rotate Switch S2 CW, and align the edge of the switch with the plunger until the plunger rises.

Note: The normally closed contact opens, and the normally open contact closes. (See Auxiliary Switches in Terminal Block 2 of Figure 5.)

4. Retighten the Phillips-head screw on Switch S2, while holding it in the designated position.

5. Depress the gear release, and rotate the coupler until the position indicator is back to 0°.



Wiring

CAUTION: Risk of Electric Shock.

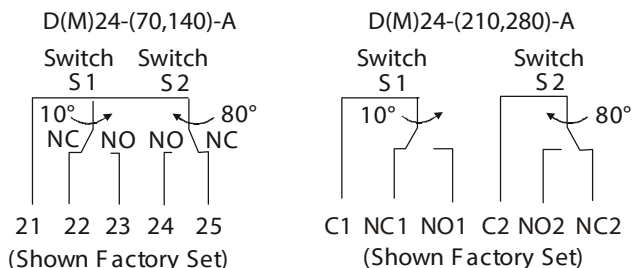
Disconnect the power supply before making electrical connections to avoid electric shock.

CAUTION: Risk of Property Damage.

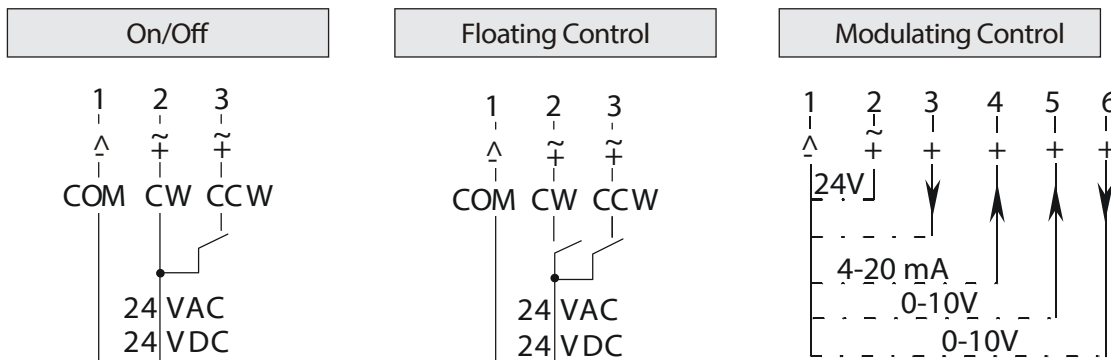
Do not apply power to the system before checking all wiring connections. Short circuited or improperly connected wires may result in permanent damage to the equipment.

IMPORTANT: Make all wiring connections in accordance with local, national, or regional regulations.

Auxillary Switches



Wiring: (Terminal Block)



Through the Conduit Openings

Depending on the model selected, use one or both conduit openings. The threaded actuator conduit openings accept 1/2 in. trade size conduit fittings. Refer to Figure 6 and proceed as follows:

1. Loosen the cover screw with a Phillips No. 1 screwdriver, and remove the actuator cover.

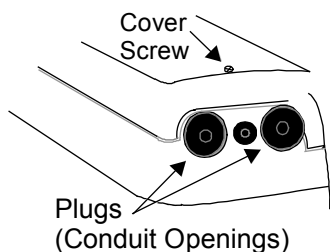


Figure 6: Location of the Conduit Openings

2. Push the plastic plug out of the conduit opening with fingertip.

3. Use the Phillips screwdriver to puncture a hole through the center of the plug, and reinsert the plug into the conduit opening.

Note: For applications requiring metal conduit, thread the conduit fitting into the conduit opening and hand tighten.

IMPORTANT: Use flexible metallic tubing or its equivalent with the fitting. Do not overtighten the conduit fitting into the actuator to avoid damaging the actuator threads.

4. Insert the cable wires through the plastic plug or conduit fitting, and connect to the terminal block using the applicable wiring diagrams in Figure 5.

5. Perform the procedures appropriate to the specific application, as described in the Tandem Operation and Setup and Adjustments sections.

6. Re-attach the cover and tighten the cover screw.



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Tandem Operation

The tandem configuration provides twice the torque of a single actuator as follows:

- 280 lb-in (32 N·m) for two D(M)24-140 Series Actuators
- 420 lb-in (48 N·m) for two D(M)24-210 Series Actuators
- 560 lb-in (64 N·m) for two D(M)24-280 Series Actuators

Models with the same torque and control input may be mounted in tandem.

Do not use D(M)24-70 in tandem.

The actuators operate in exact synchronization, ensuring the load is split evenly between each unit.

The Master/Slave Jumper is factory set in the master position. Determine the method for mounting the two actuators in tandem: front-to-back (Figure 7 shows the front view) or back-to-back, and proceed as follows:

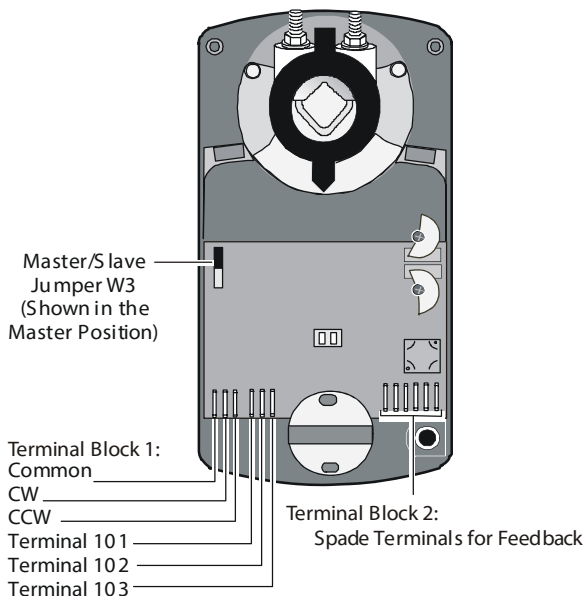


Figure 7: Settings on Floating Models

1. Designate one actuator as the master, and move Master/Slave Jumper on the other actuator to the slave position.

2. Connect Terminal 101, Terminal 102, and Terminal 103 from the master actuator to the corresponding terminals on the slave actuator. (Refer to Figure 7 for D Series models and Figure 8 for DM Series models.)

a. When mounting two actuators front-to-back on the same shaft, connect:

- Terminal 101 from the master actuator to Terminal 101 on the slave actuator

- Terminal 102 from the master actuator to Terminal 102 on the slave actuator.

- Terminal 103 from the master actuator to Terminal 103 on the slave actuator.

b. When mounting two actuators back-to-back on the same shaft, connect:

- Terminal 101 from the master actuator to Terminal 102 on the slave actuator.

- Terminal 102 from the master actuator to Terminal 101 on the slave actuator.

- Terminal 103 from the master actuator to Terminal 103 on the slave actuator.

The total wire length for these connections may be up to 30 ft (9 m).

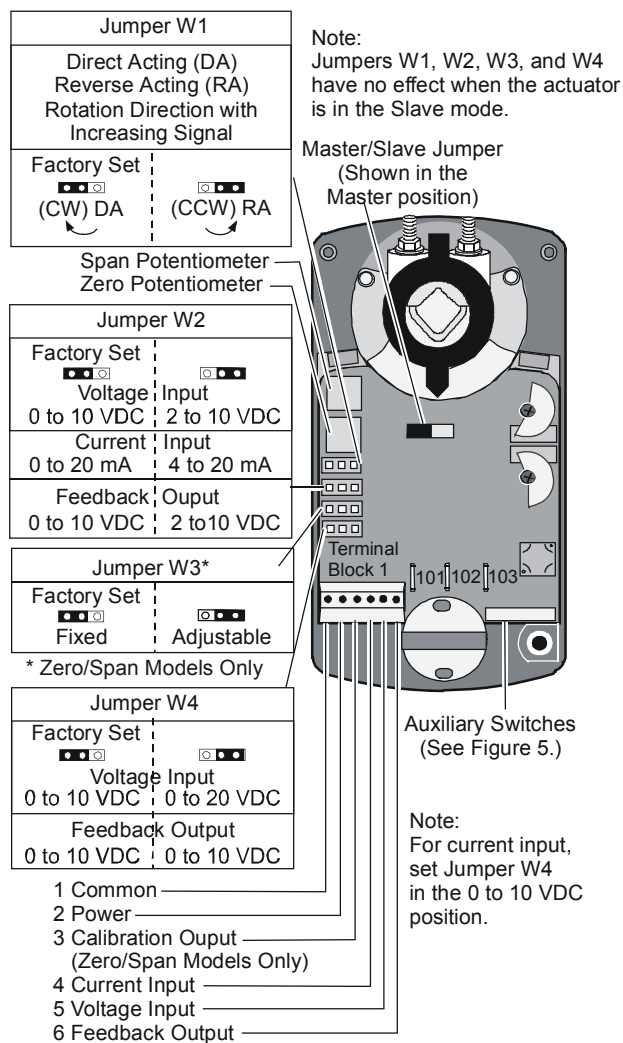


Figure 8: Settings on Modulating Models



3. Connect the input control signal:

- For D-Series, connect the input control signal to the common, CW, and CCW terminals on both the master and the slave actuators. (See Figure 7.)
- For DM-Series, connect the control signal to the master actuator, and connect 24 VAC/VDC power to both the master and slave actuators.

IMPORTANT: For proper tandem operation, do not connect the control input to the slave unit.

Note: Set the master actuator jumpers on the modulating models according to the action and signal range desired before proceeding. (Refer to Figure 8 and the Setup and Adjustments, Calibration section.)

4. Make sure of the following if the actuators configured for tandem operation stall or fail to drive:

- a. Both actuators have the same torque and control input.
- b. One actuator is set as the master and the other as the slave.
- c. The control signal is connected to the master actuator only.
- d. Terminal 101, Terminal 102, and Terminal 103 are connected properly, as described in Step 2.

Setup and Adjustments

Calibration

Calibrate only the actuator designated as the master when using two models in tandem.

Direction of Action

In the DA mode (factory set), a minimum control signal drives the actuator to the full CCW position, and a maximum control signal drives it fully CW. In the Reverse Acting (RA) mode, a minimum control signal drives the actuator to the full CW position, and a maximum control signal drives it fully CCW. To set an actuator for RA, proceed to the section for the appropriate model.

IMPORTANT: Adjust the rotation range before changing the direction of action.

D-Series Models

To set one of these models for RA operation, reverse the control wiring connections at Terminal 2 and Terminal 3. (See Terminal Block 1 in Figure 5.)

DM-Series Models

To set one of these models for RA operation, proceed as follows:

1. Press and hold the gear release, rotate the actuator coupler until it is in the full CW position, and release the gear release.
2. Move Jumper W1 from the factory-set DA position to the RA position. (See Figure 8.)
3. Apply power and then a control signal to the actuator to verify that the actuator is fully CW at minimum control input, and fully CCW at maximum control input.

Jumpers

D-Series models come factory set with the Master/Slave Jumper in the master position and have no additional jumpers. Modulating models come factory set with Jumper W1 in the DA position. Additional jumpers factory set as follows: Jumper W2 is in the 0 to 10 VDC or 0 to 20 mA position, and Jumper W4 is in the 0 to 10 VDC position. (See Figure 8.)

Note: The D-Series models do not have jumpers.