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D(M)-70-280 Series - 70-280 lb-in (8-32 Nm) Electric Actuator

IOM Manual



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D(M)-70-280 Series - Installation, Operation and Maintenance Manual

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FOR MORE INFORMATION ON THIS PRODUCT				

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Technical Specifications - D24-70, 140, 210, 280 Series Actuator								
a)	A shushes Mardala	D24-70-(A)	D24-140-(A)	D24-210-(A)	D24-280-(A)			
Ŋp	Actuator Models	Non-Spring Return - On/Off or Floating with optional Auxiliary Switches (-A)						
	Torque	70 lb-in. (8 Nm)	140 lb-in. (16 Nm)	210 lb-in. (24 Nm)	280 lb-in. (32 Nm)			
	Operating Voltage	24 VAC (20 to 30 V) at 50,	/60 Hz or VDC 24 V ±10%;	24 VAC (20 to 30 V) at 50/60 Hz or VDC 24 V ±10%;				
	Power Consumption	6.5 VA supp	ly minimum	7.5 VA supply minimum				
	Input Signal	Auxiliary Switches (-A) - 24 VAC +25%/-20% at 50/60 Hz, or DC 24 V						
Electrical	Input Signal Adjustments	Auxiliary Switches (-A) - Factory Setting, Terminals 1 and 2, CW rotation; Terminals 1 and 3, CCW rotation						
	Auxiliary Switch Rating	Auxiliary Switches (-A) - Two Single-Pole, Double-Throw (SPDT) switches rated at 24 VAC 1.5 A inductive, 3.0 A resistive, 35 VA maximum per switch, Class 2						
	Equipment Rating	Class 2 or Safety Extra-Low Voltage (SELV)						
	Electrical Connection	Screw terminals for 22 to ² 18, 20, or 22 AW	l4 AWG; maximum of two /G per terminal	1/4 in. spade terminals with pluggable 3-terminal blocks				
	Manual Override	External Push Button						
Operation	Time Out Feature	Electronic stall detection ensures higher reliability by deactivating the actuator motor when a stall condition is detected						
	Runtime for 90° of Rotation	30 seconds at 50% rated load, 25 to 50 seconds for 0 to 70 lb·in (0 to 8 N·m)	80 seconds at 50% rated load, 70 to 115 seconds for 0 to 140 lb·in (0 to 16 N·m) (0 to 24 N·m)		140 seconds at 50% rated load, 115 to 205 seconds for 0 to 280 lb·in (0 to 32 N·m)			
	Rotation Range	0 to 90° in 5-degree increments, mechanically limited to 93° Rotation range is adjusted by repositioning the output hub						
	Cycle Life			30,000 cycles at rated load				
	Mechanical Connections	Round Shafts - 3/8 to 3/4 in. (10 to 20 mm) diameter Square Shafts - 3/8 to 5/8 in. (10 to 16 mm), 1 in. (25.4 mm) diameter jackshaft with M9000-154 coupler						
١e	Enclosure		NEMA 2	2 (IP42)				
ment	Ambient Conditions (Non-Condensing)	Operating — -4 to 122°F (-20 to 50°C); 95% RH Max. Storage — -20 to 186°F (-29 to 86°C); 95% RH Max.						
ron	Audible Noise Rating	45 dBA at 39-13/32 in. (1 meter)						
Invi	Dimensions	7.09 x 3.94 x 2.54 in. (180 x 100 x 64.5 mm)						
	Weight	2.9 lb (1.3 kg)						
s		United States/Canada - UL 873 Listed, File E27734, CCN XAPX						
Condition	Agency Certifications	gency Canada - CSA C22.2 No. 139 Certified, File LR85083, Class 3221 02 ifications Europe - CE Mark -Declares that this product is in compliance with the essential requirement and other relevant provisions of the EMC Directive 2004/108/EC. Australia/New Zealand - C-Tick Mark Australia/NZ Emissions Compliant						
	Warranty	5 Years limited from time of shipment.						

Warning - These actuators are designed for use only in conjunction with operating controls. Where an operating control failure would result in personal injury and/or loss of property, it is the responsibility of the installer to add safety devices or alarm systems that protect against, and/or warn of, control failure.

To avoid excessive wear or drive time on the motor, use a controller and/or software that provides a time-out function to remove the signal at the end of rotation (stall).

Disclaimer - The performance specifications are nominal and conform to acceptable industry standards. For application at conditions beyond these specifications, consult the nearest Bray office. Bray controls shall not be liable for damages resulting from misapplication or misuse of its products.

Те	Technical Specifications - DM24-70, 140, 210, 280 Series Actuator						
Ø	Actuator Models	DM24-70-(A)	DM24-140-(A)	DM24-210-(A)	DM24-280-(A)		
Ŋ		Non-Spring Return - Modulating with optional Auxiliary Switches (-A)					
5	Torque	70 lb-in. (8 Nm)	140 lb-in. (16 Nm)	210 lb-in. (24 Nm)	280 lb-in. (32 Nm)		
	Operating Voltage	24 VAC (20 to 30 V) at 50	/60 Hz or VDC 24 V ±10%;	24 VAC (20 to 30 V) at 50/60 Hz or VDC 24 V ±10%;			
	Power Consumption	6.5 VA supp	ly minimum	7.5 VA supply minimum			
	Input Signal	Auxiliary Switches (-A) - DC 0 (2) to 10 V, DC 0 (4) to 20 V, or DC 0 (4) to 20 mA					
	Input Signal Adjustments	Factory Setting - 0 to 10 VDC, 0 to 20 mA, CW rotation with signal increase					
al		Jumper Selectable - 0 (2) to 10 VDC, 0 (4) to 20 VDC, or 0 (4) to 20 mA Action is jumper selectable Direct (CW) or Reverse (CCW) with signal increase.					
lectrid	Input Impedance	Voltage Input - 205,000 ohms for 0 (2) to 10 V and 410,000 ohms for 0 (4) to 20 V Current Input - 500 Ohms					
ш	Feedback Signal	0 to 10 VDC or 2 to 1	0 VDC for 90° (10 VDC at 1	mA) Corresponds to input s	signal span selection.		
	Auxiliary Switch Rating	Auxiliary Switches (-A) - Two Single-Pole, Double-Throw (SPDT) switches rated at 24 VAC 1.5 A inductive, 3.0 A resistive, 35 VA maximum per switch, Class 2					
	Equipment Rating	Class 2 or Safety Extra-Low Voltage (SELV)					
	Electrical Connection	Screw terminals for 22 to 18, 20, or 22 AV	14 AWG; maximum of two VG per terminal	1/4 in. spade terminals with pluggable 3-terminal blocks			
	Manual Override	External Push Button					
	Time Out Feature	Electronic stall detection ensures higher reliability by deactivating the actuator motor when a stall condition is detected					
ation	Runtime for 90° of Rotation	30 seconds at 50% rated load, 25 to 50 seconds for 0 to 70 lb·in (0 to 8 N·m)	80 seconds at 50% rated load, 70 to 115 seconds for 0 to 140 lb·in (0 to 16 N·m)	130 seconds at 50% rated load, 115 to 175 seconds for 0 to 210 lb·in (0 to 24 N·m)	140 seconds at 50% rated load, 115 to 205 seconds for 0 to 280 lb·in (0 to 32 N·m)		
Ope	Rotation Range	0 to 90° in 5-degree increments, mechanically limited to 93° Rotation range is adjusted by repositioning the output hub					
	Cycle Life		60,000 cycles at rated load		30,000 cycles at rated load		
	Mechanical Connections	Round Shafts - 3/8 to 3/4 in. (10 to 20 mm) diameter Square Shafts - 3/8 to 5/8 in. (10 to 16 mm), 1 in. (25.4 mm) diameter jackshaft with M9000-154 coupler					
_۳	Enclosure	NEMA 2 (IP42)					
menta	Ambient Conditions (Non-Condensing)	Operating — -4 to 122°F (-20 to 50°C); 95% RH Max. Storage — -20 to 186°F (-29 to 86°C); 95% RH Max.					
ron	Audible Noise Rating	45 dBA at 39-13/32 in. (1 meter)					
invi	Dimensions	7.09 x 3.94 x 2.54 in. (180 x 100 x 64.5 mm)					
ш —	Weight	2.9 lb (1.3 kg)					
onditions	Agency Certifications	United States/Canada – UL 873 Listed, File E27734, CCN XAPX Canada – CSA C22.2 No. 139 Certified, File LR85083, Class 3221 02 Europe – CE Mark -Declares that this product is in compliance with the essential requirements and other relevant provisions of the EMC Directive 2004/108/EC.					
ŭ	Warranty	5 Years limited from time of shipment.					

Warning - These actuators are designed for use only in conjunction with operating controls. Where an operating control failure would result in personal injury and/or loss of property, it is the responsibility of the installer to add safety devices or alarm systems that protect against, and/or warn of, control failure.

To avoid excessive wear or drive time on the motor, use a controller and/or software that provides a time-out function to remove the signal at the end of rotation (stall).

Disclaimer - The performance specifications are nominal and conform to acceptable industry standards. For application at conditions beyond these specifications, consult the nearest Bray office. Bray controls shall not be liable for damages resulting from misapplication or misuse of its products.

Applications

Bray's wide variety of damper electric actuator choices increases flexibility when choosing peripheral products for Building Automation Systems. We offer many different torque outputs and optional features to ensure you have the best actuator for the application. Jumper or DIP switch selectable features allow versatility in the field. The actuators are maintenance-free, which means fewer call backs after installation and start-up. In addition, our actuators are manufactured to ISO 9001 and Six Sigma Standards making them the highest quality on the market today.

All of our damper electric actuators are linkage free when applied to dampers ranging for small VAV box dampers all the way up to large outdoor air and return air dampers.

IMPORTANT:

Use the D(M)24-70, 140, 210, 280 Series Electric Non-Spring Return Actuators 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.

IMPORTANT:

D(M)24-70, 140, 210, 280 Series Electric Spring Return Actuators only to control equipment under normal operating conditions. Where failure or malfunction of the electric 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 electric actuator.

IMPORTANT:

Before specifying D(M)24-70, 140, 210, 280 Series Electric Spring Return Actuators for plenum applications, verify acceptance of exposed plastic materials in plenum areas with the local building authority. Building codes for plenum requirements vary by location. Some local building authorities accept compliance to U L 1995, Heating and Cooling Equipment, while others use different acceptance criteria

IMPORTANT:

Do not install or use this D(M)24-70, 140, 210, 280 Series Electric Spring Return Actuator in or near environments where corrosive substances or vapors could be present. Exposure of the electric actuator to corrosive environments may damage the internal components of the device, and will void the warranty.



Mounting Positions for Chilled Water and Condensing Atmosphere Applications

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 washerhead screws

Special Tools Needed

- Torque wrench with 10 mm socket
- Digital voltmeter

Mounting:

Mount the D(M)24-70-280 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 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.)



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.)

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

 Table 1: Shaft Sizes and Distances from the

 Anti-Rotation Bracket to Shaft Center

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



Figure 2: Anti-Rotation Bracket Positions

- 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 screw driver 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 screw driver 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 auxillary 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				-		
		90°	75°	Couple	er Adju	stment	15°	0°
		0°	/ 15°	30°	45° 45°	60°	75°	∖ 90°
Direct Acting	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
(DA)	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	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
(RA)	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	0-135 ohms Feedback	135Ω	113Ω	90 Ω	68 Ω	45 Ω	23 Ω	0Ω
Acting	0-1000 ohms Feedback	1000Ω	833Ω	667Ω	500Ω	333Ω	167Ω	0Ω

NOTE: 0 to 10 VDC or 2 to 10 VDC feedback is available on all modulating models.

Figure 4: Nominal Feedback Signal Relative to the Rotation Range

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.

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 5 and proceed as follows:





- 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.

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 5 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.

- 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°.

Through the Conduit Openings:

Depending on the M91xx Series 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.

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 (See Wiring).

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

6. Reattach the cover and tighten the cover screw.

Tandem Operation:

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

NOTE:

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/Subordinate 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

- Designate one actuator as the master, and move Master/Subordinate Jumper on the other actuator to the subordinate position.
- Connect Terminal 101, Terminal 102, and Terminal 103 from the master actuator to the corresponding terminals on the subordinate actuator. (Refer to Figure 7 for D series and Figure 8 for DM series.)

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

- Terminal 101 from the master actuator to Terminal 101 on the subordinate actuator.
- Terminal 102 from the master actuator to Terminal 102 on the subordinate actuator.
- Terminal 103 from the master actuator to Terminal 103 on the subordinate actuator.

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

- Terminal 101 from the master actuator to Terminal 102 on the subordinate actuator.
- Terminal 102 from the master actuator to Terminal 101 on the subordinate actuator.
- Terminal 103 from the master actuator to Terminal 103 on the subordinate 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.
- For DM-Series, connect the control signal to the master actuator, and connect 24 VAC/VDC power to both the master and subordinate actuators.

IMPORTANT:

For proper tandem operation, do not connect the control input to the subordinate 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 subordinate.
- 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 Wiring)

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/ Subordinate 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.



Dimensions





