

M9104-AGx-2N Electric Non-spring Return Actuators

Installation

IMPORTANT: The M9104-AGx-2N Series actuator is intended to control equipment under normal operating conditions. Where failure or malfunction of an M9104-AGx-2N actuator could lead to an abnormal operating condition that could cause personal injury or damage to the equipment or other property, other devices (limit or safety controls) or systems (alarm or supervisory) intended to warn of or protect against failure or malfunction of an M9104-AGx-2N actuator must be incorporated into and maintained as part of the control system.

Parts Included

- M9104-AGx-2N Actuator
- CBL-2000-1 Wiring Harness and DPT-2015-0 Differential Pressure Transmitter (included with the M9104-AGx-2N)
- No. 10 self-drilling sheet metal screw

Special Tools Needed

- 5/16 in. (8 mm) square socket
- 3/8 in. (10 mm) 12-point socket

Mounting

The actuator may be mounted in any convenient orientation. When installing the DPT-2015 Differential Pressure Transmitter on the actuator, mount it so the tubing connecting the flow pickup device to the DPT-2015 creates a moisture trap. This prevents condensation from entering the sensor.

No extra mounting brackets, linkage, or couplers are required for standard mounting, but wiring terminals must be accessible and protected from moisture and corrosive fumes.

To mount the actuator to a damper:

1. Position the actuator on the damper shaft so the damper shaft protrudes through the actuator coupler as shown in Figure 1.

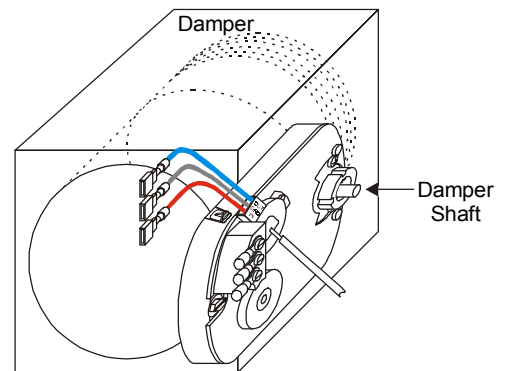


Figure 1: Mounting on the Damper Shaft

2. Make sure the actuator is in the desired mounting position, parallel to the mounting surface as shown in Figure 2.

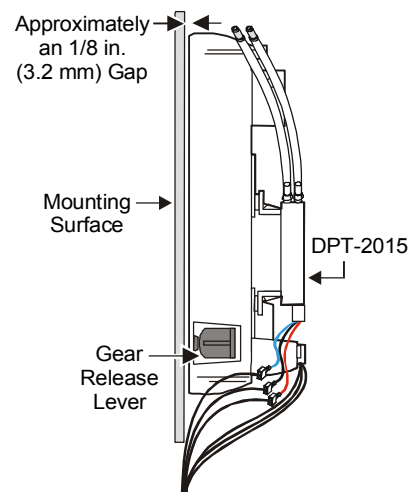


Figure 2: Actuator Position

- Verify that the shoulder washer is centered between the plastic ribs of the actuator housing to allow actuator movement during rotation. (See Figure 3.)

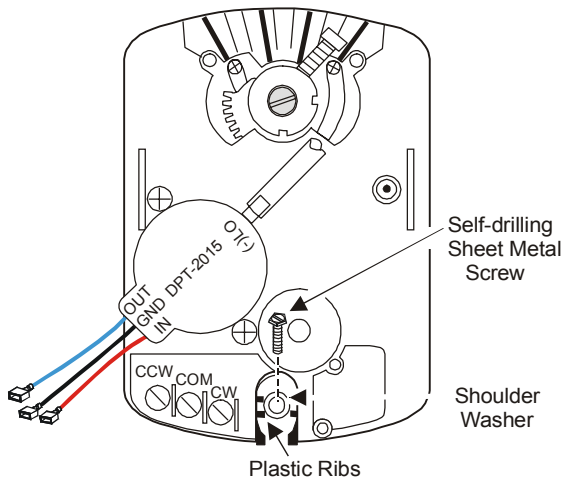


Figure 3: Shoulder Washer Position with Self-drilling Sheet Metal Screw

- Hold the actuator in place on the damper shaft, and insert the self-drilling sheet metal screw through the shoulder washer. (See Figure 3.)
- Place a 5/16 in. (8 mm) socket on the screw and using a drill and extension, drill it into the mounting surface until tight against the washer.

IMPORTANT: Do not overtighten the screw to avoid stripping the threads.

Rotation Range

Make sure that the damper blade is visually accessible or its position is permanently marked on the end of the damper shaft as shown in Figure 4.

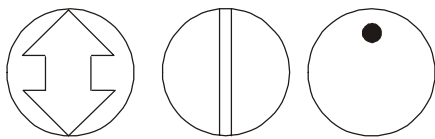


Figure 4: Damper Position Icons

To set the actuator stroke, proceed as follows:

- Grasp the damper shaft firmly with pliers and rotate the damper fully closed. (See Figure 5.)

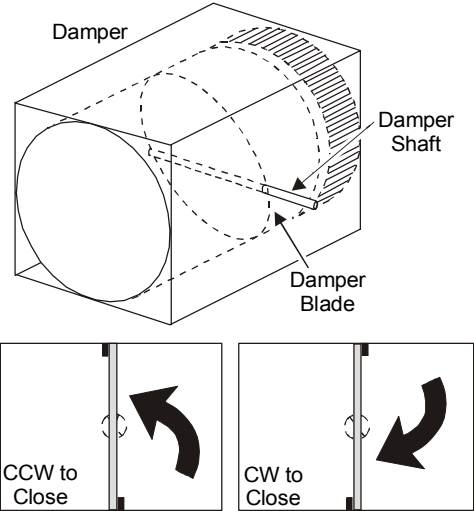


Figure 5: Damper Rotation

- Press and hold the gear release lever shown in Figure 2, and rotate the actuator coupler to the fully closed position.
- Make a note of the rotation range and direction, either Clockwise (CW) or Counterclockwise (CCW), required to close the damper.

If rotation is less than 90°, proceed to the *Less Than 90 Degrees* section.

IMPORTANT: Do not remove the sheet metal screw and force the damper blade closed by rotating the actuator. This puts additional stress on the gear train and could reduce the life of the actuator.

90 Degrees

To set a rotation range for 90°, proceed as follows:

- Release the gear release lever.
- Secure the coupler to the shaft using a crescent wrench or one of the tools from the *Special Tools Needed* section to tighten the coupler set screw against the damper shaft. (See Figure 6.)

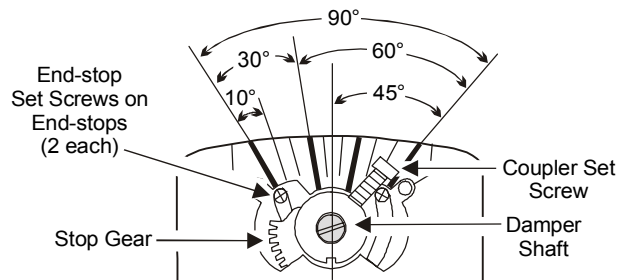


Figure 6: Setting the Rotation Range

3. Keeping the actuator parallel to the mounting surface, continue tightening the coupler set screw approximately 1/2 turn to achieve 150 to 180 lb-in (17 to 20 N·m) torque.
4. Press and hold the gear release lever, and turn the coupler by hand to ensure the damper rotates from end to end.

Proceed to the *DPT-2015* section if needed.

Less Than 90 Degrees

If the damper shaft rotation is less than 90°, adjust the stroke of the actuator using the scale on the actuator. (See Figure 6.)

Use the center of the coupler set screw as a pointer to observe the position on the scale when rotating the coupler from one side to the other.

Examples:

- For a rotation range of 90°, set both end-stop set screws fully up as shown in Figure 6.
- To set a rotation range of 60°, leave one end-stop set screw fully up and adjust the other one so the coupler rotates between the 30 and 90° indicator marks on the scale.
- To set a rotation range of 45°, adjust both end-stop set screws so the coupler rotates between 30 and 75°.
- To set a rotation range of 30°, move both end-stop set screws so the coupler rotates between the 30 and 60° indicator marks on the scale.

To accurately set the end-stops:

1. Press and hold the gear release lever, and turn the actuator coupler to the minimum rotation position for the minimum ventilation flow required.
2. Release the gear release lever.
3. Use a Phillips No. 1 screwdriver to loosen the end-stop set screw that is closest to the stop gear, and move it in its slot until it is tight against the stop gear. (See Figure 6.)

IMPORTANT: Do not remove the end-stop set screws, as this could interfere with the actuator's operation.

4. Hand tighten the set screw so it remains in this position.

5. Secure the coupler to the shaft using a crescent wrench or one of the tools from the *Special Tools Needed* section to tighten the coupler set screw against the damper shaft. (See Figure 6.)
6. Keeping the actuator parallel to the mounting surface, continue tightening the coupler set screw approximately 1/2 turn to achieve 150 to 180 lb-in (17 to 20 N·m) torque.
7. Repeat Steps 1 through 3 to set the desired maximum rotation position.
8. Use the Phillips screwdriver to tighten both end-stop set screws to a minimum of 25 lb-in (2.8 N·m).
9. Press and hold the gear release lever, and turn the coupler by hand to ensure the damper rotates from end to end.

DPT-2015

The M9104-AGx-2N housing has two mounting bosses for the DPT-2015. (See Figure 7.) Follow the procedure in the installation instructions included with the DPT-2015 (*DPT-2015 Differential Pressure Transmitter for VAV Box Applications Installation Instructions [Part No. 24-7547-18]*).

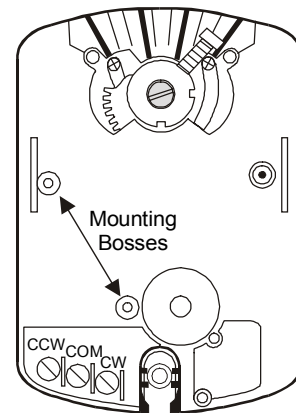


Figure 7: Location of the Mounting Bosses

Wiring



CAUTION: Equipment Damage Hazard. Disconnect all power supplies before wiring connections are made, or prior to performing maintenance. Check all wiring connections before applying power to the system. Short-circuited or improperly connected wires result in permanent damage to the equipment.

IMPORTANT: All wiring must be in accordance with the National Electrical Code and local electrical regulations.

The actuator requires a 24 VAC control signal and is compatible with a variety of controllers. Refer to Figure 8 for the wiring configuration.

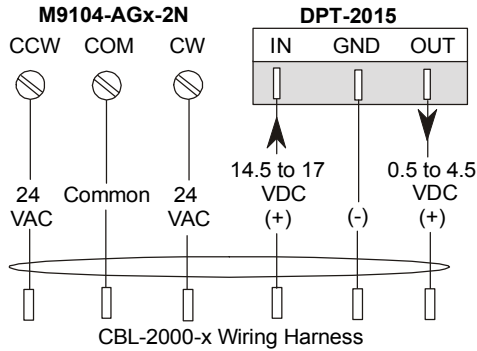


Figure 8: Wiring Diagram

Note: 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).

The 20 in. (0.5 m) CBL-2000-1 Wiring Harness, accepted by Underwriters Laboratories, Inc.® (UL) for plenum use, is prewired with the M9104-AGS-2N. It may also be ordered separately. A plenum-rated 20 in. (0.5 m) CBL-2000-2 or 72 in. (1.8 m) CBL-2000-3 Wiring Harness is also available.

Setup and Adjustments

Air Pressure (M9104-AGS-2N)

The flow pickup device provided with the Variable Air Volume (VAV) box must be connected to the DPT-2015 using field-supplied tubing as follows:

1. Cut two lengths of tubing, and connect them to the flow pickup device.

IMPORTANT: Make sure the tubing is properly sized and made of an elastic material, such as silicone rubber, to ensure airtight connections and minimize flow measurement errors.

2. Connect the tubing from the flow pickup device to the corresponding barbed high and low pressure ports on the DPT-2015. (See Figure 9.)

Note: The upper port is the low pressure port and indicated as (-)LO on the transmitter.

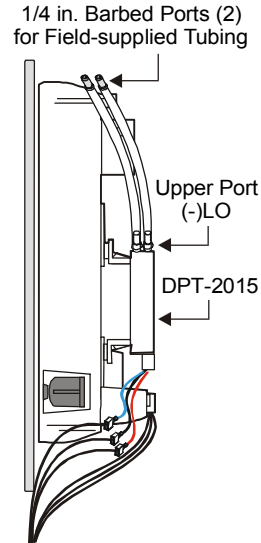


Figure 9: M9104-AGS-2N with Wiring Harness

3. Route the tubing so a portion of it is lower than the DPT-2015. This creates a trap that prevents any condensation from entering the sensor. Avoid making any sharp bends in the tubing.

IMPORTANT: Overpressure limit is 15 in. W.C. (3.74 kPa). Do not blow into ports to test the operation, as this could damage the sensing element.

Commissioning

M9104-AGx-2N

After wiring is completed, apply power to the controller and provide signals to the actuator to drive it at least one complete cycle open and closed.

DPT-2015

To commission the transmitter:

1. Perform the checkout procedure provided in the controller instructions to ensure proper operation of the transmitter.

IMPORTANT: Perform commissioning when the transmitter is permanently mounted and operating at normal temperatures.

2. Set up and zero using HVAC PRO™ software when using a DPT-2015 with a Johnson Controls VAV Series controller. Refer to the *Variable Air Volume (VAV) Controller Technical Bulletin (LIT-6363040)* for details.

Troubleshooting

M9104-AGx-2N

If the actuator is not responding or working properly:

- Verify that the actuator/transmitter is properly secured to the duct.
- Check that all electrical connections are complete and power is applied.
- Verify that the damper fully opens and closes, using the gear release lever on the actuator.
- Check that the actuator stroke is set for the desired application.

DPT-2015

The DPT-2015 must be auto zeroed by a Johnson Controls VAV controller. If the DPT-2015 is not operating properly:

- Verify that the air lines on the DPT-2015 are connected to their respective high and low ports with no kinks in the tubing.
- Check the supply voltage to ensure it is within the 14.5 to 17 VDC range and the polarity is correct.
- Disconnect the air lines from the high and low ports, and place a voltmeter across the OUT and GND terminals on the DPT-2015. If the output is not between 0.4 and 0.6 volts with power applied to the DPT-2015 in the vertical position, the transmitter is defective and should be replaced.

Note: Voltage readings may vary by 0.1 volt if the transmitter is in the horizontal position.

Repairs and Replacement

Field repairs must not be made. For a replacement or an accessory, refer to the Ordering Information section *M9104-AGx-2N Series Electric Non-spring Return Actuators Product Bulletin (LIT-2681121)*.

Technical Data

Product	M9104-AGx-2N Electric Non-spring Return Actuators	
Power Requirements	M9104-AGx-2N:	20 to 30 VAC at 50 or 60 Hz, 2.1 VA supply, Class 2
	DPT-2015:	15 VDC (14.5 to 17 VDC) unregulated; 15 mA maximum
Input Signal	M9104-AGx-2N:	24 VAC (20 to 30 VAC) at 50 or 60 Hz
Motor Input Impedance	M9104-AGx-2N:	250 ohms, nominal
DPT-2015-0	Pressure Range:	0 to 1.5 in. W.C. (0 to 374 Pa)
	Over Pressure Limit:	15 in. W.C. (3.74 kPa)
	Output Voltage:	0.5 to 4.5 VDC with 25,000 ohm minimum load impedance
Audible Noise Rating	30 dBA maximum at 1 m	
Mechanical Output	Running Torque:	35 lb-in (4 N·m)
Rotation Range	Adjustable from 30 to 90°, CW or CCW	
Rotation Time	Nominal 90 seconds at 60 Hz for 90° Nominal 108 seconds at 50 Hz for 90°	
Cycles	100,000 full cycles, 2,500,000 repositions rated at 35 lb-in (4 N·m)	
Electrical Connection	No. 6-32 screw terminals on the M9104 actuator; 1/4 in. spade terminals on the DPT-2015	
Pressure Connection	6 in. (152 mm) length of silicone tubing with barbed fittings for 1/4 in. (6.35 mm) O.D. tubing	
Enclosure	NEMA 1, IP30	
Ambient Operating Conditions	M9104-AGA-2N:	32 to 125°F (0 to 52°C); 90% RH maximum, non-condensing
	M9104-AGS-2N:	32 to 125°F (0 to 52°C); 90% RH maximum, non-condensing 60 to 100°F (16 to 38°C); 90% RH maximum, non-condensing for DPT rated accuracy (See <i>DPT-2015 Differential Pressure Transmitter for VAV Box Applications Installation Instructions</i> [Part No. 24-7547-18].)
Ambient Storage Conditions	-20 to 150°F (-29 to 66°C); 90% RH maximum, non-condensing	
Dimensions (H x W x D)	M9104-AGA-2N:	5.95 x 4.2 x 2.15 in. (151.2 x 107.3 x 54.6 mm)
	M9104-AGS-2N:	5.95 x 4.2 x 2.32 in. (151.2 x 107.3 x 58.9 mm) with the DPT-2015
Shipping Weight	M9104-AGA-2N:	2.0 lb (0.91 kg)
	M9104-AGS-2N:	2.2 lb (0.99 kg) with the DPT-2015
Agency Compliance (M9104)	UL 873 Listed, File E27734, CCN XAPX CSA Certified C22.2 No. 139, File LR85083, Class 3221 02 CE Mark, EMC Directive 89/336/EEC	

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



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