

## M9106-AGx-2N0x Series Electric Non-Spring Return Actuators

### Installation

**IMPORTANT:** Use this M9106-AGx-2N0x Series Actuator only to control equipment under normal operating conditions. Where failure or malfunction of the actuators 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 actuators.

**IMPORTANT :** Utiliser ce M9106-AGx-2N0x Series Actuator uniquement pour commander des équipements dans des conditions normales de fonctionnement. Lorsqu'une défaillance ou un dysfonctionnement du actuators risque de provoquer des blessures ou d'endommager l'équipement contrôlé ou un autre équipement, la conception du système de contrôle doit intégrer des dispositifs de protection supplémentaires. Veiller dans ce cas à intégrer de façon permanente d'autres dispositifs, tels que des systèmes de supervision ou d'alarme, ou des dispositifs de sécurité ou de limitation, ayant une fonction d'avertissement ou de protection en cas de défaillance ou de dysfonctionnement du actuators.

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 pick-up device to the DPT-2015 creates a moisture trap. This will prevent 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.

### Parts Included

- M9106-AGx-2N0x Actuator
- CBL-2000-1 Wiring Harness and DPT-2015-0 Differential Pressure Transmitter (included with the M9106-AGS-2N02)
- No. 10 self-drilling sheet metal screw

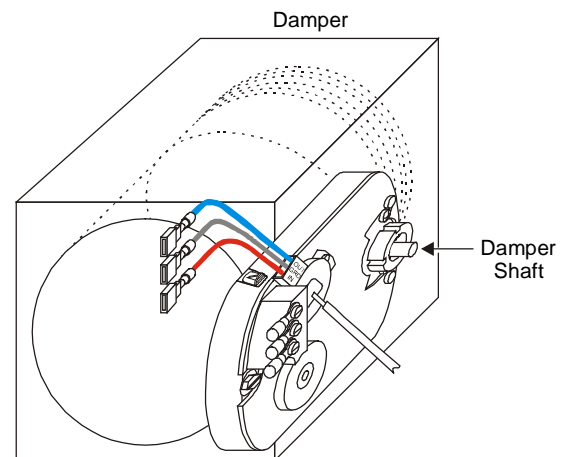
### Special Tools Needed

- 5/16 in. (8 mm) square socket
- 3/8 in. (10 mm) 12-point socket
- drill with a 5/16 in. hex nut driver
- digital voltmeter (for troubleshooting the transmitter)

### Mounting

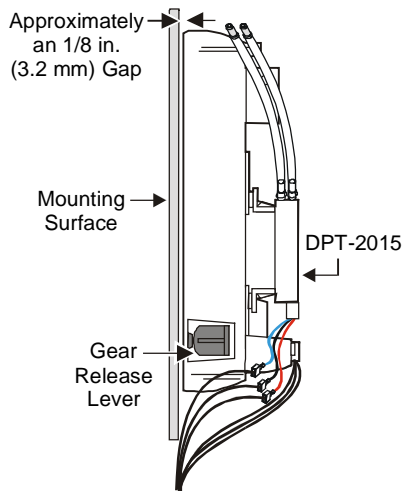
To mount the actuator to a damper:

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



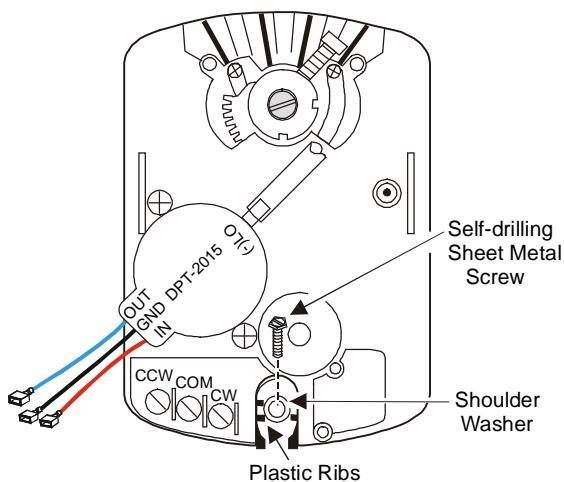
**Figure 1: Mounting on the Damper Shaft**

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**

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



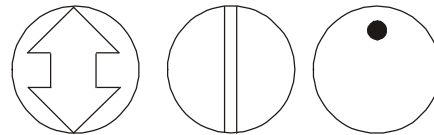
**Figure 3: Shoulder Washer Position**

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

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

**Rotation Range**

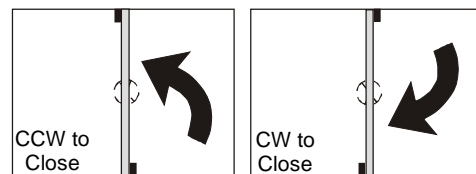
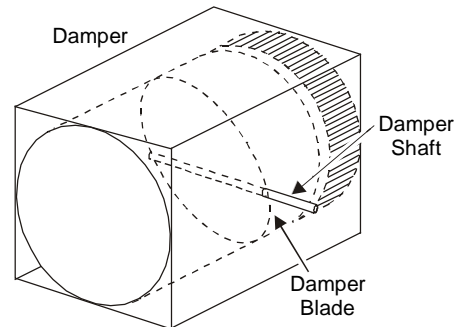
Make sure that the damper blade is visually accessible or its position is permanently marked on the end of the damper shaft as shown in Figure 4.



**Figure 4: Damper Position Icons**

To set the actuator stroke, proceed as follows:

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



**Figure 5: Damper Rotation**

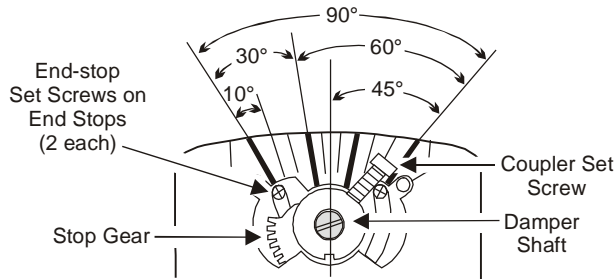
2. Press and hold the gear release lever shown in Figure 2, and rotate the actuator coupler to the fully closed position.
3. Make a note of the rotation travel and direction, either Clockwise (CW) or Counterclockwise (CCW), required to close the damper.

If rotation is less than 90°, proceed to *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**

1. Release the gear release lever.
2. 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°, the stroke of the actuator has to be adjusted 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.
- For 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.
- For a rotation range of 45°, adjust both end-stop set screws, so the coupler rotates between 30 and 75°.
- For 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:

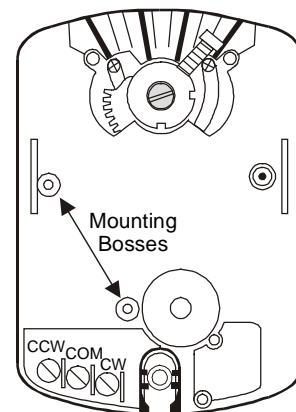
1. Press and hold the gear release lever, and turn the actuator coupler to the minimum rotation position for the minimum ventilation flow required.
2. Release the gear release lever.
3. Use a Phillips screwdriver to loosen the end-stop set screw that is closest to the stop gear. Move the end-stop set screw 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 by 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 M9106-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: Risk of Electric Shock.

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

### MISE EN GARDE : Risque de décharge

électrique. Débrancher l'alimentation avant de réaliser tout raccordement électrique afin d'éviter tout risque de décharge électrique.



### CAUTION: Risk of Property Damage.

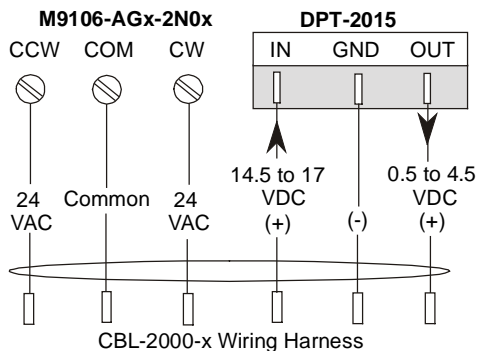
Do not apply power to the system before checking all wiring connections. Short circuited or improperly connected wires may result in permanent damage to the equipment.

### MISE EN GARDE : Risque de dégâts matériels.

Ne pas mettre le système sous tension avant d'avoir vérifié tous les raccords de câblage. Des fils formant un court-circuit ou connectés de façon incorrecte risquent d'endommager irrémédiablement l'équipement.

**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 pre-wired with the M9106-AGS-2N02 or may be ordered separately.

The plenum-rated 20 in. (0.5 m) CBL-2000-2 and 72 in. (1.8 m) CBL-2000-3 Wiring Harnesses are also available. (See Table 1.)

## Setup and Adjustments

### Air Pressure (M9106-AGS-2N02)

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:

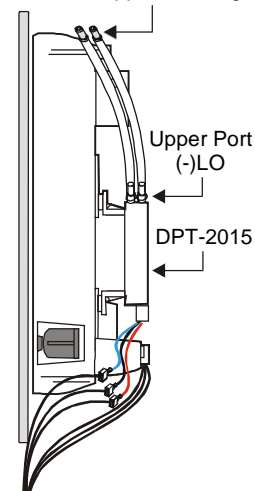
1. Cut two lengths of tubing, and connect them to the flow pickup device.

**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.

1/4 in. Barbed Ports (2)  
for Field-supplied Tubing



**Figure 9: M9106-AGS-2N02 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 their operation, as this could damage the sensing element.

## Commissioning

### M9106-AGx-2N0x

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 installation instructions, *DPT-2015 Differential Pressure Transmitter for VAV Box Applications Installation Instructions*

## Troubleshooting

### M9106-AGx-2N0x

If the actuator is not responding or working properly:

- Verify that the actuator assembly 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:

(Part No. 24-7547-18), 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 Controller Technical Bulletin (LIT-6363040)* for details.

- 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 product or an accessory, refer to the *M9106-AGx-2N0x Series Electric Non-Spring Return Actuators Product Bulletin (LIT-2681126)*.

## Technical Data

<b>Product</b>	M9106-AGx-2N0x Series Electric Non-Spring Return Actuators	
<b>Power Requirements</b>	M9106-AGA-2N01:	20 to 30 VAC at 50/60 Hz, 2.5 VA supply, Class 2
	M9106-AGx-2N02:	20 to 30 VAC at 50/60 Hz, 2.1 VA supply, Class 2
	DPT-2015:	15 VDC (14.5 to 17 VDC) unregulated; 15 mA maximum
<b>Input Signal</b>	M9106-AGx-2N0x:	24 VAC (20 to 30 VAC) at 50 or 60 Hz
<b>Motor Input Impedance</b>	M9106-AGA-2N01:	200 ohms, nominal
	M9106-AGx-2N02:	250 ohms, nominal
<b>DPT-2015-0</b>	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
<b>Mechanical Output</b>	Running Torque:	53 lb·in (6 N·m)
<b>Cycles</b>	100,000 full cycles; 2,500,000 repositions rated at 53 lb·in (6 N·m)	
<b>Audible Noise Rating</b>	35 dBA maximum at 1 m	
<b>Rotation Range</b>	Adjustable from 30 to 90°, CW or CCW	
<b>Rotation Time</b>	M9106-AGx-2N01:	Nominal 60 seconds at 60 Hz and 72 seconds at 50 Hz for 90°
	M9106-AGS-2N02:	Nominal 120 seconds at 60 Hz and 144 seconds at 50 Hz for 90°
<b>Electrical Connection</b>	No. 6-32 screw terminals on the M9106 actuator; 1/4 in. spade terminals on the DPT-2015	
<b>Pressure Connection</b>	6 in. (152 mm) length of silicone tubing with barbed fittings for 1/4 in. (6.35 mm) O.D. tubing	
<b>Enclosure</b>	NEMA1, IP30	
<b>Ambient Operating Conditions</b>	M9106-AGA-2N0x:	32 to 125°F (0 to 52°C); 90% RH maximum, non-condensing
	M9106-AGS-2N02:	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 (Part No. 24-7547-18)</i> .	
<b>Ambient Storage Conditions</b>	-20 to 150°F (-29 to 66°C); 90% RH maximum, non-condensing	
<b>Dimensions (H x W x D)</b>	M9106-AGA-2N01:	5.95 x 4.2 x 2.15 in. (151.2 x 107.3 x 54.6 mm)
	M9106-AGx-2N02:	5.95 x 4.2 x 2.32 in. (151.2 x 107.3 x 58.9 mm) with the DPT-2015
<b>Shipping Weight</b>	M9106-AGA-2N0x:	2.0 lb (0.91 kg)
	M9106-AGS-2N02:	2.2 lb (0.99 kg) with the DPT-2015
<b>Agency Compliance (M9106 Actuator)</b>	UL 873 Listed, File E27734, CCN XAPX CSA C22.2 No. 139 Certified, File LR85083, Class 3221 02 CE Mark – Johnson Controls, Inc., declares that this product is in compliance with the essential requirements and other relevant provisions of the EMC Directive	



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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