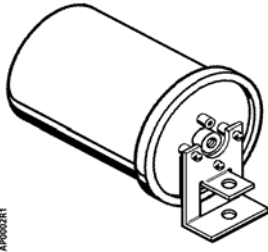


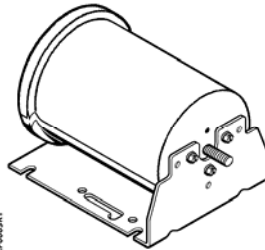
POWERS™ Controls

No. 3 Pneumatic Damper Actuator



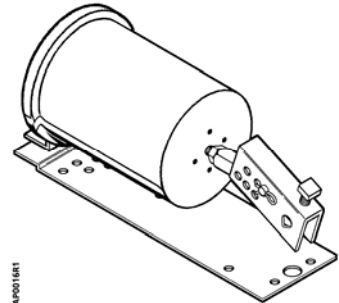
AP00021

331-4312 Pivot Mounting



AP00021

331-4313 Fixed Mounting



AP00021

331-4311 Extended Shaft Mounting

Description

The POWERS Controls No. 3 Pneumatic Damper Actuator is a compact, totally enclosed, rolling diaphragm-type actuator designed for modulating or two-position actuation of dampers or air valves.

Features

- All metal body construction
- Totally enclosed to protect internal parts
- Variety of spring ranges for sequencing
- Fixed or pivot mounting models
- Pivot mounting for extended shaft
- Positioning relay (optional)
- Variety of mounting/linkage kits for special applications
- Threaded shaft for easy mounting to accessory thread

Product Numbers

See Table 1.

Application

Typical applications are for control of mixing box dampers or air valves, and damper control for unit ventilators, unit conditioners and other HVAC applications.

These compact, totally enclosed actuators are easily installed either directly within the mixing box or unit enclosure, or externally, as required for each application.

Table 1. Product Numbers for No. 3 Pneumatic Damper Actuators.

| Description | Mounting Style | Part No. | | |
|--|---|------------------------|-------------------------|-------------------------|
| | | Nominal Spring Range | | |
| | | 3-7 psi (21-48 kPa) | 5-10 psi (35-69 kPa) | 8-13 psi (55-90 kPa) |
| Actuator | Front | 331-4310 | 331-4510 | 331-4810 |
| Actuator, bracket | Fixed | 331-4313 | 331-4513 | 331-4813 |
| Actuator, bracket, clevis | Fixed | 331-4314 | 331-4514 | 331-4814 |
| Actuator, integral pivot | Pivot | 331-4312 | 331-4512 | 331-4812 |
| Actuator, integral pivot with pivot post * | Extended shaft | 331-4311 | 331-4511 | 331-4811 |
| Actuator, integral pivot with pivot post * | Extended shaft kit with positioning relay | — | — | 332-4811 |
| Actuator, bracket, ball joint connector | Fixed | 331-4331 | 331-4531 | 331-4831 |
| Actuator, bracket, ball joint connector and positioning relay | Fixed | 332-4331 | 332-4531 | 332-4831 |
| Extended shaft with 90° barb fitting (for fume hood controller applications) | Extended shaft | — | — | 546-00020 |

* Mounted on plate for extended shaft with clevis and crank for 3/8-inch (10-mm), 7/16-inch (11-mm), or 1/2-inch (13-mm) diameter shaft.

NOTE: When the actuator is ordered with extended shaft mounting, the mounting plate, pivot post and hardware, clevis, damper crank, rocker arm, and all screws/nuts are included. Order other frame mounting accessories as required if not supplied by damper manufacturer.

| Specifications | | |
|----------------------------|--|---|
| Effective diaphragm area | | 8 inches ² (51.6 cm ²) |
| Stroke | | 2-3/8 inches (6 mm) * |
| Housing (totally enclosed) | | Aluminum |
| Stem | | Plated steel |
| Diaphragm | | Ozone resistant rubber |
| Spring | | Steel |
| Cup | | Zytel |
| Maximum air pressure | | 30 psig (210 kPa) |
| Type of mounting | | Fixed or pivot |
| Thrust and torque rating | | See Table 3 |
| Agency Approvals | | Complies with UL555 and UL555S |
| | * For special applications, an actuator stroke of 2-3/4 inch is available in 3 to 7, 5 to 10, or 8 to 13 psi (21 to 58, 35 to 69, or 55 to 90 kPa) spring ranges. Some models are UL Recognized Components under UL's Damper Actuator category (EMKU2), which covers pneumatic damper actuators intended to be employed on fire dampers and leakage rated dampers. Contact Siemens Building Technologies, Inc. National OEM Sales and Marketing for information. | |

| | | |
|--------------------------------------|---|--|
| Specifications, Continued | Nominal spring ranges | 3 to 7 psi (21 to 50 kPa) 5 to 10 psi (35 to 69 kPa) 8 to 13 psi (55 to 90 kPa) |
| | Operating | |
| | Operating temperature | -20°F to 160°F (-29°C to 71°C) |
| | Air connection | Straight barb fitting for 1/4-inch OD plastic tubing installed in 1/8-inch NPT opening |
| Miscellaneous | Shipping Weight: | |
| | Basic actuator | 1.3 lb (0.58 kg) |
| | Actuator with extended shaft mounting | 3.1 lb (1.4 kg) |
| | Actuator with fixed bracket | 2.5 lb (1.1 kg) |
| | Actuator with fixed bracket and clevis | 2.7 lb (1.2 kg) |
| | Actuator with extended shaft mounting and Positioning Relay | 4.8 lb (2.2 kg) |
| | Dimensions | See Figures 4 through 8 |

Accessories

| | |
|---|----------|
| Linkage kit, 4-inch link and crank | 331-958 |
| Linkage kit, 4-inch rod, ball joint and crank | 331-947 |
| Damper shaft crank, selectable radius, 45°, 60°, and 90°, angular rotation for 3/8 to 1/2-inch (10 to 13-mm) diameter damper shafts | 331-941 |
| Damper shaft crank, adjustable radius 3/4 to 2-7/8 inch (19 to 73 mm) for 1/2-inch (13-mm) diameter damper shafts | 331-795 |
| Damper shaft crank, adjustable radius 3/4 to 4-5/8 inch (19 to 177 mm) for 3/8-inch (9 mm) diameter damper shafts | 331-805 |
| Damper shaft extension, 1/2 x 9 inches long | 333-042 |
| Damper shaft extension, 1/2 inch shaft | 331-631 |
| Damper shaft extension Adapter, for 3/8 inch shaft | 331-632 |
| Pivot mounting kit (bracket and three mounting screws) | 333-148 |
| Pivot post | 333-139 |
| Fixed mounting bracket | 331-916 |
| Extended shaft mounting plate | 331-033 |
| Clevis, steel | 333-207 |
| Clevis, forged | 331-292 |
| Clevis pin | 331-293 |
| Clevis, frame mounting | 331-653 |
| Hitch pin | 331-807 |
| 12-inch Damper actuator push rod | 338-041 |
| 15-inch Damper actuator push rod | 338-042 |
| 18-inch Damper actuator push rod | 338-043 |
| 24-inch Damper actuator push rod | 338-044 |
| 36-inch Damper actuator push rod | 338-045 |
| 48-inch Damper actuator push rod | 338-046 |
| Damper blade rocker arm | 333-034 |
| Positioning relay | 147-2000 |
| Relay mounting kit | 147-104 |

Table 3. Thrust Torque Ratings.

| Nominal Spring Range | Maximum Thrust lb. (N) | | | | Torque Rating* lb-in (Nm) | | | |
|-------------------------------|------------------------|---------------------|---------------------|---|---------------------------|----------------------|---------------------|---------------------|
| | Full Stroke Forward | | | Spring Return (No Stroke) 0 psig (0 kPa) | Gradual Operation | 2-Position Operation | | |
| | 15 psi (103 kPa) | 18 psi (124 kPa) | 25 psi (172 kPa) | | | 15 psi (103 kPa) | 18 psi (124 kPa) | 25 psi (172 kPa) |
| 3 to 7 psi (21 to 48 kPa) | 64 (285) | 88 (391) | 144 (641) | 24 (107) | 10 (1.1) | 20.2 (2.3) | 20.2 (2.3) | 20.2 (2.3) |
| 5 to 10 psi (35 to 69 kPa) | 40 (178) | 64 (285) | 120 (534) | 40 (178) | 10 (1.1) | 33.6 (3.8) | 33.6 (3.8) | 33.6 (3.8) |
| 8 to 13 psi (55 to 90 kPa) | 16 (71) | 40 (178) | 96 (427) | 64 (285) | 10 (1.1) | 53.8 (6.1) | 53.8 (6.1) | 53.8 (6.1) |

* With maximum hysteresis of 2.5 psi (17.2 kPa) @ 90° rotation.

Sizing

The size and quantity of actuators required depends on several damper torque factors:

- Damper type (standard or low leakage)
- Quality of damper installation
- Number of damper sections
- Air velocity
- Static pressure
- Age of damper

To determine the correct actuator required for the installation:

- Obtain the damper torque ratings (lb-in/sq-ft) from the damper manufacturer.
- Determine the area of the damper.
- Calculate the total torque required to move the damper.
- Select the appropriate actuator(s).

Installation

Extended Shaft Mounting, Pivot Mounting

For Actuators 331-4311, 331-4511, 331-4811, or 332-4811. These assemblies are designed for 90° damper rotation.

NOTE: Clevis mounts in Crank Radius Hole No. 6 for 90° damper rotation.

1. Slip the 9/16-inch (14 mm) diameter hole in the mounting plate over the damper shaft (Figure 1).
2. Slip the crank over the 3/8 through 1/2-inch (10 through 13-mm) diameter damper shaft (Figure 2).
3. Position the mounting plate (Table 3).
4. Attach the mounting plate to the duct with four screws.

Installation, Continued

Table 3. Damper Blade Rotation.

| Actuator Position in Relation to Damper Shaft | Crank Position in Relation to Damper Shaft | Rotation of Damper Blade on Increase of Pressure |
|---|--|--|
| Left | Above | Clockwise |
| | Below | Counterclockwise |
| Right | Above | Counterclockwise |
| | Below | Clockwise |

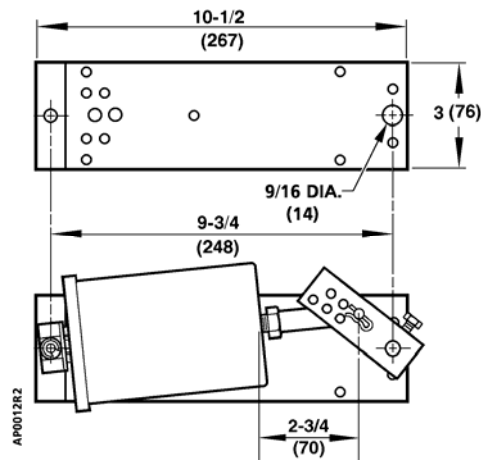
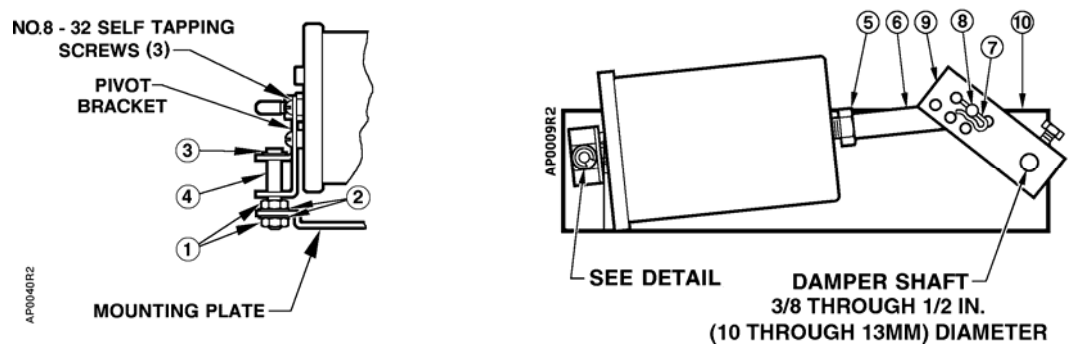


Figure 1. Mounting Plate and Extended Shaft Mounting.



| Item | Description | Item | Description |
|------|------------------|------|--------------------------------|
| 1 | Nut(s) | 6 | Clevis |
| 2 | Lock Washers (2) | 7 | Hitch Pin |
| 3 | E-ring | 8 | Clevis Pin |
| 4 | Pivot Post | 9 | Crank Assembly Kit No. 331-941 |
| 5 | Nut | 10 | Actuator Mounting Plate |

Figure 2. Extended Shaft Mounting with Pivot.

Installation, Continued

Extended Shaft Mounting, Fixed Actuator

For Actuators 331-4314, 331-4514, 331-4814 order Linkage Kit 331-958.

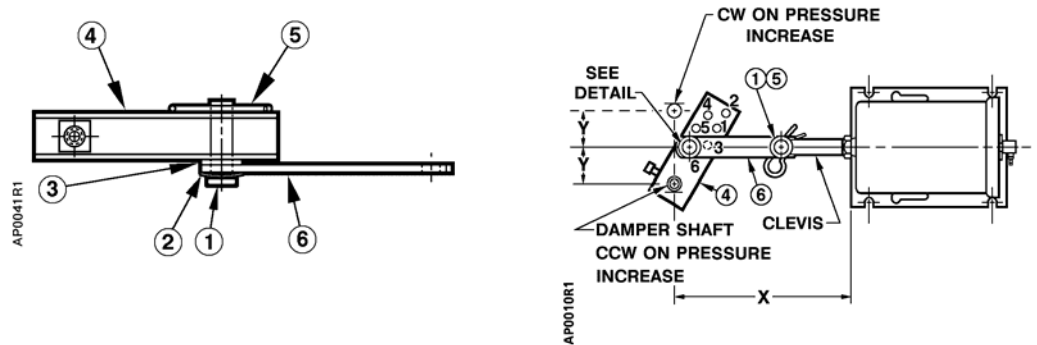
For Actuators 331-4313, 331-4513, 331-4813, order Clevis 333-207 and Linkage Kit 331-958.

1. Determine the direction of the damper shaft rotation (clockwise or counterclockwise) on an increase in pressure to the actuator.
2. Determine the angle of rotation required for the damper to move from closed to full open.

NOTE: Since the actuator stroke is 2-3/8 inch (6 cm) and the angle of rotation is known, the crank radius can be determined from the graph in *TB181 Maximum Thrust Ratings of Pneumatic Damper Actuators Technical Bulletin* (155-219P25) or use Table 4.

3. Attach the link to the crank at the radius value determined in Step 2.
4. Attach the clevis and other end of the linkage to the actuator shaft (Figure 3).
5. The normal position of the damper (open or closed) and its direction of rotation (CW or CCW) will determine the location of the actuator and linkage assembly (Table 3).
6. Attach an air line or Baumanometer (squeeze bulb) to the actuator and increase pressure until the actuator shaft moves one half of its stroke, 1-3/16 inch (3 cm). Select the correct location for the actuator assembly as determined in Step 5.
7. Slip the crank over the damper shaft and position the assembly so that the actuator shaft and link are straight and perpendicular to the crank.
8. Mark and attach the actuator bracket to the duct at this location. If this installation procedure is followed, there will be no problem with linkage scissoring or locking up.

The installation is complete.



| Item | Description | Item | Description |
|------|---------------|------|------------------------------|
| 1 | Clevis Pin | 4 | Crank with Set Screw |
| 2 | Spring Washer | 5 | Hitch Pin |
| 3 | Washer, Nylon | 6 | Link, 4 inches (102 mm) long |

Figure 3. Fixed Mounted Actuator Assembly with Linkage Kit 331-958.

Installation, Continued

Table 4. Crank Radius Connection.

| Dimensions | | Application | Crank Radius Connection | Crank Hole Number |
|------------------------|------------------------|---|-------------------------|-------------------|
| X | Y | | | |
| 7-7/8 inch (200 mm) | 1-3/16 inch (30 mm) | 2-3/8 inch (60 mm) stroke 90 ° Rotation | 1-11/16 inch (43 mm) | 6 |
| 7-7/8 inch (200 mm) | 2-1/16 inch (52 mm) | 2-3/8 inch (60 mm) stroke 60 ° Rotation | 2-3/8 inch (60 mm) | 5 |

NOTE: Crank Radius Holes No. 1 through 4 are used for No. 4 and No. 6 Pneumatic Damper Actuators only.

Dimensions

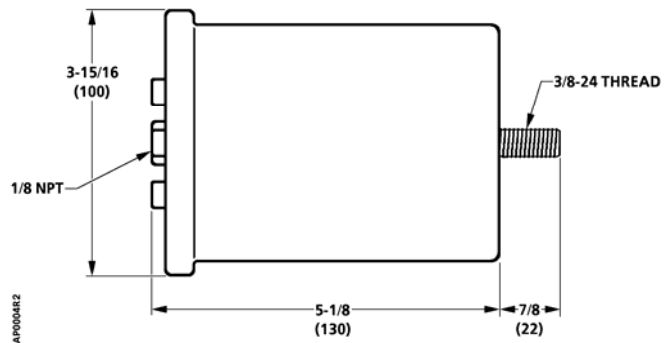


Figure 4. No. 3 Pneumatic Damper Actuator Dimensions. Dimensions are in Inches (Millimeters).

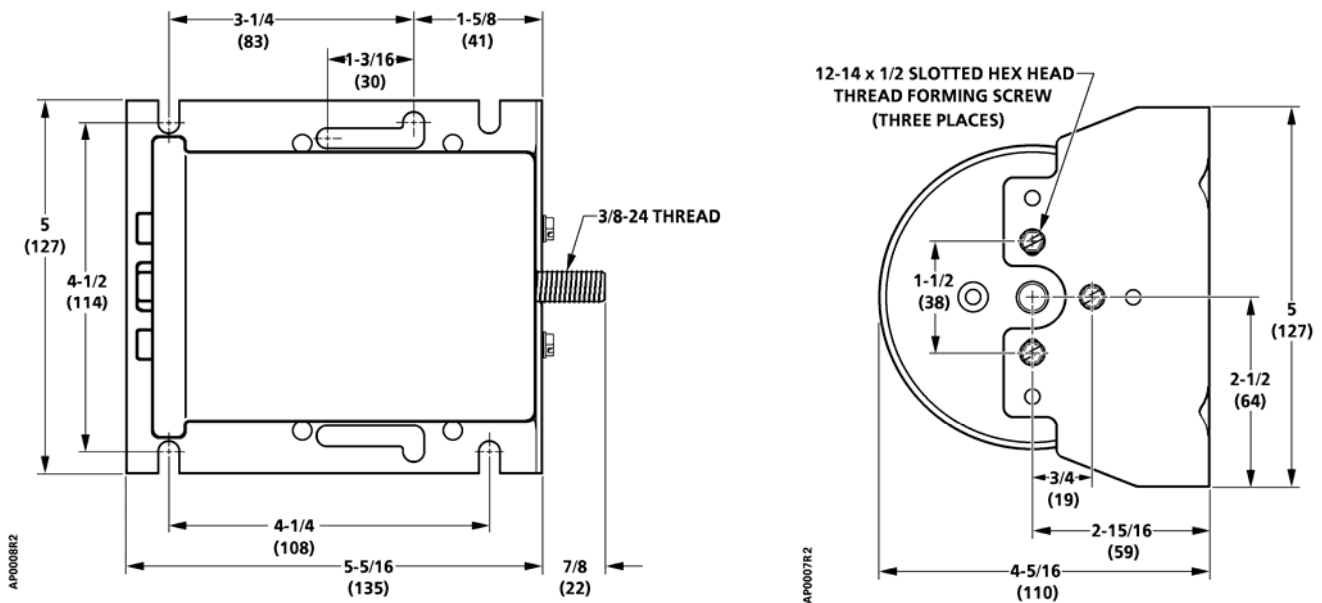


Figure 5. No. 3 Actuator with Fixed Mounting Bracket Dimensions. Dimensions are in Inches (Millimeters).

Dimensions, Continued

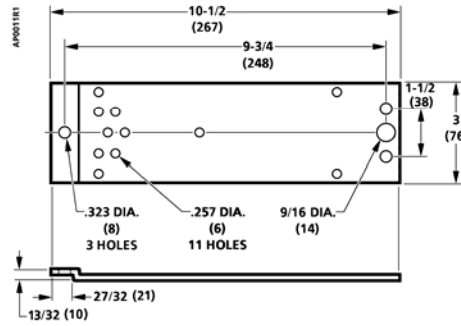


Figure 6. Extended Shaft Mounting Bracket Dimensions. Dimensions are in Inches (Millimeters).

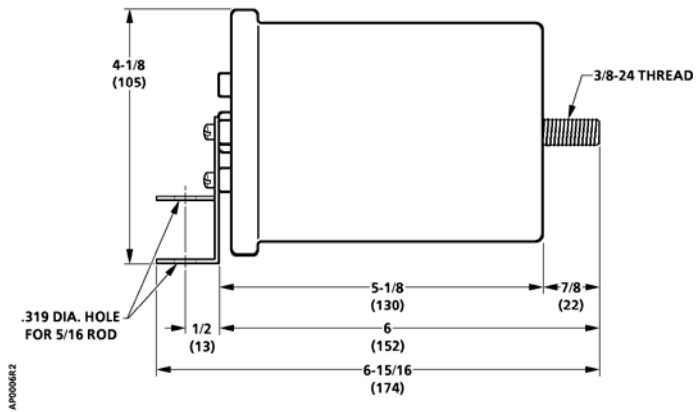
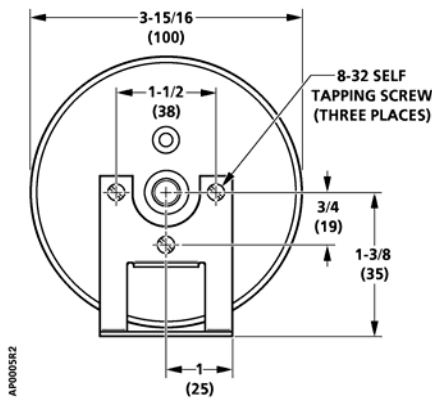


Figure 7. No. 3 Actuator with Pivot Mounting Bracket Dimensions. Dimensions are in Inches (Millimeters).

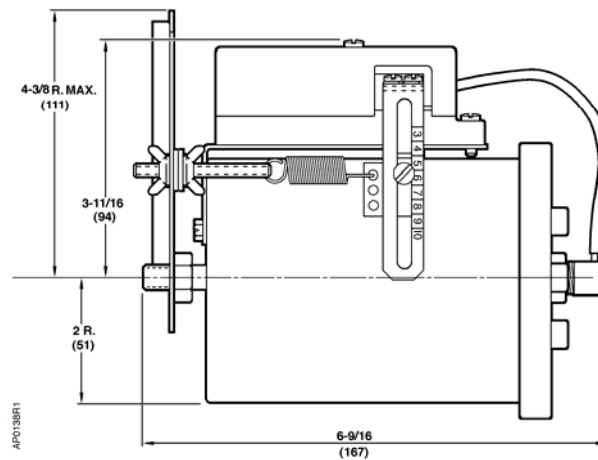


Figure 8. No. 3 Actuator with the RL 147 Positioning Relay Mounted Dimensions. Dimensions in Inches (Millimeters).

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