



**COMBINATION FIRE/SMOKE DAMPER FOR GRILLES**  
 1 1/2 HR. LABEL • LEAKAGE CLASS I OR II  
 VERTICAL OR HORIZONTAL MOUNT  
**MODEL: 1271G**



**QUALIFICATIONS:**

- UL 555 & CAN/ULC-S112 CLASSIFIED DYNAMIC FIRE DAMPER 1 1/2 hr. Label (File #'s R9492 and R19569).
- UL 555S CLASSIFIED SMOKE DAMPER (File # R9492) Leakage Class I or II at 250°F or 350°F elevated temperature.
- Meets NFPA 80, 90A, 92, 101 and 105.
- Maximum velocity: 2000 fpm @ 4" w.g. (10 m/s @ 1 kPa).

Model 1271G combination fire/smoke damper is specifically designed for supply or return ducts that terminate at a grille. The special factory sleeve with unique 3/4" (19) grille mounting flanges simplifies installation, saves on field labor and eliminates the requirements for unsightly front retaining angles which commonly protrude from behind the grill. Steel grille with correctly located countersunk screw holes is available from Nailor and installs over and completely hides the mounting flanges. The standard damper offset in the sleeve accommodates a single or double deflection supply air grille, single deflection supply air register or a return air grille or register.

The 1271G is ideal for applications where building codes require both a fire damper for the protection of ductwork penetrations in walls or floors that have a fire resistance rating of up to 2 hours and also require a leakage rated damper for operational smoke control in static or dynamic smoke management systems.

The 1271G has been especially designed and tested to offer a rugged cost effective damper well suited to the majority of commercial applications.

**STANDARD CONSTRUCTION:**

- Frame:** 5" x 7/8" x 16 ga. (127 x 22 x 1.6) galvanized steel hat channel.
- Blades:** 6" (152) wide on 5 1/2" (140) centers. 16 ga. (1.6) galvanized steel vee groove or double-skin design.
- Sleeve:** 16" x 20 ga. (406 x 1.0) galvanized steel with 3/4" (19) wide grille mounting tabs.
- Linkage:** Concealed in frame. 12 ga. (2.7) plated steel.
- Bearings:** 1/2" (13) dia. self-lubricating oilite bronze.
- Axles:** 1/2" (13) dia. plated steel double bolted to blades.
- Jackshaft:** 1/2" (13) dia. cadmium plated steel.
- Jamb Seals:** Stainless steel.
- Blade Seals:** Stainless steel on vee groove blade.

**Heat Responsive Device (Controlled Closure):**

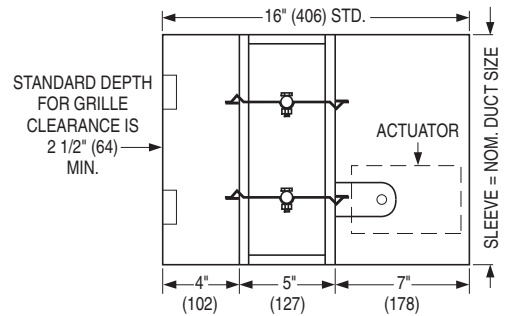
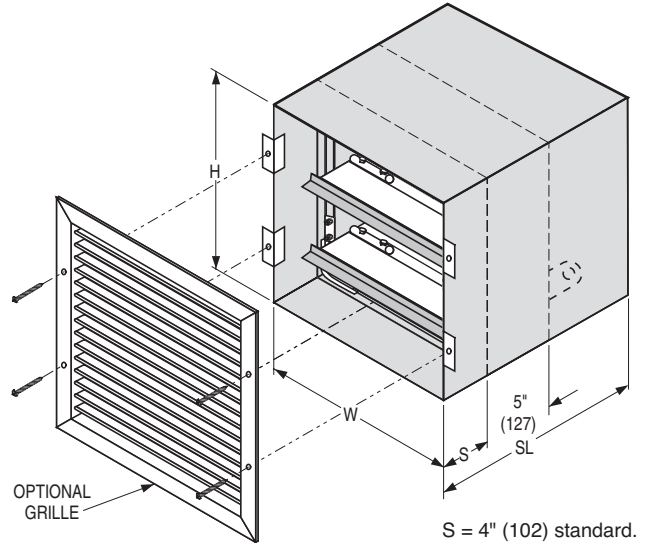
ERL (Electric Resettable Link) is standard on dampers with electric actuators: 250°F (121°C) standard. 165°F (74°C), 212°F (100°C) and 350°F (177°C) available.

PRL (Pneumatic Replaceable Link) is standard on dampers with pneumatic actuators: 212°F (100°C) standard. 165°F (74°C) and 280°F (138°C) available.

**Model 1271G Sizes (Duct W x H):**

Velocity/ Pressure Rating	Elevated Temp. °F	Minimum		Maximum	
		Single Section		Single Section	
		Vertical/Horizontal	Vertical/Horizontal	Vertical/Horizontal	Vertical/Horizontal
24	250/350	8" x 8" (203 x 203).		24" x 24" (610 x 610)	

**Note:** With S = 4" (102), a minimum 6 1/2" (165) wall thickness is required for this installation. Centerline of damper must be within plane of wall. Reducing the offset reduces the minimum wall thickness by an equal amount, but also reduces clearance for the grille.



**BASE MODEL SELECTION:**

- 1271G Standard factory sleeve (caulked to UL requirements) 16" (406) see above.
- 1271G Non-standard sleeve: Specify \_\_\_ length \_\_\_ ga. Non-standard damper position: S = \_\_\_\_.

**LEAKAGE CLASS / ELEVATED TEMPERATURE:**

- I  II @ 250°F (Standard)
- I  II @ 350°F (Optional)

**ACTUATOR SELECTION:**

- Electric  Pneumatic Specify model \_\_\_\_\_.

**ACTUATOR LOCATION :**

- External (std.)  Internal (in the airstream)

**ACTUATOR FAIL POSITION: Closed.**

**OPTIONS:**

- BS Stainless steel bearings
- MLS-300 Position indicator switch pack
- MLS-400 Electric Fire Sensor (Re-openable control system). Includes dual heat sensors (165°F and 250°F or 350°F) and position indicator switch pack.
- QS1 Quick-set retaining angle (one side)
- TDF1 Flange (one end)

For installation instructions, see IOM-FSDGTINST  
 Dimensions are in inches (mm).

**SCHEDULE TYPE:**

**PROJECT:**

**ENGINEER:**

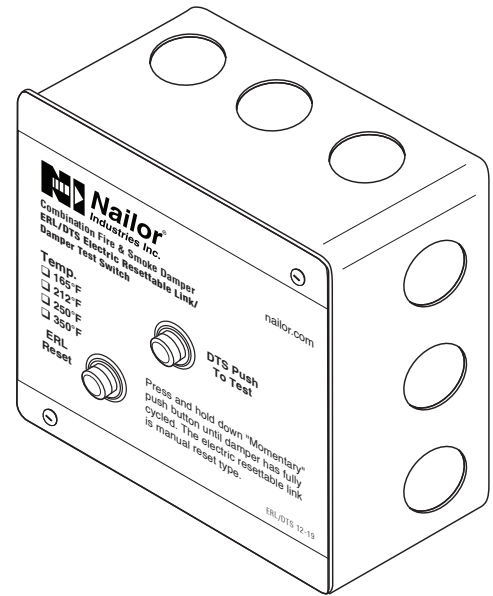
**CONTRACTOR:**

DATE	B SERIES	SUPERSEDES	DRAWING NO.
6 - 16 - 16	1200	8 - 20 - 13	1271G

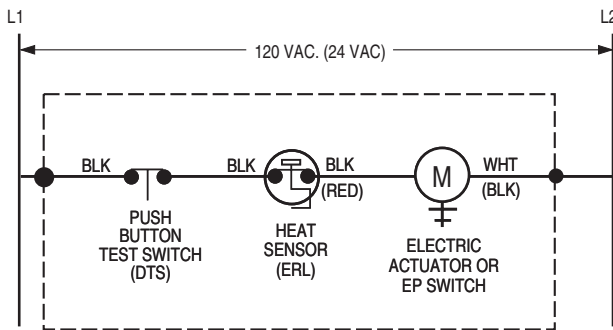
The DTS (Damper Test Switch) is an optional "momentary" push button test switch available on all Nailor smoke and combination fire/smoke dampers. The DTS provides the ability to "cycle test" the damper by pushing and holding down the button until the damper has cycled and closure has been visually verified, either by inspecting the damper through the access door or by confirmation at a remote control panel when equipped with the optional MLS-300 position indicator.

The DTS is mounted right on the damper and enables a single maintenance person to test and cycle the damper, eliminating the need for help from another person in the control room.

When a combination fire/smoke damper is ordered, the DTS is combined with the ERL (Electric Resettable Link), in a common enclosure.



### WIRING DIAGRAMS:



MOUNTED ON DAMPER (FACTORY WIRING TERMINATES AT SPLICE POINTS INDICATED INSIDE 4" x 4" ELECTRICAL BOX)

Figure 1. DTS/ERL Damper Test Switch with Electric Resettable Link

### Belimo Actuator Aux. Switch Wiring Connections

Model Series	Open (OP)	Closed (CL)
FSTF	Orange / Gray	Violet / Red
FSLF / FSAFA	Gray / Gray	Violet / Violet
FSNF / FSAFB	White S4 / S6	White S1 / S2

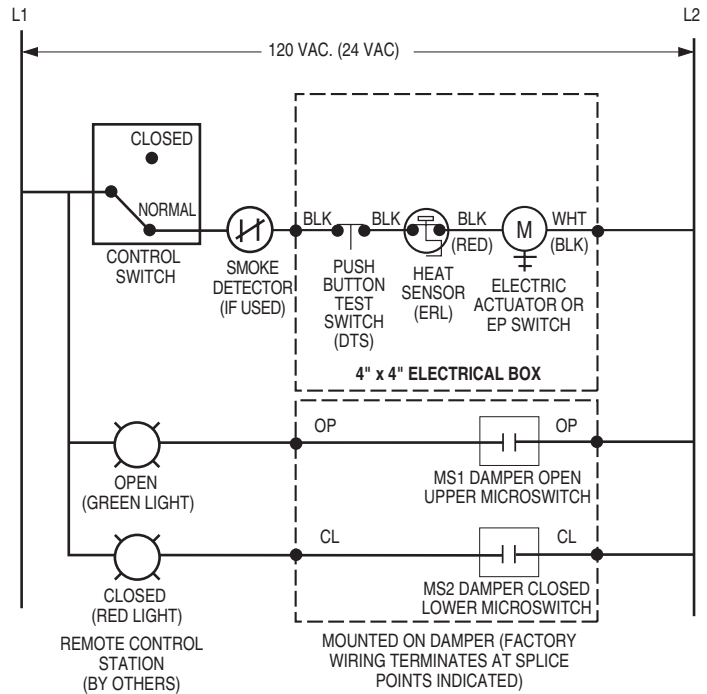


Figure 2. DTS/ERL with MLS-300 Belimo (actuator aux. switches) Position Indicator Package

SCHEDULE TYPE

PROJECT

ENGINEER

CONTRACTOR

DATE

B SERIES

SUPERSEDES

DRAWING NO.

9 - 3 - 20

FD-ACC

3 - 29 - 18

DTS

### WIRING DIAGRAMS:

#### Honeywell Actuator Aux. Switch Wiring Connections

Model Series	Open (OP)	Closed (CL)
MSXX04	Yellow / Yellow	Blue / Blue
MSXX20	Yellow / Yellow	Blue / Blue

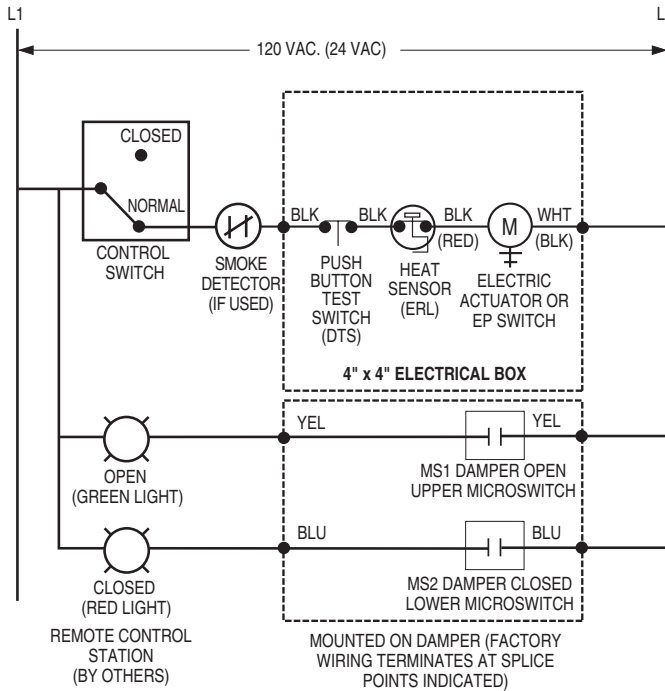


Figure 3. DTS/ERL with MLS-300 Nailor or Honeywell (actuator aux. switches) Position Indicator Package

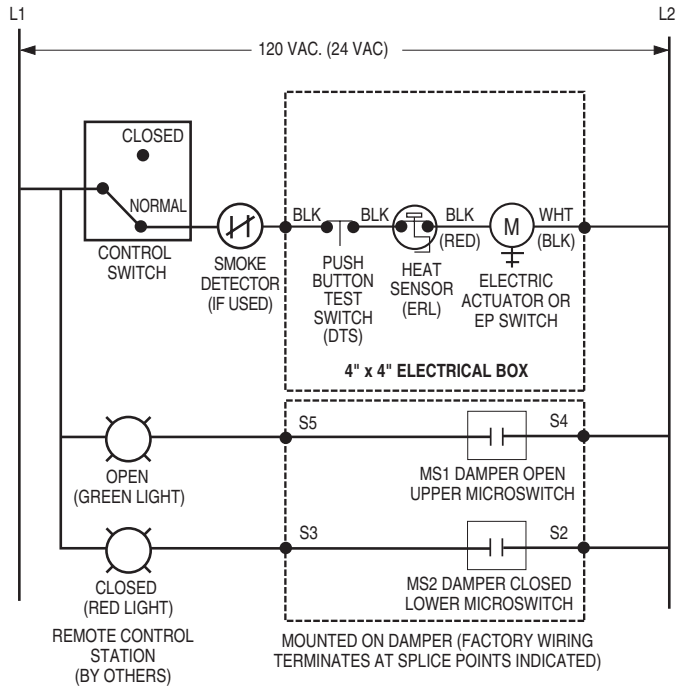
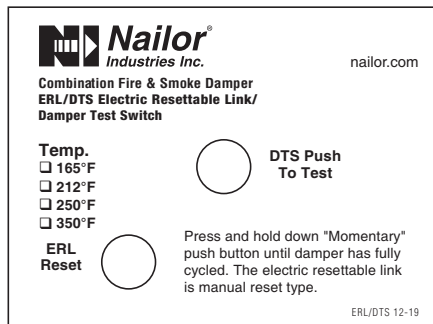
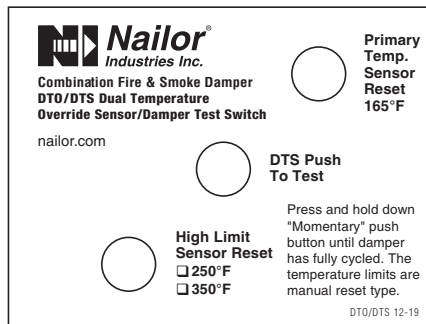


Figure 4. DTS/ERL with MLS-300 Siemens GJD Series (actuator auxiliary switches) Position Indicator Package

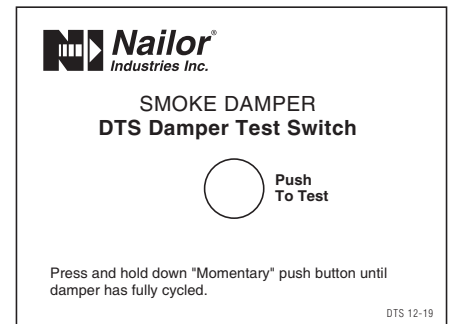
### DTS LABEL VARIATIONS:



ERL/DTS Combination Fire/Smoke Damper



DTO/DTS Combination Fire/Smoke Damper



DTS Smoke Damper

SCHEDULE TYPE

PROJECT

ENGINEER

CONTRACTOR

Page 2 of 2

DATE

B SERIES

SUPERSEDES

DRAWING NO.

9 - 3 - 20

FD-ACC

3 - 29 - 18

DTS

**"QUICK-SET" RETAINING ANGLES BOTH SIMPLIFY AND SPEED INSTALLATION,  
 SAVING BOTH TIME AND MONEY.**

**BENEFITS:**

- One piece angles are fastened together in the corners. Only two sets of angles to handle per damper (rather than four separate angles per side).
- Angles are shipped with damper - no sorting or matching.
- Provided with pre-drilled fastening holes on 2" (51) centers to ensure correct angle/sleeve attachment.
- Factory fabricated by Nailor to suit the individual fire damper.
- Reduced cost when compared to conventional retaining angles.
- Dampers can ship directly to the job site complete with all necessary installation sheet metal hardware (saves on double handling at contractor's shop).
- Help ensure a correct installation as per U.L. approved installation instructions.

The majority of installing contractors view fire damper installation as a costly time consuming and troublesome procedure. Eight conventional angles must be custom fabricated for each damper either in a sheet metal shop or at the job site and sized to suit each individual damper. Invariably, they are mislaid or lost and must be matched to each factory supplied damper.

The Nailor "Quick-Set" solution solves the majority of problems. They are pre-formed to fit and ship with the individual damper for ultimate convenience. "Quick-Set" angles are supplied with correctly spaced pre-drilled screw-holes to ensure a quick, easy and accurate installation for all integral sleeve Nailor fire and combination fire/smoke dampers - no measuring required.

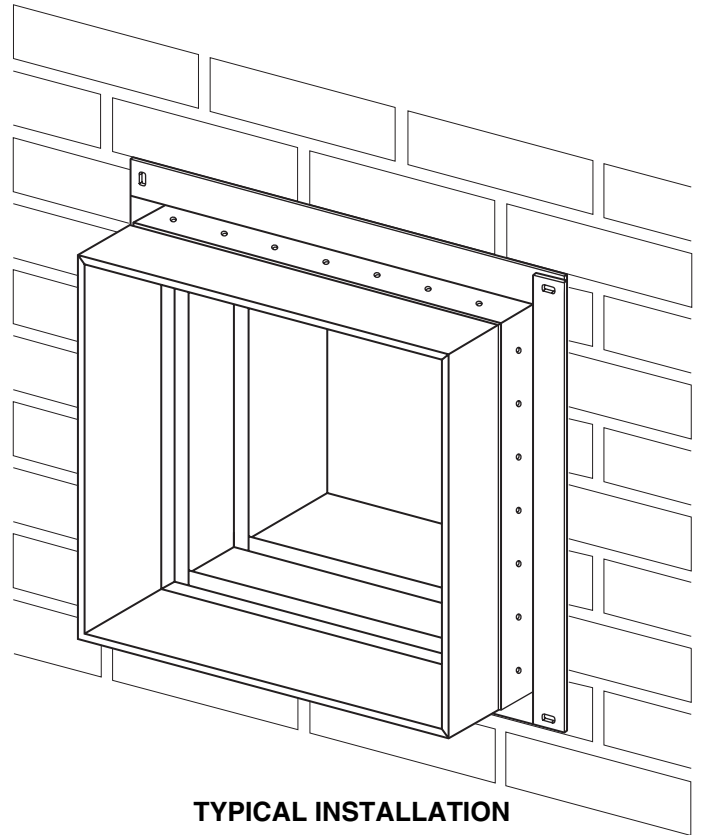
"Quick-Set" retaining angles provide the "complete" installation package. Simple, fast, convenient.

**MODELS:**

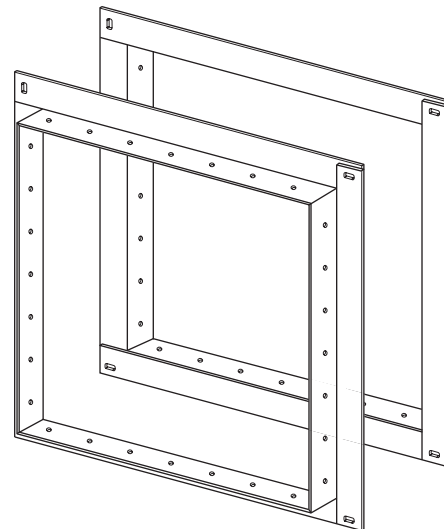
Nailor "Quick-Set" retaining angles are an accessory option for all dampers ordered with factory sleeves.

**QS2:** Two sides (pair). For standard installations where angles are installed on both sides of the fire partition.

**QS1:** One side (single set). For use in single side retaining angle installations and with grille mount and "out of wall" damper models.



**TYPICAL INSTALLATION**

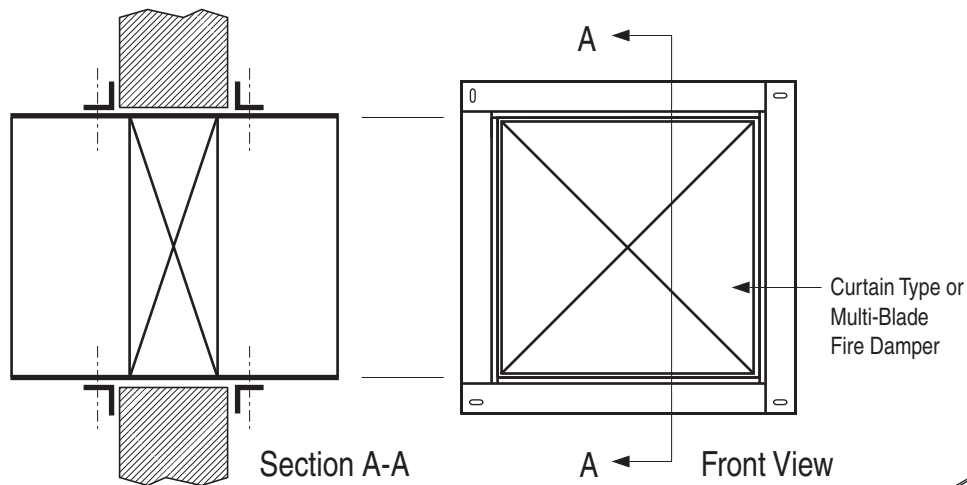


**TYPICAL PAIR OF PRE-ASSEMBLED  
 QUICK-SET' RETAINING ANGLES**

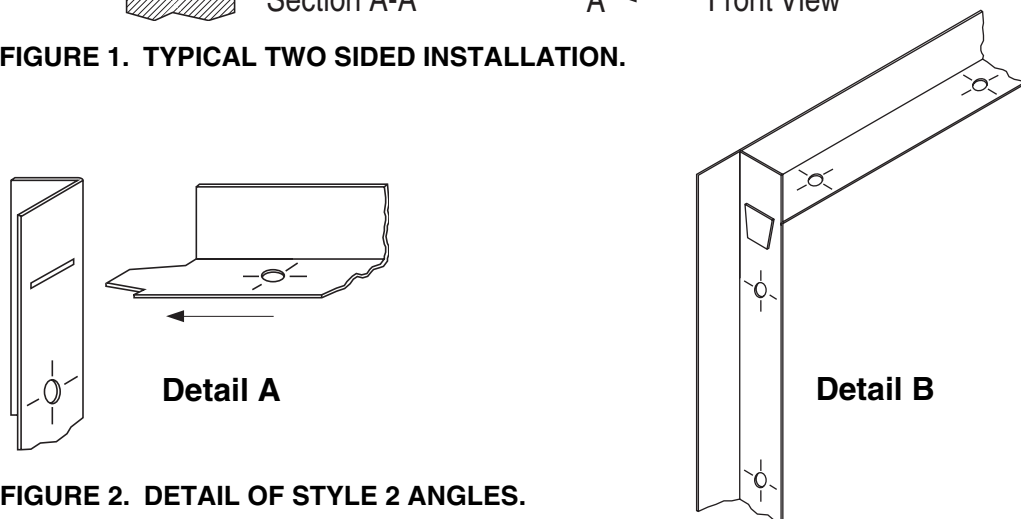


<b>SCHEDULE TYPE:</b>	Page 1 of 2			
<b>PROJECT:</b>	Dimensions are in inches (mm).			
<b>ENGINEER:</b>	<b>DATE</b>	<b>B SERIES</b>	<b>SUPERSEDES</b>	<b>DRAWING NO.</b>
<b>CONTRACTOR:</b>	2 - 26 - 09	FD-ACC	6 - 5 - 03	QSRA

**"QUICK-SET" RETAINING ANGLES**  
**FOR ALL SLEEVED FIRE AND**  
**COMBINATION FIRE/SMOKE DAMPERS**  
**MODELS: QS1 AND QS2**



**FIGURE 1. TYPICAL TWO SIDED INSTALLATION.**



**FIGURE 2. DETAIL OF STYLE 2 ANGLES.**

**APPLICATION:**

The Nailor Quick-Set Retaining Angle System may be used in lieu of conventional retaining angles on all Nailor Fire and Combination Fire/Smoke Dampers.

Quick-Set angles are supplied in one of two styles, dependent upon fire resistance label, damper size and installation method.

**Style 1:** 1 1/2" x 1 1/2" x 20 ga. (38 x 38 x 1.0) Four sides are connected together with rivets in three corners.

Standard for the majority of applications with the following limitations:

- 1 1/2 hour label fire dampers.
- Maximum Size: 36" x 36" (914 x 914)
- Two sided installation only

**Style 2:** 1 1/2" x 1 1/2" x 16 ga. (38 x 38 x 1.6) Slot and tab design. The retaining angle assembly for each side has four angles, each with a tab end and a slot end (Detail A).

The tabs are to be inserted into the slots and knocked down either before or after fastening to the sleeve (Detail B).

- 1 1/2 or 3 hour label fire dampers
- Maximum Size: 90" x 48" (2286 x 1219) or 48" x 90" (1219 x 2286)
- Single side (1 1/2 hour only. Refer to Single Side Retaining Angles Supplementary Installation Instructions for size limitations) or two sided installation

**Refer to the Following Installation Instructions:**

Quick-Set Retaining Angles	FDQSRA
Curtain Type Fire Dampers (D)0100 & (D)0500	FDINST
Curtain Type Fire Dampers 0200 & 0500 Thinline	FDTINST
Multi-Blade Fire Dampers 1200 & 1250	MBFDINST
Combination Fire/Smoke Dampers 1220	1220INST
Combination Fire/Smoke Dampers 1270	1270INST
Single Side Retaining Angles	FDSSRAINST

<b>SCHEDULE TYPE:</b>	Page 2 of 2			
<b>PROJECT:</b>	Dimensions are in inches (mm).			
<b>ENGINEER:</b>	<b>DATE</b>	<b>B SERIES</b>	<b>SUPERSEDES</b>	<b>DRAWING NO.</b>
<b>CONTRACTOR:</b>	2 - 26 - 09	FD-ACC	5 - 5 - 03	QSRA

## Powers™ Controls No. 4 Pneumatic Damper Actuator

### Product Description

The No. 4 Pneumatic Damper Actuator is a totally enclosed pneumatic piston type actuator designed to actuate dampers for ventilating systems, mixing box control, and other applications requiring a large, effective diaphragm area and long stroke. The No. 4 Hesitation Actuator is frequently used to operate the outdoor air damper on unit ventilators.

### Product Numbers

See Table 1.

### Prerequisites

- Ensure all kits are ordered and available for installation. Kits are listed with each mounting application.
- Have the damper manufacturer drill the mounting holes.
- Have the damper manufacturer weld the mounting lug to the damper frame in frame mounting installations.



#### WARNING:

Do not remove the jam nut (Figure 1). Spring is under heavy load. Repair by trained personnel only.

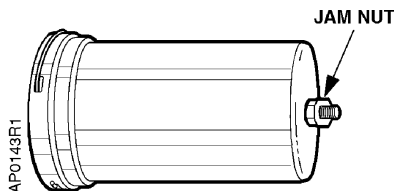


Figure 1. Actuator Jam Nut Location.

### Required Tools

- Flat-blade screwdriver
- Adjustable crescent wrench
- Pliers

### Warning/Caution Notations

<b>WARNING</b>		Personal injury/loss of life may occur if the user does not follow a procedure as specified.
<b>CAUTION</b>		Equipment damage, or loss of data may occur if the user does not follow a procedure as specified.

### Installation

#### Extended Shaft Mounting-Pivot Actuator

**Expected Installation Time:** 28 minutes

Actuators: 331-3000, 331-3001, 331-3002, 331-2973, or 331-3004.

These assemblies are designed for 90° damper rotation.

**NOTE:** Clevis mounts in Crank Radius Hole No. 1 for 90° damper rotation.

1. Slip 3/4-inch (19 mm) diameter hole in the mounting plate over the damper shaft (Figure 2).

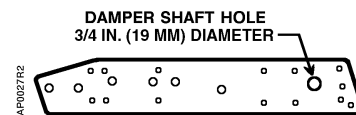


Figure 2. Actuator Mounting Plate.

2. Slip the crank over the 3/8 through 1/2-inch (10 through 13-mm) diameter damper shaft (Figure 3).

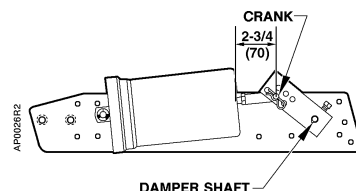


Figure 3. Extended Shaft Mounting.

3. Position the mounting plate and attach it to the duct with four screws.

**Table 1. No. 4 Damper Actuator Product Numbers.**

Description	Mounting Style	Product Numbers				
		Nominal Spring Range				
		3-7 psi (21-48 kPa)	3-13 psi (21-90 kPa)	5-10 psi (35-69 kPa)	8-13 psi (55-90 kPa)	2-3, 8-13 psi (14-21, 55-90 kPa) Hesitation Model
Actuator, mounting screws (non-pivot)	Front	331-2910	—	331-2917	331-2963	—
Actuator, bracket (non-pivot) 3-inch stroke for unit ventilator	Fixed	331-2911	—	331-2934	331-2966	331-2927
Actuator, bracket (non-pivot) 2-3/8 inch stroke for unit ventilator	Fixed	—	—	—	—	331-2974
Actuator, mounting plate, ball joint connector	Fixed	331-3015	331-3018	331-3016	331-3017	331-3019
Actuator, mounting plate, ball joint connector with positioning relay	Fixed	—	—	—	332-3017	—
Actuator, integral pivot	Pivot	331-2904 <sup>1</sup>	331-2905 <sup>1</sup>	331-2906 <sup>1</sup>	331-2961 <sup>1</sup>	331-2909 <sup>1</sup>
Actuator, integral pivot, clevis and clevis pin for use with frame mounting accessory	Pivot	331-2929	331-2930	331-2931	331-2968	—
Actuator, integral pivot with pivot post <sup>2</sup>	Universal kit	331-3000	331-3001	331-3002	331-2973 <sup>1</sup>	331-3004
Actuator, integral pivot with pivot post, and positioning relay <sup>2</sup>	Universal kit with positioning relay	—	—	—	332-2973	—

<sup>1</sup> UL Recognized Components for Fire/Smoke Applications.

<sup>2</sup> 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. Parts for frame mounting (blade drive) are included with kit.

**NOTE:** When the actuator is ordered with universal 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.

## Installation, Continued

### Extended Shaft Mounting-Fixed Actuator

**Expected Installation Time:** 28 minutes

Actuator with mounting bracket: 331-2911,  
 331-2966, 331-2934, 331-2927, or 331-2974

Clevis: 331-801

Linkage Kit: 331-958

1. Determine the application from Table 2 and then select appropriate "X" and "Y" dimensions. Select a rigid section of the duct, if possible, and draw these lines on the duct.



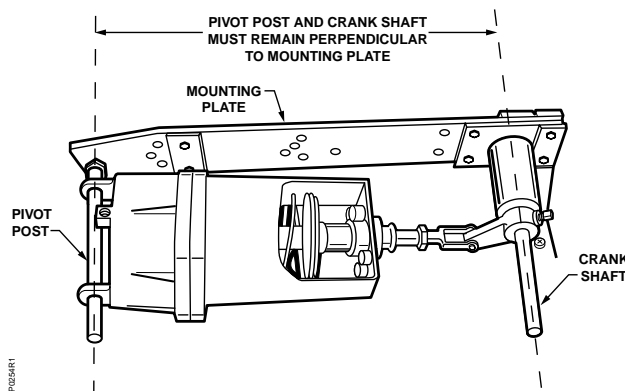
**CAUTION:**

It is important to use the "X" and "Y" dimensions from Table 2 to position the actuator to ensure that the crank is approximately perpendicular to the actuator shaft at half its stroke (see Figure 4). This will prevent the linkage from scissoring or locking up.

**Table 2. Fixed Mounted Assembly Dimensions.**

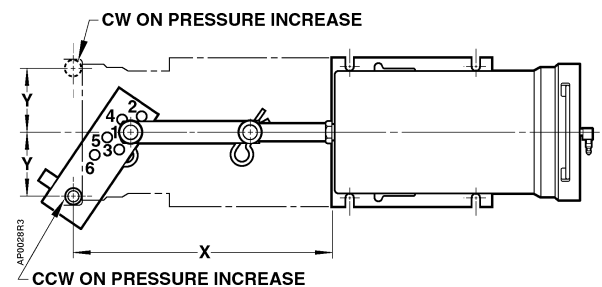
Application	Dimensions in Inches (mm)		Crank Radius Hole
	X	Y	
4-inch (102 mm) Stroke – 90° Rotation	8-1/2 (216)	2 (51)	1
4-inch (102 mm) Stroke – 70° Rotation	8-1/2 (216)	3 (76)	2
3-inch (76 mm) Stroke – 90° Rotation	8 (203)	1-1/2 (38)	3
3-inch (76 mm) Stroke – 60° Rotation	8 (203)	2-1/2 (64)	4

**NOTE:** Crank Radius Holes No. 5 and 6 are used for No. 3 Pneumatic Damper Actuators only.



**Figure 4. Perpendicular Mounting.**

2. Place front of actuator on "X" dimension line so that the actuator shaft faces damper shaft. Place center line of actuator over "Y" dimension line (see Figure 5).
3. Thread Clevis 331-801 on to actuator shaft and tighten against locknut. Assemble Linkage Kit 331-958 to actuator assembly (see Figure 4). The linkage is assembled so that the damper shaft will rotate counterclockwise as actuator pressure increases. This is a typical normally closed damper installation.



**Figure 5. Fixed Mounted Actuator Assembly.**

### Frame Mounting

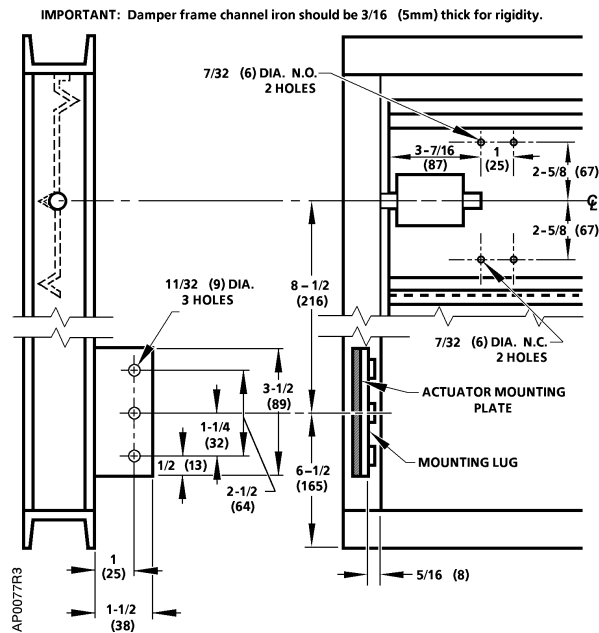
**Expected Installation Time:** 3 hours

Actuator: 331-3000, 331-3001, 331-3002, 331-2973,  
 or 331-3004.

Mounting lug: 331-569

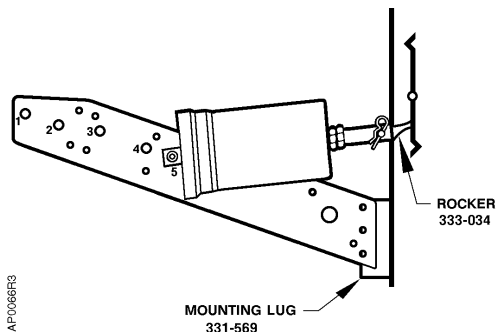
1. If the damper frame is aluminum, light gauge sheet metal, or an unusual shape, bolt a 3/16-inch (5 mm) thick, flat piece of steel to the frame where the mounting lug is to attach. The mounting lug can then be welded to it.
2. Weld the mounting lug parallel and 5/16-inch (8 mm) from the inside edge of the damper frame and perpendicular to it (Figure 6). Weld the lug along both sides. The lug should be as close as possible to the corner of the damper frame to minimize deflection. The damper manufacturer should weld the lug.
3. If the damper frame is aluminum, light gauge sheet metal, or an unusual shape, bolt a 3/16-inch (5-mm) thick, flat piece of steel to the frame. Then, weld the mounting lug to the piece of steel.





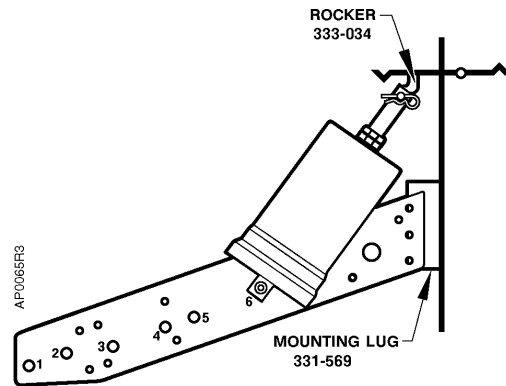
**Figure 6. Frame Mounting Dimensions.  
 Dimensions in Inches (Millimeters).**

4. Attach rocker to blade in proper position for normally open or normally closed damper (Figure 6).
5. Attach mounting plate to mounting lug.
  - a. Normally closed damper: attach plate to lug (Figure 7). Place pivot post in Hole 3.



**Figure 7. No. 4 Actuator Frame Mounting,  
 Normally Closed Damper.**

- b. Normally open damper: attach plate to lug (Figure 8). Place pivot post in Hole 6.



**Figure 8. No. 4 Actuator Frame Mounting,  
 Normally Open Damper.**

6. Fasten clevis to rocker. Discard crank and other parts not used.
7. The actuator mounting plate has a tendency to pivot at the point where the lug is welded to the damper frame when the actuator strokes. It is recommended that some means be devised in the field to prevent this from happening. A threaded rod attached to the mounting plate and duct wall will normally work.

## Hesitation Actuator Adjustment

**Expected Installation Time:** 15 minutes

1. To obtain an initial hesitation point, add air pressure to actuator until shaft travels the desired distance.
2. Turn locknuts on cycle adjustment rods until they contact lower housing and then lock together. Tighten cycle adjustment nuts evenly to ensure smooth operation.

The installation is now complete.

## References

AP 331-2 Powers™ Controls No. 4 Pneumatic Damper Actuator Technical Instructions, (155-032P25)

TB 181, Maximum Thrust Ratings of Pneumatic Damper Actuators Technical Bulletin, (155-219P25)

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## Powers® Controls No. 6 Damper Actuator

### Product Description

The No. 6 Damper Pneumatic Actuator is a heavy duty, rolling diaphragm, spring return actuator designed to drive large dampers, centrifugal refrigeration inlet vanes, and other applications requiring a large, effective diaphragm area and long stroke.


### Required Tools

- Flat-blade screwdriver
- Adjustable crescent wrench
- Pliers

### Prerequisites

- Ensure all kits are ordered and available for installation. Kits are listed with each mounting application.
- Have the damper manufacturer drill mounting holes.
- Have the damper manufacturer weld mounting lug to damper frame for Frame Mounting—Type B installations.

### Product Numbers

Description	Mounting Style	Product Numbers		
		Nominal Spring Range		
		3-8 psi (21-55 kPa)	3-13 psi (21-90 kPa)	8-13 psi (55-90 kPa)
Actuator, integral pivot	Pivot	331-2793	331-2794	331-3060 <sup>1</sup>
Actuator, integral pivot and forward travel stops	Pivot	—		331-2988
Actuator with clevis	Pivot <sup>2</sup>	331-2857	331-2858	331-2856 <sup>1</sup>
Actuator with clevis and positioning relay	Pivot <sup>2</sup>	—	—	332-2856
Actuator, integral pivot with pivot post <sup>3</sup>	Extended Shaft	331-3012	331-3013	331-3011 <sup>1</sup>
Actuator, integral pivot with pivot post and positioning relay <sup>3</sup>	Extended Shaft with Positioning Relay	—	—	332-3011

<sup>1</sup> UL Recognized Components for Fire/Smoke Applications.

<sup>2</sup> Also order frame mounting kit accessories.

<sup>3</sup> 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. Parts for frame mounting (blade drive) included with kit.

**NOTE:** When the actuator is ordered with universal 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.

## Installation

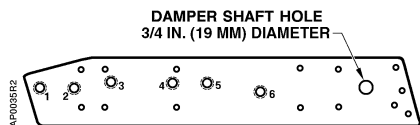
### Extended Shaft Mounting – Pivot Actuator

**Expected installation time:** 28 minutes

Actuators: 331-3012, 331-3013, 331-3011, or 332-3011. These assemblies are designed for 90° damper rotation.

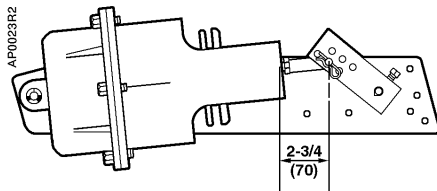
**NOTE:** Clevis mounts in crank radius hole No. 1 for 90° damper rotation.

1. Slip 3/4-inch (19-mm) diameter hole in the mounting plate over the damper shaft (Figure 1).



**Figure 1. Actuator Mounting Plate.**

2. Slip the crank over the 3/8-inch through 1/2-inch (10-millimeter through 13-millimeter) diameter damper shaft (Figure 2).



**Figure 2. Extended Shaft Mounting.**

3. Position the mounting plate and attach it to the duct with 4 screws.

### Frame Mounting – Type A

Actuator and Clevis Assembly: 331-2857, 331-2858 or 331-2856.

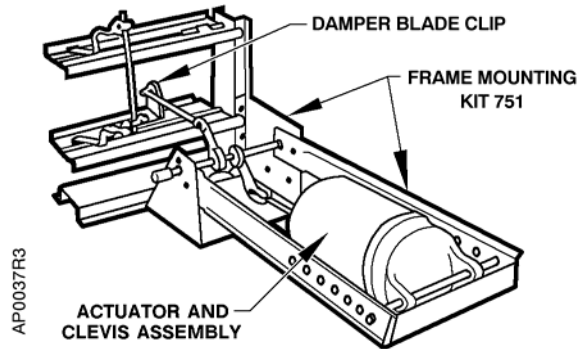
Frame Mounting Kit: 751\* for one-section damper, or 752\* for two-section damper.

\* Order from Arrow United Industries.

**NOTE:** Have manufacturer drill holes in damper frame and damper blade(s). Specific locations of holes are shown in the AP 331-3 Powers™ Controls No. 6 Pneumatic Damper Actuator Technical Instructions, (155-029P25).

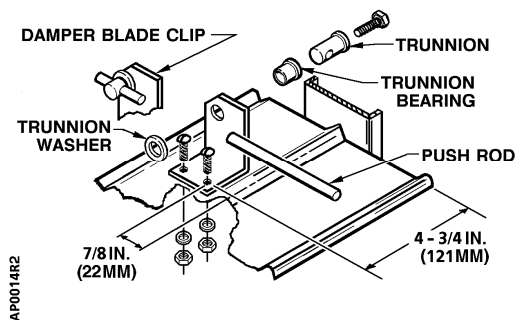
### One-Section Damper (Kit 751)

**Expected installation time:** Two hours



**Figure 3. One-section Damper.**

1. Attach damper mounting bracket to lower right-hand corner (or upper left-hand corner, if necessary) of damper section with six screws provided. For Arrow 1770 Dampers, add shim provided between brackets and bottom of frame.
2. Attach damper blade clip (included) to damper blade (Figure 4). Use the same clip location for both normally open and normally closed dampers. Put damper in its normal position, open or closed. Connect push rod to trunnion in blade clip and tighten setscrews. Connect other end of push rod to crank on drive shaft and tighten trunnion setscrew on push rod. Position crank so push rod is parallel to bracket, then tighten crank setscrews.



**Figure 4. Damper Blade Clip.**

3. Install actuator in actuator support bracket using pivot shaft and hitch pins. Pivot shaft should be in holes about 17-1/2 inches (445 mm) from drive shaft. The actuator support bracket can also mount in the vertical position for installations where space is limited.

4. Position crank drive by actuator as follows:
  - a. Normally open dampers: crank is above drive shaft.
  - b. Normally closed dampers: crank is below drive shaft.
5. Connect actuator clevis to crank. Place damper in its normal position, open or closed. Stroke actuator 1/4-inch (6-millimeter) with hand pump, and then tighten crank setscrews. This will ensure a tight damper closure.

The installation is now complete.

### Two-Section Damper (Kit 752)

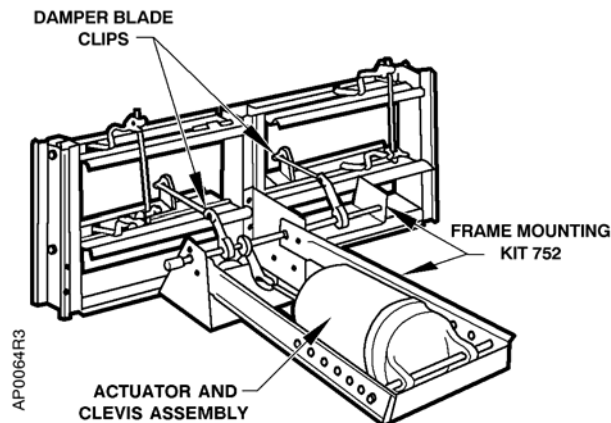


Figure 5. Two-section Damper.

**Expected installation time:** Two hours, 30 minutes

1. Follow the steps in *One-Section Damper*.
2. Attach Damper Blade Clip (included) to damper blade in second damper section. Repeat Step 2 in *One-Section Damper*. The push rod will connect to the extra crank on the drive shaft.

### Frame Mounting – Type B

**Expected installation time:** Three hours

Actuator: 331-3012 (331-3013 or 331-3011)

Mounting lug: 331-569.

1. If damper frame is aluminum, light gauge sheet metal, or an unusual shape, bolt a 3/16-inch (5-millimeter) thick, flat piece of steel to the frame where the mounting lug is to attach. The mounting lug can then be welded to it.

2. Weld the mounting lug parallel and 5/16-inch (8-millimeter) from the inside edge of the damper frame and perpendicular to it (Figure 6). Weld the lug along both sides. The lug should be as close as possible to the corner of the damper frame to minimize deflection. The damper manufacturer should weld the lug.
3. If the damper frame is aluminum, light gauge sheet metal, or an unusual shape, bolt a 3/16-inch (5-millimeter) thick, flat piece of sheet metal to the frame. Then weld the mounting lug to it.
4. Attach rocker to blade in proper position for normally open or normally closed damper (Figure 6).

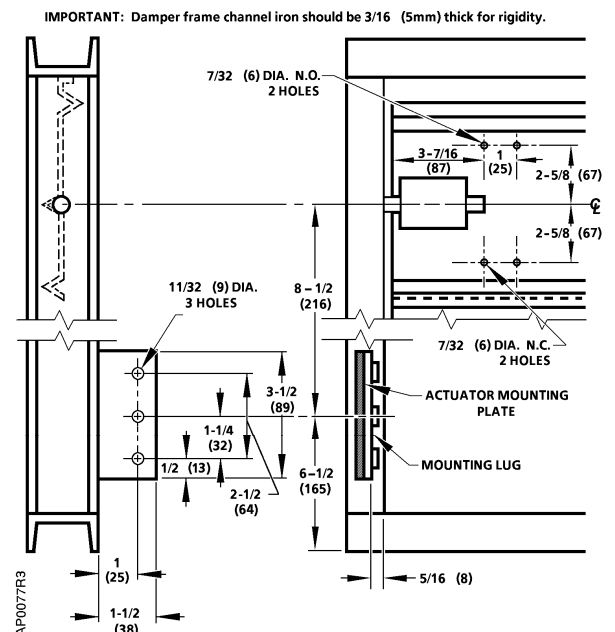
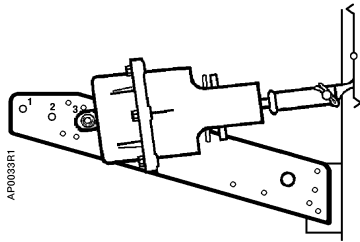
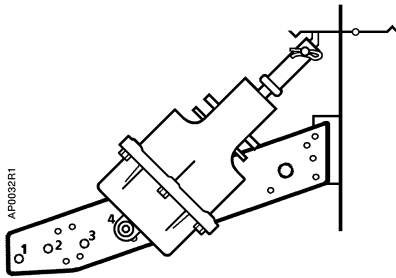


Figure 6. Frame Mounting-Type B Dimensions. Dimensions in Inches (Millimeters).

5. Attach mounting plate to mounting lug.
  - a. Normally closed damper: attach plate to lug (Figure 7). Place pivot post in Hole 3.
  - b. Normally open damper: attach plate to lug (Figure 8). Place pivot post in Hole 4.



**Figure 7. No. 6 Actuator Frame Mounting, Normally Closed Damper.**



**Figure 8. No. 6 Actuator Frame Mounting, Normally Open Damper.**

6. Fasten clevis to rocker. Discard crank and other unused parts.
7. The actuator mounting plate has a tendency to pivot at the point where the lug is welded to the damper frame when the actuator strokes. It is recommended that some means be devised in the field to prevent this from happening. A threaded rod attached to the mounting plate and duct wall will normally work.

The installation is now complete.

### Extended Shaft Remote Mounting (Figure 9)

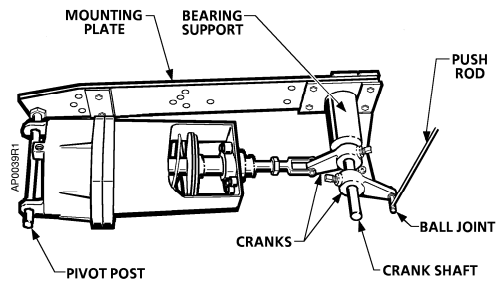
Actuator: 331-2857, 331-2858, or 331-2856

Remote Mounting Kit: 331-618

1. Attach the mounting plate assembly to the mounting surface.
2. Attach the pivot post to the mounting plate assembly.
3. Slide the crank shaft into the bearing support.

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4. Attach the two cranks to the crank shaft.
5. Position the actuator on the mounting plate and attach the clevis to one crank on the crank shaft.
6. To the other crank, attach a ball joint and a 3/8-inch (10-millimeter) diameter push rod (not provided) cut to the proper length.
7. Attach the remaining crank to the damper shaft and use the remaining ball joint to fasten it to the push rod.



**Figure 9. Extended Shaft Remote Mounting Assembly.**

The installation is now complete.

### References

AP 331-3, Powers™ Controls No. 6 Pneumatic Damper Actuator Technical Instructions, (155-029P25)

TB 181, Maximum Thrust Ratings of Pneumatic Damper Actuators Technical Bulletin, (155-219P25)

# MS4120F; MS4620F; MS8120F; S2024-F; S20230-F Fast-Acting, Two-Position Actuators

PRODUCT DATA



## FEATURES

- 175 lb-in. (20 Nm) minimum driving torque at 350°F (176°C).
- Reversible mounting facilitates use in either clockwise (cw) or counterclockwise (ccw) spring rotation.
- Integral spring return ensures level of return torque.
- Stainless steel internal spring.
- Fifteen-second spring return timing.
- No special cycling required during long-term holding. (See Operation section.)
- No audible noise during holding.
- Patent pending design eliminates need for limit switches to reduce power consumption.
- Models available for 24, 120, and 230 Vac applications.
- Ninety-five degree angle of rotation.
- Actuator holds rated torque at reduced power level.
- Die-cast aluminum housing.
- Housing design allows flush mounting to damper.
- Self-centering shaft adapter (SCSA), patent pending.
- Designed to operate reliably in smoke control systems requiring Underwriter's Laboratories Inc. UL555S ratings up to 350°F.

## APPLICATION

The MS4120F, MS4620F, MS8120F, S2024-F, and S20230-F Fast-Acting, Two-Position Actuators are spring return direct coupled actuators (DCA) for on/off damper control. The actuator accepts an on/off signal from a single-pole, single-throw (spst) controller. Reversible mounting allows actuator to be used for either clockwise (cw) or counterclockwise (ccw) spring rotation.

Designed to operate reliably in smoke control systems requiring Underwriter's Laboratories Inc. UL555S ratings up to 350°F.

## APPLICABLE LITERATURE

— Specification Data Sheet	63-2592
— Motor/Actuator Selection Guide for Damper Applications	63-8419
— Engineering Manual of Automatic Control (also called The Gray Manual)	77-1100
— Direct Coupled Actuator Quick Selection Guide	63-8553
— Damper Torque Calculator	63-8437

## MS4120F, MS4620F, MS8120F

- High temperature Teflon® lead wires.
- Models available with integral high temperature (350°F) SPST position-indicating switches (7°, 85° stroke).

## S2024-F, S20230-F

- Double-insulation rating.
- High-temperature, halogen-free, silicone-free leadwires.
- Models available with integral high temperature (350°F) SPDT position-indicating switches (7°, 85° stroke).



# SPECIFICATIONS

**Models:** See Tables 1, 2, and 3.

**Table 1. Models.**

Model	Voltage in Vac	Internal Auxiliary Switches
MS4120F1006	120	None
MS4120F1204	120	2 SPST <sup>a</sup>
MS4620F1005	230	None
MS4620F1203	230	2 SPST <sup>a</sup>
MS8120F1002	24	None
MS8120F1200	24	2 SPST <sup>a</sup>
S2024-F (MS8120S1006)	24	None
S20230-F (MS4620S1009)	230	
S2024-F-SW2 (MS8120S1204)	24	2 SPDT <sup>a</sup>
S20230-F-SW2 (MS4620S1207)	230	

<sup>a</sup> Internal switches are designed to pass UL555S requirements (at 350°F).

**Dimensions:** See Fig. 1.

**Device Weight:**

MS4120F, MS4620F, S20230-F: 7.5 lb (3.4 kg)  
MS8120F, S2024-F: 6.25 lb (2.8 kg)

**Stroke:** 95° ± 3°, mechanically limited.

**Electrical Ratings:**

Power Input:

MS4120F: 120 Vac ±10%, 60 Hz.  
MS4620F,S; S20230-F: 230 Vac ±10%, 50/60 Hz.  
MS8120F,S; S2024-F: 24 Vac +20%, -10%, 50/60 Hz (Class 2).

Power Consumption:

MS4120F: Driving: 0.35A, 35W. Holding: 0.15A, 10W.  
MS4620F,S; S20230-F:  
Driving: 0.20A, 35W. Holding: 0.14A, 10W.  
MS8120F,S; S2024-F: Driving: 45 VA. Holding: 10 VA.

**Electrical Connections:**

Lead Wires:

MS4120F, MS4620F, MS8120F: 1m Teflon wire.  
MS4620S, MS8120S, S2024-F, S20230-F: 1m halogen-free, silicone-free wire.

Two integral 3/8 in. flexible conduit connections.

**Timing (At Rated Torque and Voltage):**

Drive Open: 15 seconds typical.  
Spring Close: 15 seconds typical.

**Auxiliary Switches:**

Dry Contact  
Ratings (maximum load): 250 Vac, 5A resistive.  
Settings (fixed): 7° nominal stroke, 85° nominal stroke.

**Torque Rating (at Rated Voltage):**

Typical Holding (minimum at 350°F): 175 lb-in. (20 Nm).  
Spring Return (minimum at 350°F): 175 lb-in. (20 Nm).  
Stall Maximum (fully open at 75°F): 425 lb-in. (48.0 Nm).  
350°F Minimum Driving: 175 lb-in. (20 Nm).

**Design Life (at Rated Voltage):** 30,000 full stroke cycles.

**Minimum Damper Shaft Length:**

1 in. (25 mm); 3-1/4 (83 mm) recommended.

**Cycling Requirements:**

Prolonged holding-period (1 year) testing of these actuators has been performed with no spring return failures. The actuator and the internal spring are designed to require no special cycling during long-term holding.

Honeywell recommends following all local, state and national codes for periodic testing of the entire smoke control system. Refer to National Fire Protection Association (NFPA) National Fire Codes®: NFPA90A, NFPA92A and NFPA92B for your application.

NFPA recommends periodic examination of each fire/smoke damper (semi-annually or annually) to ensure proper performance.

**Mounting:** Self-centering shaft adapter.

Round Damper Shafts: 0.5 to 1.06 in.

Square Damper Shafts: 1/2 to 3/4 in.

Actuator can be mounted with shaft in any position.

**IMPORTANT**

- Honeywell does not recommend using linkages with these actuators because side-loading of the output hub reduces actuator life.
- 3/4 in. or greater shaft diameter recommended.

**Noise Rating at 1m (Maximum):**

Driving or Spring Return: 70 dBA.

Holding: 20 dBA (no audible noise).

**Vibration:**

Not suitable for high vibration applications (Example installation environment: Truck Trailers or Railroad Cars)

Acceptable Vibration Levels 0.6g at 30 to 300 Hz.

**Temperature Ratings:**

Ambient: -40°F to 130°F (-40°C to 55°C).

Shipping and Storage: -40°F to 140°F (-40°C to 60°C).

**IMPORTANT**

*The actuator is designed to meet UL555S standards at 350°F (176°C). The actuator must be tested with the damper to achieve this rating.*

**NOTE: The actuator is designed to operate for 30 minutes during a one-time excursion to 350°F (176°C).**

**Humidity Ratings:** 5% to 95% RH noncondensing.

**Environmental Protection Ratings:**

NEMA2 and IP54 when mounted on a horizontal shaft and the base of the actuator below the shaft.

**Accessories:**

205649 Mounting Bracket (not supplied with actuator).

**Approvals:** See Table 4.

**Controller Type:**

MS4120F: Line voltage (120 Vac), 2-position, spst (Series 40).

MS4620F,S; S20230-F: Line voltage (230 Vac), 2-position, spst (Series 40).

MS8120F,S; S2024-F: Low voltage (24 Vac), 2-position, spst (Series 80).

**Table 2. Actuator Selection (MS Series)**

<b>M</b>	Electrical Motor
<b>S</b>	Fail Safe Function (Spring Return)
<b>41</b>	120 Vac 2-position Control; Reversible Mount Spring Return
<b>46</b>	230 Vac 2-position Control; Reversible Mount Spring Return
<b>81</b>	24 Vac 2-position Control; Reversible Mount Spring Return
<b>20</b>	175 lb-in. (20 Nm)
<b>F</b>	Fire and Smoke (US)
<b>1</b>	No Feedback
<b>0</b>	No Auxiliary Switches
<b>2</b>	Two Auxiliary Switches
<b>XX</b>	System Controlled Numbers

**M S 41 20 F 1 2 XX**

**Table 3. Actuator Selection (S20 Series).**

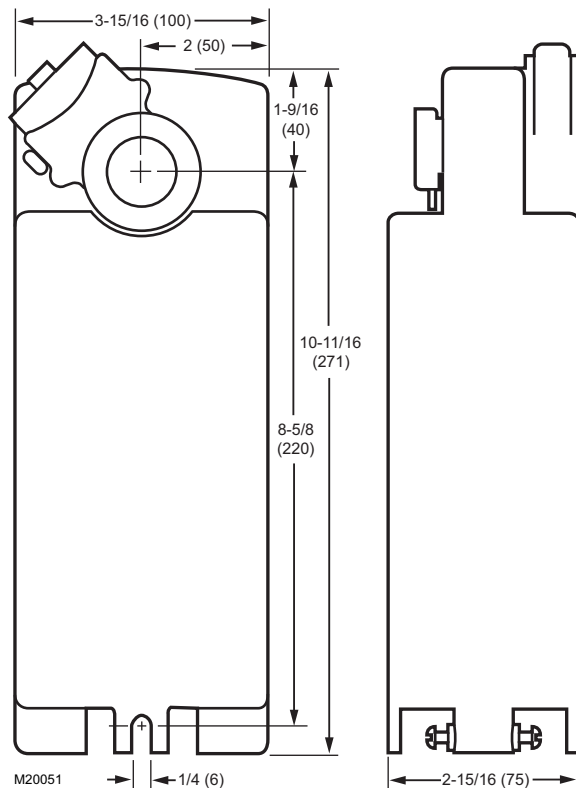
<b>S</b>	Fail Safe Function (Spring Return)
<b>20</b>	20 Nm (175 lb-in.)
<b>24</b>	24 Vac 2-position Control; Reversible Mount Spring Return
<b>230</b>	230 Vac 2-position Control; Reversible Mount Spring Return
<b>F</b>	Fire and Smoke Actuator
	No Auxiliary Switches
<b>-SW2</b>	Two Auxiliary Switches

**S 20 24 - F -SW2**

**Table 4. Approvals.**

	MS4120F	MS4620F, MS8120F	S20230-F	S2024F
UL/cUL	X	X		
UL873 Plenum Rating, File No. E4436; Guide No. XAPX. <sup>a</sup>	X	X		
CE		X	X	
C-TICK		X	X	X

<sup>a</sup> Plenum applications require that conductors be enclosed in conduit (see Wiring section for conduit details).



**Fig. 1. Dimensional drawing of actuator in in. (mm).**



## INSTALLATION

### When Installing this Product...

1. Read these instructions carefully. Failure to follow them could damage the product or cause a hazardous condition.
2. Check the ratings given in the instructions and on the product to make sure the product is suitable for your application.
3. Installer must be a trained, experienced service technician.
4. After installation is complete, check out product operation as provided in these instructions.

### WARNING

**Electrical Power Hazard.**  
Line voltage can cause death or serious injury and short equipment circuitry.  
Disconnect power supply before installation.



### CAUTION

**Electrical Shock or Equipment Damage Hazard.**  
Low voltage can shock individuals or short equipment circuitry.  
Disconnect power supply before installation.

### IMPORTANT

All wiring must agree with applicable codes, ordinances and regulations.

### Location

The actuators are designed to open a damper by driving the damper shaft in either a clockwise  or counterclockwise  direction. The actuator housing has two slots on the bottom, either of which, with a 205649 Mounting Bracket, secures it flush to a damper box (see Fig. 2).

**NOTE:** When mounted correctly, these slots allow the actuator to *float* without rotating relative to the damper shaft.

### CAUTION

**Equipment Damage Hazard.**  
Tightly securing actuator to damper housing can damage actuator.  
Mount actuator to allow it to float along its vertical axis.

### Preparation

Before mounting the actuator onto the damper shaft, determine the:

- Damper/valve opening direction for correct spring return rotation. The actuator can be mounted to provide clockwise or counterclockwise spring return.
- Damper shaft size (see Specifications section).

### Determine Appropriate Mounting Orientation

See Fig. 2 for mounting orientation.

#### NOTES:

- Actuators are shipped in the fully closed position.
- An arrow molded into the hub points to tick marks on the label to indicate the hub rotary position.
- See Fig. 3 for proper mounting to a square damper shaft.

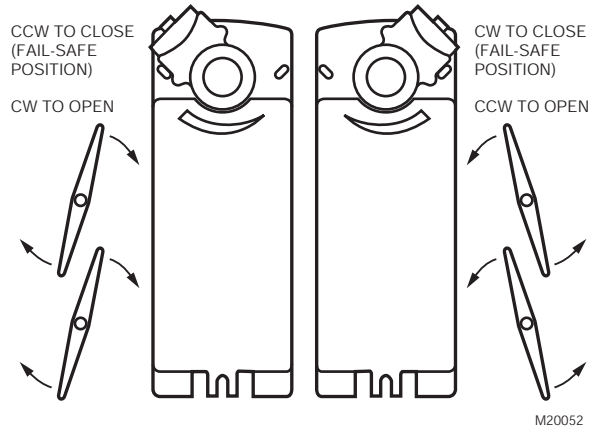


Fig. 2. Spring Return DCA mounting orientation.

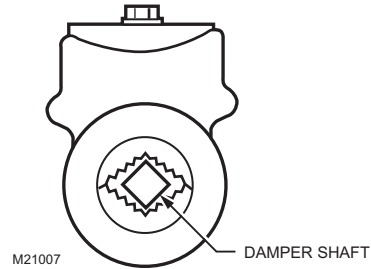


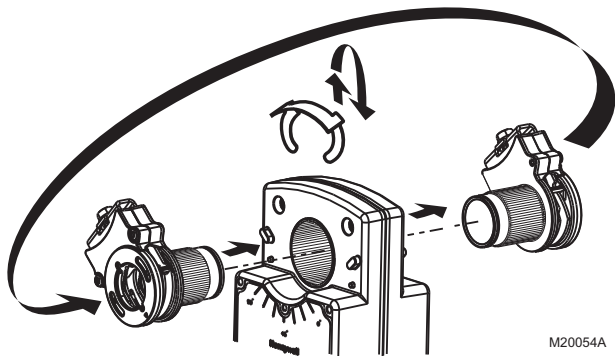
Fig. 3. Proper mounting to square damper shaft.

### Measure Damper/Valve Shaft Length

If the shaft is less than three inches in length, the shaft coupling must be located between the damper/valve and actuator housing. If the shaft length is more than three inches, the shaft coupling may be located on either side of the actuator housing.

If the coupling must be moved from one side of the actuator to the reverse, follow these instructions (see Fig. 4):

1. Remove the retainer clip from the shaft coupling and set it aside for later use.
2. Remove shaft coupling from one side of the actuator.
3. Replace the shaft coupling on the opposite side of the actuator aligning it based on the stroke labelling.
4. Replace the retainer clip on the shaft coupling using the groove of the coupling.



M20054A

Fig. 4. Mounting shaft coupling to actuator opposite side.

## Mounting



### CAUTION

**Device Malfunction Hazard.**  
**Improper shaft coupling tightening causes device malfunction.**  
 Tighten shaft coupling with proper torque to prevent damper shaft slippage.



### CAUTION

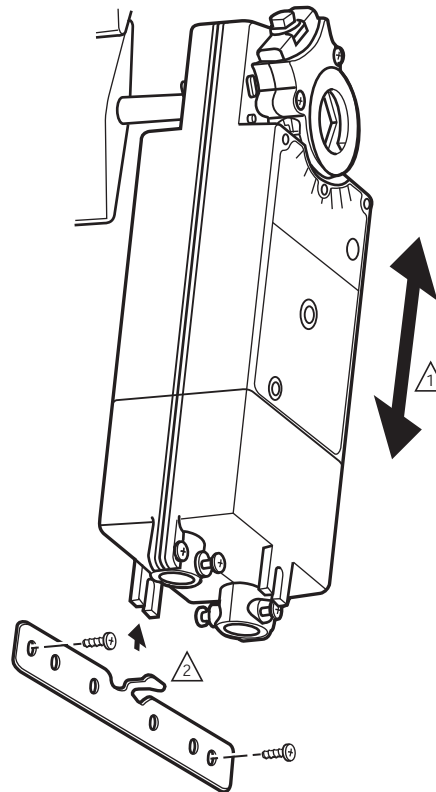
**Actuator Damage Hazard.**  
**Using actuator as shaft bearing causes device damage.**  
 Use actuator only to supply rotational torque. Avoid any side loads to actuator output coupling bearings.

To mount actuator, proceed as follows:

1. Place actuator over damper shaft; and hold mounting bracket in place. See Fig. 5.
2. Mark screw holes on damper housing.
3. Remove actuator and mounting bracket.
4. Drill or center-punch holes for mounting screws (or use no.10 self-tapping sheet metal screws).

**NOTE:** If necessary, use a field-fabricated steel base plate secured with sheet metal screws.

5. Turn damper blades to desired normal (closed) position.
6. Place actuator and mounting bracket back into position and secure bracket to damper box with sheet metal screws.
7. Using 10 mm wrench, tighten shaft coupling securely onto damper shaft using minimum 120 lb-in., maximum 180 lb-in. torque.



1 ENSURE THAT MOUNTING ASSEMBLY PREVENTS ACTUATOR ROTATION AND ALLOWS ACTUATOR TO FLOAT ALONG INDICATED AXIS. WHEN TOO TIGHT, THE RESULTING BINDING CAN DAMAGE THE ACTUATOR OR REDUCE TORQUE OUTPUT.

2 ACCESSORY MOUNTING BRACKET IS NOT SUPPLIED WITH THE ACTUATOR.

M20055

Fig. 5. Mounting actuator to damper housing.

## Manual Positioning

The actuator can be operated with no power present. Use this feature during installation or to move and lock the damper or valve shaft position when there is no power.

To operate the manual positioning:

1. If the power is on, turn it off.
2. Insert supplied hex wrench (key) as shown in Fig. 6.
3. Rotate key in the direction indicated on the cover.
4. Once the desired position is reached, hold the key to prevent the spring return from moving the actuator.

**NOTE:** No detente for fire and smoke actuators. If key is released, actuator will return to spring closed position.

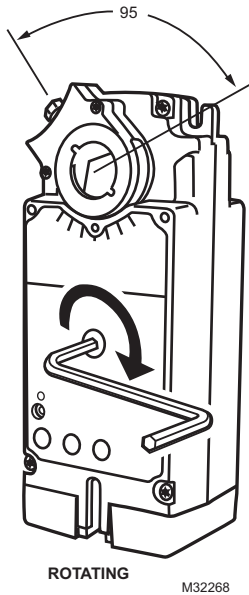


Fig. 6. Manual positioning.

## WIRING

See Fig. 7 through 11 for typical wiring diagrams.

### ⚠ WARNING

**Electrical Power Hazard.**  
Line voltage can cause death or serious injury and short equipment circuitry.  
Disconnect power supply before installation.

### ⚠ CAUTION

**Electrical Shock or Equipment Damage Hazard.**  
Disconnect all power supplies before installation.  
Motors with auxiliary switches can have more than one disconnect.

### IMPORTANT

1. All wiring must comply with local electrical codes, ordinances and regulations.
2. Voltage and frequency of transformer used with MS8120F,S and S2024-F must correspond with the characteristics of power supply and actuator.

**NOTE:** The conduit fittings are designed for use with 3/8 in. reduced-wall steel or aluminum flexible conduit.

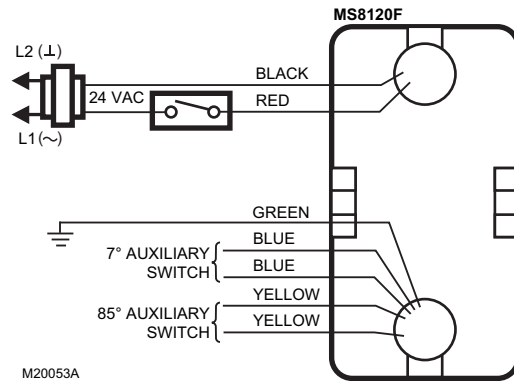


Fig. 7. Typical 24 Vac wiring (MS Series).

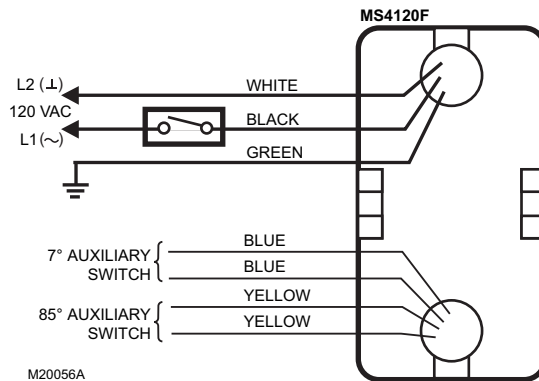


Fig. 8. Typical 120 Vac wiring (MS Series).

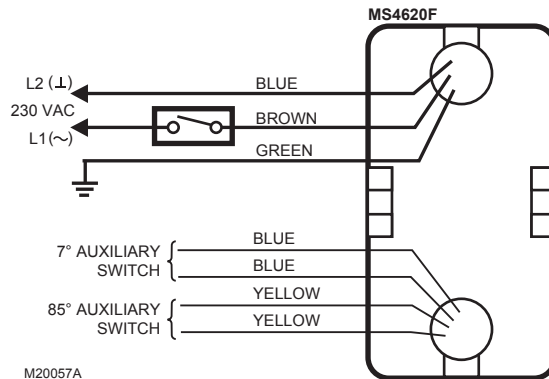
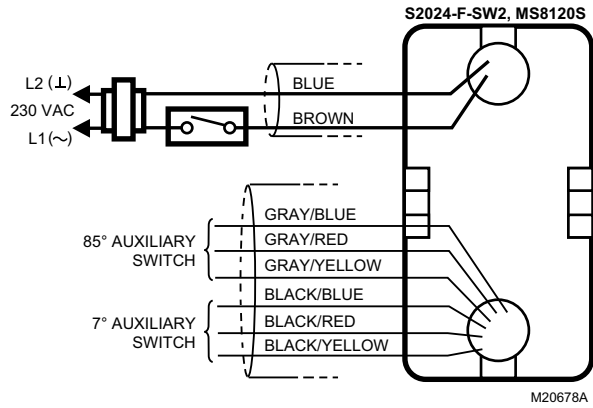
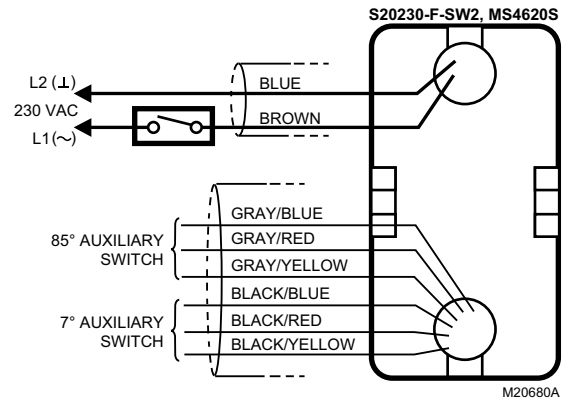


Fig. 9. Typical 230 Vac wiring (MS Series).



**Fig. 10. Typical 24 Vac wiring (S20 Series).**



**Fig. 11. Typical 230 Vac wiring (S20 Series).**

## OPERATION

The actuators are designed for use in Smoke Control Systems. If power fails, the actuator spring returns to the 0° position. The actuator mounts flush with the damper box. The actuator drives from 0° to 95° and spring returns back to 0°.

The actuators are operated by an spst two-position controller. When using an spst two-position controller, the actuator drives to the damper fully open position when controller contact makes and spring returns to the damper fully closed position when controller contact breaks. The actuator drops to holding power level on detection of stall, independent of hub position.

### Cycling

The actuator and the internal spring are designed so that no special cycling during long-term holding is required. Honeywell recommends following all local, state, and national codes for periodic testing of the entire smoke control system. Refer to National Fire Protection Association (NFPA) National Fire Codes®: NFPA90A, NFPA92A, and NFPA92B for your application.

### Auxiliary Switches

Some models include auxiliary switches (see Table 1).

#### SPST Switches (Table 5)

See Fig. 7 through 9 for SPST auxiliary switch wiring.

Table 5. SPST Auxiliary Switch Operation.

Switch	Wire Color	Makes	Breaks
		(degrees from fully closed position)	
7°	blue	less than 7	greater than 7
85°	yellow	greater than 85	less than 85

**NOTE:** Both sets of contacts are open when the actuator is between 7° and 85°.

#### SPDT Switches (Fig. 12)

See Fig. 10 through 12 for SPDT auxiliary switch wiring.

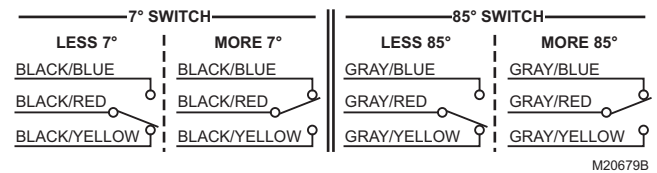


Fig. 12. SPDT auxiliary switch operation.

## CHECKOUT

### MS4120F (120 Vac model)

1. Check damper position.
2. Connect 120 Vac to the black and white leadwires to drive the damper to the open position. The actuator should drive the damper.
3. If the actuator does not run, remove power for at least two seconds.
4. If the actuator spring returns, allow it to close entirely, then return to step 2.
5. If the actuator does not spring return, verify that the actuator is properly installed. See Installation section.
6. If the actuator is correctly installed but neither runs nor spring returns, replace the actuator.

### MS4620F; S20230-F (230 Vac models)

1. Check damper position.
2. Connect 230 Vac to the blue and brown leadwires to drive the damper to the open position. The actuator should drive the damper.
3. If the actuator does not run, remove power for at least two seconds.
4. If the actuator spring returns, allow it to close entirely, then return to step 2.
5. If the actuator does not spring return, verify that the actuator is properly installed. See Installation section.
6. If the actuator is correctly installed but neither runs nor spring returns, replace the actuator.

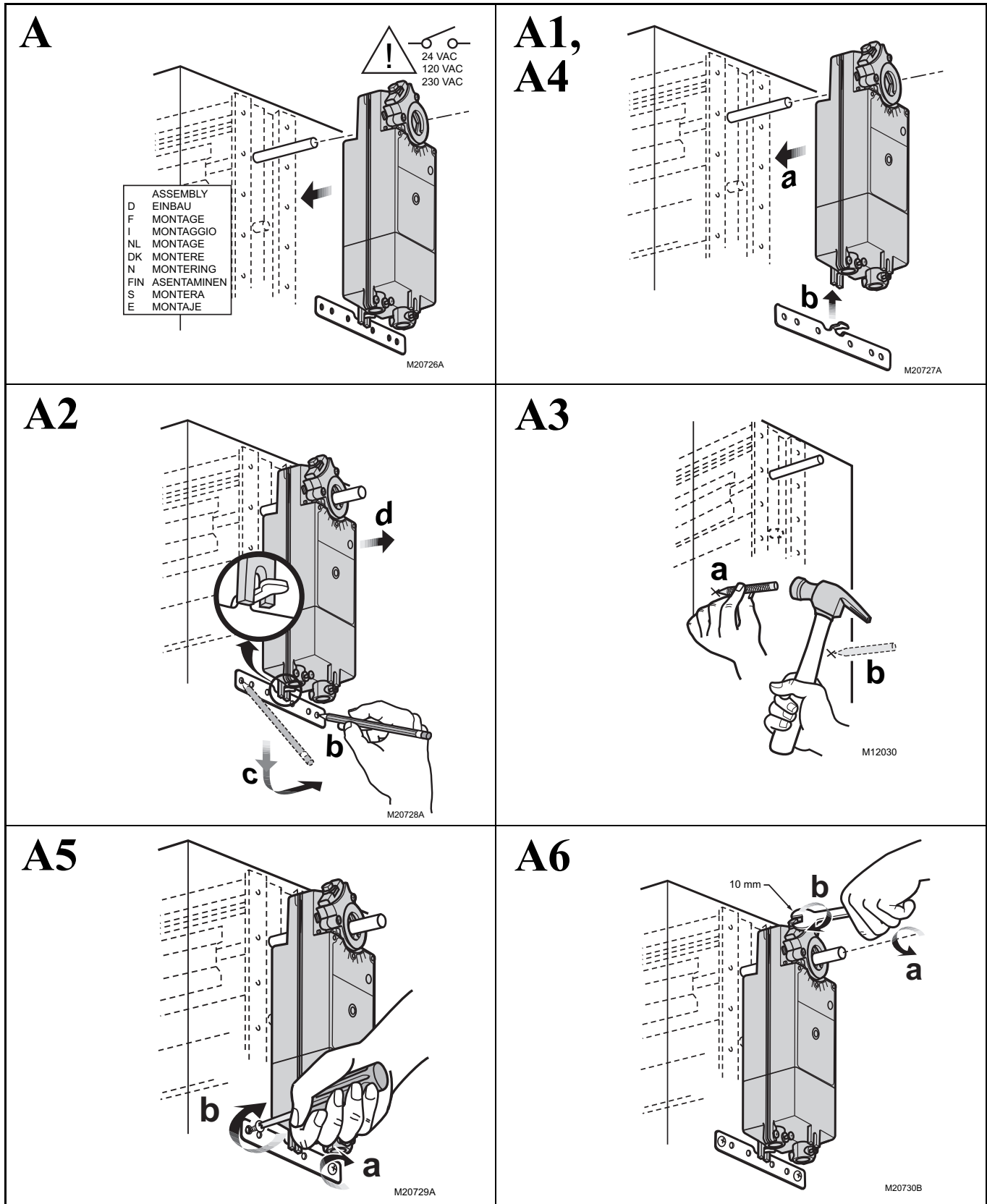
### MS8120F; S2024-F (24 Vac models)

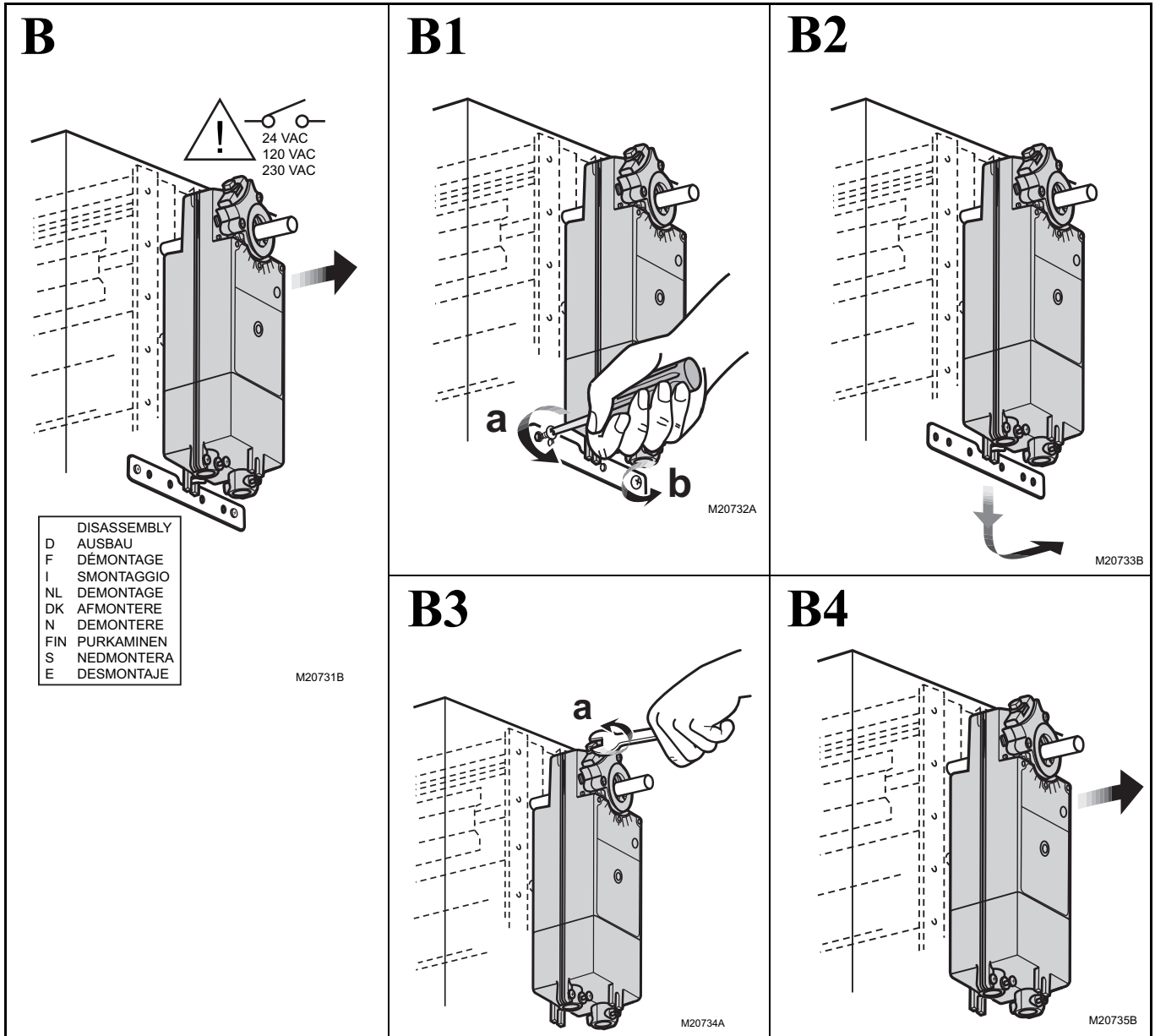
1. Check damper position.
2. Connect 24 Vac to the red and black leadwires to drive the damper to the open position. The actuator should drive the damper.
3. If the actuator does not run, remove power for at least two seconds.
4. If the actuator spring returns, allow it to close entirely, then return to step 2.
5. If the actuator does not spring return, verify that the actuator is properly installed. See Installation section.
6. If the actuator is correctly installed but neither runs nor spring returns, replace the actuator.

D Montageanweisung  
 F Instructions d'Installation  
 I Istruzioni per l'Installazione

NL Installatievoorschrift  
 DK Installasjonsinstruks  
 N Installationsinstruktioner

SF Asennusohje  
 S Installations Instruktioner  
 E Instrucciones de montaje









MS4120F; MS4620F; MS8120F; S2024-F; S20230-F FAST-ACTING, TWO-POSITION ACTUATORS

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*National Fire Codes® is a registered trademark of the National Fire Protection Association (NFPA).*

## **Automation and Control Solutions**

Honeywell International Inc.  
1985 Douglas Drive North  
Golden Valley, MN 55422  
[customer.honeywell.com](http://customer.honeywell.com)

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# **Honeywell**

## MS4104, MS4109, MS4604, MS4609, MS8104, MS8109 Fast-Acting, Two-Position Actuators FOR FIRE/SMOKE CONTROL APPLICATIONS

### PRODUCT DATA



### FEATURES

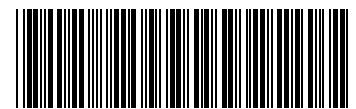
- 30 lb-in. (3.4 N•m) or 80 lb-in. (9 N•m) minimum driving torque at 350°F (176°C).
- Reversible mounting facilitates use in either clockwise (cw) or counterclockwise (ccw) spring rotation.
- Integral spring return ensures level of return torque.
- Fifteen-second spring return timing.
- No special cycling required during long-term holding. (See Operation section.)
- No audible noise during holding.
- Patent pending design eliminates need for limit switches to reduce power consumption.
- Models available for 24, 120, and 230 Vac.
- Ninety-five degree angle of rotation.
- Actuator holds rated torque at reduced power level.
- Die-cast aluminum housing.
- Housing design allows flush mounting to damper.
- Designed to operate reliably in smoke control systems requiring Underwriter's Laboratories Inc. UL555S ratings up to 350°F.
- Models available with SPST position-indicating switches (7°, 85° stroke).

### APPLICATION

The MS4104, MS4109, MS4604, MS4609, MS8104 and MS8109 Fast-Acting, Two-Position Actuators are spring return direct coupled actuators (DCA) for Fire and Smoke dampers (on/off control). The actuator accepts an on/off signal from a single-pole, single-throw (SPST) controller. Reversible mounting allows actuator to be used for either clockwise (cw) or counterclockwise (ccw) spring rotation.

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63-2740-05

# SPECIFICATIONS

**Models:** See Table 1.

**Table 1. Models.**

Model	Voltage (Vac)	Internal Auxiliary Switches
MS4104F1010	120	None
MS4104F1210	120	2 SPST <sup>a</sup>
MS4109F1010	120	None
MS4109F1210	120	2 SPST <sup>a</sup>
MS4604F1010	230	None
MS4604F1210	230	2 SPST <sup>a</sup>
MS4609F1010	230	None
MS4609F1210	230	2 SPST <sup>a</sup>
MS8104F1010	24	None
MS8104F1210	24	2 SPST <sup>a</sup>
MS8109F1010	24	None
MS8109F1210	24	2 SPST <sup>a</sup>

<sup>a</sup> Internal switches are designed to pass UL555S requirements (at 350°F for 30 minutes) and are intended for use as position indication.

**Dimensions:** See Fig. 1.

**Minimum Damper Shaft Length:** 2 in. (51 mm).

**Device Weight:** 5 lb (2.3 kg).

**Stroke:** 95° ± 3°, mechanically limited.

**Electrical Ratings:** See Table 2.

**Electrical Connections:**

Power Lead Wires:

MS410xF and MS460xF: 32 inches (0.8m), 18 AWG

MS810xF: 39 inches (1m), 18 AWG

**Switch Lead Wires:** 18 inches, 18 AWG, 2 color coded leads

**Mounting:** Round 1/2 inch shaft adapter with 1/4 inch set screws.

Threads: ¼-20 UNC-2A

Material: Alloy Steel hardened to HRC 45-53

Thread Lock: Nylon Patch

**IMPORTANT**

*Honeywell does not recommend using linkages with these actuators because side-loading of the output hub reduces actuator life.*

**Temperature Ratings:**

Ambient: 0°F to 130°F (-18°C to 55°C).

Shipping and Storage: -40°F to 140°F (-40°C to 60°C).

**IMPORTANT**

*The actuator is designed to meet UL555S standards at 350°F (176°C). The actuator must be tested with the damper to achieve this rating.*

**Humidity Ratings:** 5% to 95% RH noncondensing.

**Noise Rating (Maximum):**

Driving Open: 75 dBA at 1m.

Holding: 20 dBA at 1m (no audible noise).

**Controller Type:**

MS4104, MS4109: Line voltage (120 Vac), two-position, SPST (Series 40).

MS4604, MS4609: Line voltage (230 Vac), two-position, SPST (Series 40).

MS8104, MS8109: Low voltage (24 Vac), two-position, SPST (Series 80).

**Table 2. MS4104, MS4109, MS4604, MS4609, MS8104 and MS8109 DCA Models.**

Model	Power Consumption		Torque in lb-in. (N•m)	Voltage Input in Vac
	Running	Holding		
MS4104F	0.18A, 18W	0.11A, 9W	30 (3.4)	120 ±10%, 50/60 Hz
MS4109F	0.25A, 23W	0.13A, 7W	80 (9)	
MS4604F	0.13A, 18W	0.10A, 11W	30 (3.4)	230 ±10%, 50/60 Hz
MS4609F	0.13A, 23W	0.09A, 7W	80 (9)	
MS8104F	16 VA	8 VA	30 (3.4)	24Vac/dc +20%, -10%, 50/60 Hz
MS8109F	23 VA	7 VA	80 (9)	

# ORDERING INFORMATION

When purchasing replacement and modernization products from your TRADELINE® wholesaler or distributor, refer to the TRADELINE® Catalog or price sheets for complete ordering number. If you have additional questions, need further information, or would like to comment on our products or services, please write or phone:

1. Your local Honeywell Environmental and Combustion Controls Sales Office (check white pages of your phone directory).
2. Honeywell Customer Care  
1985 Douglas Drive North  
Minneapolis, Minnesota 55422-4386
3. <http://customer.honeywell.com> or <http://customer.honeywell.ca>

International Sales and Service Offices in all principal cities of the world. Manufacturing in Belgium, Canada, China, Czech Republic, Germany, Hungary, Italy, Mexico, Netherlands, United Kingdom, and United States.

**Torque Rating (at rated voltage):**

**Spring Return:**

MS4104F, MS4604F, MS8104F: 30 lb-in. (3.4 N•m).  
 MS4109F, MS4609F, MS8109: 80 lb-in. (9 N•m).

**Stall Maximum:**

MS4104F, MS4604F, MS8104F: 150 lb-in. (17 N•m).  
 MS4109F, MS4609F, MS8109: 240 lb-in. (27 N•m).

**350°F Driving:**

MS4104F, MS4604F, MS8104F: 30 lb-in. (3.4 N•m).  
 MS4109F, MS4609F, MS8109: 80 lb-in. (9 N•m).

**Timing (At Rated Torque and Voltage):**

Drive Open: 15 seconds typical.  
 Spring Close: 15 seconds typical.

**Cycling Requirements:**

The actuator and the internal spring are designed to require no special cycling during long-term holding.

Honeywell recommends following all local, state and national codes for periodic testing of the entire smoke control system. Refer to National Fire Protection Association (NFPA) National Fire Codes®: NFPA90A, NFPA92A and NFPA92B for your application.

NFPA recommends periodic examination of each fire/smoke damper (semi-annually or annually) to ensure proper performance.

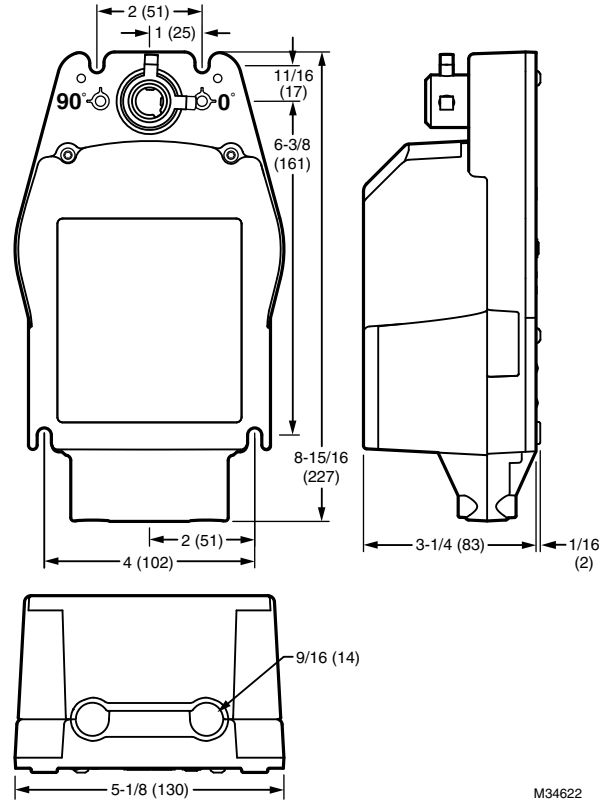
**Design Life (at Rated Voltage):** 30,000 full stroke cycles.

**Approvals:** See Table 3.

**Environmental Protection Ratings:** See Table 4.

**Accessories:**

205649 Mounting Bracket (not supplied with actuator).



**Fig. 1. MS4104, MS4109, MS4604, MS4609, MS8104 and MS8109 dimensional drawing in in. (mm).**

**Table 3. Approvals.**

	MS4104F, MS4109F	MS4604F, MS4609F	MS8104F, MS8109F
UL/cUL	X	X	X
UL60730	X	X	X
CE	X	X	X
C-Tick	X	X	X

**Table 4. Environmental Ratings.**

All Devices	MS4104, MS4109, MS4604, MS4609, MS8104 and MS8109
NEMA1	IP40

# INSTALLATION

## When Installing this Product...

1. Read these instructions carefully. Failure to follow them could damage the product or cause a hazardous condition.
2. Check the ratings given in the instructions and on the product to make sure the product is suitable for your application.
3. Installer must be a trained, experienced service technician.
4. After installation is complete, check out product operation as provided in these instructions.

**IMPORTANT**

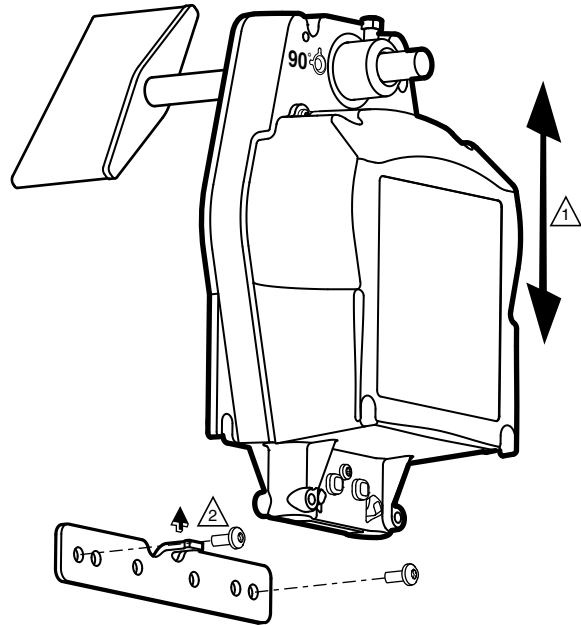
*All wiring must agree with applicable codes, ordinances and regulations.*

### **! WARNING**

**Electrical Power Hazard.**  
**Line voltage can cause death or serious injury and short equipment circuitry.**  
 Disconnect power supply before installation.

### **! CAUTION**

**Electrical Shock or Equipment Damage Hazard.**  
**Low voltage can shock individuals or short equipment circuitry.**  
 Disconnect power supply before installation.





**! ENSURE THAT MOUNTING ASSEMBLY PREVENTS ACTUATOR ROTATION AND ALLOWS ACTUATOR TO FLOAT ALONG INDICATED AXIS. WHEN TOO TIGHT, THE RESULTING BINDING CAN DAMAGE THE ACTUATOR OR REDUCE TORQUE OUTPUT.**

**! ACCESSORY MOUNTING BRACKET IS NOT SUPPLIED WITH THE ACTUATOR.**

M34623

**Fig. 2. Mounting actuator to damper housing.**

## Location and Mounting

The actuators are designed to open a damper by driving the damper shaft in either clockwise  or counterclockwise  direction. The actuator housing has two slots on the bottom that, with a 205649 Mounting Bracket, secure it flush to a damper box (see Fig. 2). When mounted correctly, these slots allow the actuator to *float* without rotating relative to the damper shaft.

### **! CAUTION**

**Equipment Damage Hazard.**  
**Tightly securing actuator to damper housing can damage actuator.**  
 Mount actuator to allow it to float along its vertical axis.

## Preparation

Before mounting the actuator onto the damper shaft, determine the:

- Damper/valve opening direction for correct spring return rotation. The actuator can be mounted to provide clockwise or counterclockwise spring return.
- Damper shaft size (see Specifications section).

## Installation



### CAUTION

#### Device Malfunction Hazard.

**Improper set screw tightening causes device malfunction.**

Ensure damper blade is in the correct position and tighten set screws with proper torque to prevent damper shaft slippage.



### CAUTION

#### Actuator Damage Hazard.

**Using actuator as shaft bearing causes device damage.**

Use actuator only to supply rotational torque. Avoid any side loads to actuator output coupling bearings.

To install actuator, proceed as follows:

1. Place actuator over damper shaft; and hold mounting bracket in place. See Fig. 2.
2. Mark screw holes on damper housing.
3. Remove actuator and mounting bracket.
4. Drill or center-punch holes for mounting screws (or use no.10 self-tapping sheet metal screws).
5. Turn damper blades to desired normal (closed) position.
6. Place actuator and mounting bracket back into position and secure bracket to damper box with sheet metal screws.
7. Tighten set screws securely into damper shaft using minimum 100 lb-in., maximum 130 lb-in. torque. Use 1/4 in. wrench (see Specifications for details) to tighten set screws.

## Wiring

See Fig. 3 through 5 for typical wiring diagrams.



### WARNING

#### Electrical Power Hazard.

**Line voltage can cause death or serious injury and short equipment circuitry.**

Disconnect power supply before installation.



### CAUTION

**Electrical Shock or Equipment Damage Hazard. Low voltage can shock individuals or short equipment circuitry.**

Disconnect power supply before installation.

### IMPORTANT

1. All wiring must comply with local electrical codes, ordinances and regulations.
2. Voltage and frequency of transformer must correspond with the characteristics of power supply and actuator.
3. Use wires rated for at least 75°C (167°F).
4. The conduit fittings are designed for use with 3/8 in. reduced-wall steel or aluminum flexible conduit.

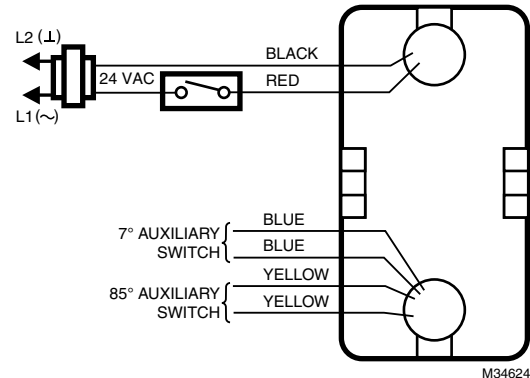


Fig. 3. Typical 24 Vac wiring.

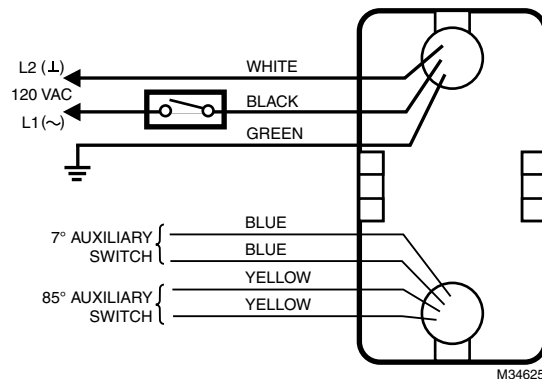


Fig. 4. Typical 120 Vac wiring.

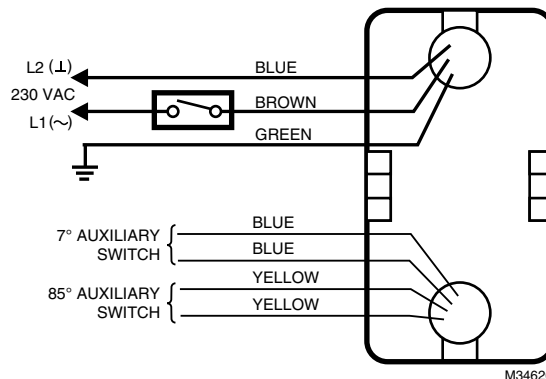


Fig. 5. Typical 230 Vac wiring.

## OPERATION

The MS4104, MS4109, MS4604, MS4609, MS8104 and MS8109 DCA are designed for use in Smoke Control Systems. If power fails, the actuator spring returns to the 0° position. The actuator mounts flush with the damper box. The actuator drives from 0° to 95° and spring returns back to 0°.

The actuators are operated by an spst two-position controller. When using an spst two-position controller, the actuator drives to the damper fully open position when controller contact makes and spring returns to the damper fully closed position when controller contact breaks. The actuator drops to holding power level on detection of stall, independent of hub position.

### Cycling

The actuator and the internal spring are designed so that no special cycling during long-term holding is required. Honeywell recommends following all local, state, and national codes for periodic testing of the entire smoke control system. Refer to National Fire Protection Association (NFPA) National Fire Codes®: NFPA90A, NFPA92A, and NFPA92B for your application.

**NOTE:** The actuator is designed to operate for 30 minutes during a one-time excursion to 350°F (176°C).

## CHECKOUT

### MS4104F, MS4109F (120 Vac model)

1. Check damper position.
2. Connect 120 Vac to the black and white leadwires to drive the damper to the open position. The actuator should drive the damper.
3. If the actuator does not spring return, verify that the actuator is properly installed. See Installation section.
4. If the actuator is correctly installed but neither runs nor spring returns, replace the actuator.

### MS4604F, MS4609F (230 Vac model)

1. Check damper position.
2. Connect 230 Vac to the blue and brown leadwires to drive the damper to the open position. The actuator should drive the damper.
3. If the actuator does not spring return, verify that the actuator is properly installed. See Installation section.
4. If the actuator is correctly installed but neither runs nor spring returns, replace the actuator.

### MS8104F, MS8109F (24 Vac model)

1. Check damper position.
2. Connect 24 Vac to the red and black leadwires to drive the damper to the open position. The actuator should drive the damper.
3. If the actuator does not spring return, verify that the actuator is properly installed. See Installation section.
4. If the actuator is correctly installed but neither runs nor spring returns, replace the actuator.

*National Fire Codes® is a registered trademark of the National Fire Protection Association (NFPA).*





**Automation and Control Solutions**

Honeywell International Inc.  
1985 Douglas Drive North  
Golden Valley, MN 55422  
[customer.honeywell.com](http://customer.honeywell.com)

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**Honeywell**



**DUAL TEMPERATURE OVERRIDE SENSOR**  
**REOPENABLE CONTROL SYSTEM WITH HIGH LIMIT**  
**FOR COMBINATION FIRE / SMOKE DAMPERS**  
**MODEL: DTO FIRE SENSOR**

The DTO Dual Temperature Override Sensor is a factory installed option on Nailor combination fire/smoke dampers, incorporating two electric heat sensors (with external manual reset buttons). A primary heat sensor (manual reset) automatically closes the damper upon sensing an elevated temperature of 165°F (74°C) at the damper. The sensor interrupts power to the actuator, and the actuator's spring return mechanism causes the damper to close. The damper may be closed at anytime by placing a control switch (by others) in the closed position.

The primary heat sensor and the smoke detector (if used) can be bypassed by an external electrical signal from a remote control station, allowing the damper to reopen as may be required in the operation of a smoke control system. The Fire Fighter's Smoke-Control Station must include a three position (double throw, center off) master switch for correct operation.

The damper remains operational until the the temperature at the damper reaches that of the high limit secondary heat sensor. This is the UL listed elevated/degradation temperature rating (operational limit) of the damper/actuator assembly. The standard high limit temperature is 250°F (121°C). A 350°F (177°C) elevated temperature classification is available as an option. When the temperature of the high limit heat sensor is exceeded, the damper closes and locks and remains closed thereafter, in conformance with UL 555 and NFPA 90A. The secondary sensor can be manually reset, using the external button, at the damper after temperatures have cooled down.

The DTO can be ordered with electric (120 or 24 Vac) or pneumatic actuators. Pneumatic actuators are supplied with a factory mounted EP (electric/pneumatic) switch.

The DTO Fire Sensor also incorporates a position indicator package. Two auxiliary switches indicate the open and closed damper position at a remote control station.

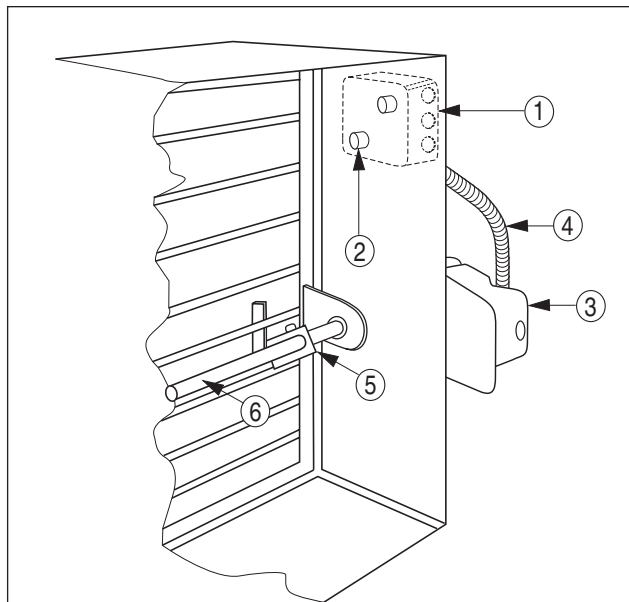
For installation and operation instructions, see dwg. IOM-DTO.

**NOTE:**

Nailor recommends the use of a single ERL Electric Resettable Link at the elevated/degradation temperature of the damper/actuator assembly on all combination fire/smoke dampers. 250°F Standard (350°F optional). Together with a position indicator package (MLS-300) where remote damper position status is required.

The re-openable system only provides a narrow temperature window of operation, increased cost and complexity of operation, since UL555 introduced the high limit closure requirement in 1995 in full compliance with the intent of NFPA 90A.

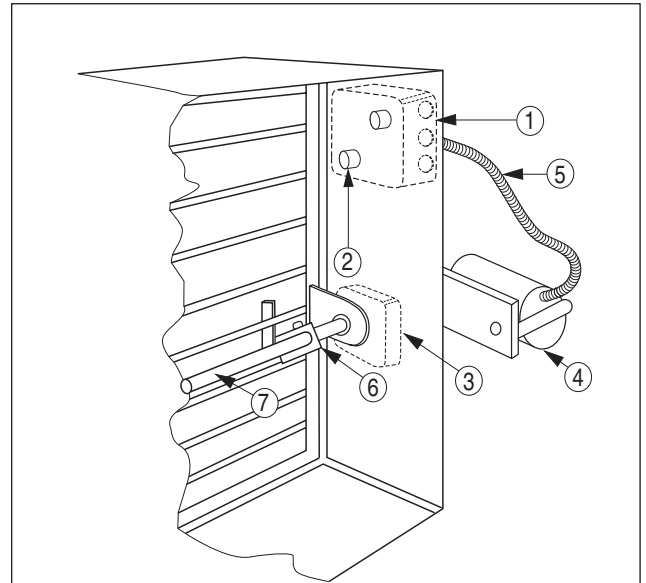
Previous building codes used to require 165°F (74°C) for all fire dampers. This is no longer the case for Smoke Management Systems.



**With UL Listed Electric Actuator**  
**Description:**

1. Electrical Junction Box with 165°F (74°C) Primary Heat Sensor
2. High Limit Secondary Heat Sensor 250°F or 350°F (121°C or 177°C)
3. Electric Actuator with Auxiliary Position Indicator Switches
4. Flexible Conduit
5. Over-Center Knee Lock
6. Jackshaft

<b>SCHEDULE TYPE:</b>	Page 1 of 2			
<b>PROJECT:</b>	Dimensions are in inches (mm)			
<b>ENGINEER:</b>	<b>DATE</b>	<b>B SERIES</b>	<b>SUPERSEDES</b>	<b>DRAWING NO.</b>
<b>CONTRACTOR:</b>	9 - 8 - 20	FD-ACC	MLS-400/7-20-19	DTO



**With UL Listed Pneumatic Actuator**  
**Description:**

1. Electrical Junction Box with 165°F (74°C) Primary Heat Sensor and EP Switch
2. High Limit Secondary Heat Sensor 250°F or 350°F (121°C or 177°C)
3. Position Indicator Package
4. Pneumatic Actuator
5. Silicone Tubing
6. Over-Center Knee Lock
7. Jackshaft

<b>SCHEDULE TYPE:</b>
<b>PROJECT:</b>
<b>ENGINEER:</b>
<b>CONTRACTOR:</b>

Page 2 of 2  
Dimensions are in inches (mm)

DATE	B SERIES	SUPERSEDES	DRAWING NO.
9 - 8 - 20	FD-ACC	MLS-400/7-20-19	DTO

# FSAF120A

## On/Off, Spring Return Fail-Safe, 120 VAC



Technical Data	
Power Supply	120 VAC, ±10%, 50/60 Hz
Power consumption in operation	30 VA
Power consumption in rest position	7.5 W, 12 VA (50 Hz 20 VA), End stop 55 VA, 0.5 A slow blow fuse *
Shaft Diameter	1/2" to 1.05" round, centers on 3/4" with insert, 1.05" without insert
Electrical Connection	3 ft [1 m], 18 GA appliance cable with 1/2" conduit connector
Overload Protection	electronic throughout 0° to 95° rotation
Electrical Protection	grounded enclosure, 120V
Angle of rotation	95°
Torque motor	180 in-lb [20 Nm]
direction of rotation motor	reversible with CW/CCW mounting
direction of rotation spring-return	reversible with CW/CCW mounting
Position indication	visual indicator, 0° to 95° (0° is full spring return position)
Running time motor	<25 sec
Running time emergency control position	<15 sec
Ambient humidity	5 to 95% RH non-condensing
Ambient temperature	32...122°F [0...50°C]
Non-operating temperature	-40...176°F [-40...80°C]
Degree of Protection	IP40, NEMA 1
Housing material	zinc coated steel
Gears	steel, permanently lubricated
Agency Listing	cULus listed to UL60730-1A:02; UL 60730-2-14:02 and CAN/CSA-E60730-1:02; Listed to UL 2043 - suitable for use in air plenums per Section 300.22(c) of the NEC and Section 602.2 of the IMC
Noise level, motor	inaudible holding, running <40 dB (A) spring <62 dB (A)
Noise Level (Fail-Safe)	inaudible holding, spring 73 dB (A)
Maintenance	maintenance free
Quality Standard	ISO 9001, RoHS (EU-Directive 2011/65/EU)
Weight	6.84 lb [3.0 kg]

† UL File XAPX.E108966

**Fire & Smoke, 180 in-lb at 350°F for 30 min., 25 sec. drive, 15 sec. spring**

### Application

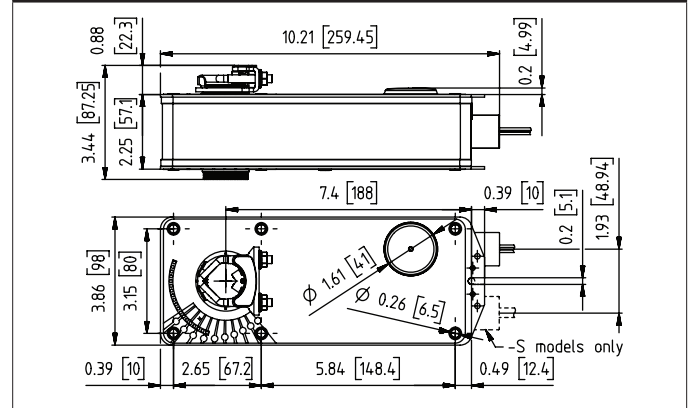
The FSAF\_A actuators provide true spring return operation for reliable fail-safe application and positive close-off on UL555S dampers. The spring return system provides constant torque to the damper with and without power applied to the actuator. The FSAF\_A series provides 95° of rotation and is provided with a graduated position indicator showing 0 to 95°.

### Operation

The FSAF\_A series actuators are mounted to the damper axle shaft or jackshaft (1/2" to 1.05") via a cold-weld clamp. Teeth in the clamp and V-bolt dig into the metal of both solid and hollow shafts maintaining a perfect connection. The specially designed clamp will not crush hollow shafts. The bottom end of the actuator is held by an anti-rotation strap or by a stud provided by the damper manufacturer. The actuator is mounted in its fail safe position with the damper blade(s) closed. Upon applying power, the actuator drives the damper to the open position. The internal spring is tensioned at the same time. If the power supply is interrupted, the spring moves the damper back to its fail-safe position.

Note on linkage kits. The correct leg kit for the FSAF\_A series is the older ZG-AF US as the actuator has a classic AF frame. However, the spline is the new generation type and the crank arm required is the KH-AFB.

### Dimensions (Inches[mm])



### Safety Notes

\* Neither UL nor Belimo require local over-current protection. The FSAF\_A actuators draw higher peak current when driving against any type of stop. After 10 seconds current drops to the lower holding level. If used, this requires the value of a local fuse or breaker to be increased to avoid nuisance opening or tripping. A 2 A slow blow should be used for 24 VAC. A 0.5 A slow blow should be used for 120 VAC. A 0.25 A slow blow should be used for 230 VAC and a 0.3 A slow blow for 208 VAC.

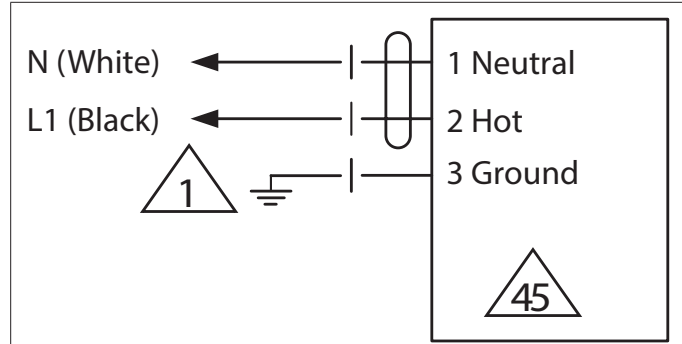
Accessories	
---AF-P	Anti-rotation bracket AF/NF.
---SH8	Push rod for KG6 & KG8 ball joints (36" L, 5/16" diameter).
---TOOL-06	8 mm and 10 mm wrench.
---ZG-100	Univ. right angle bracket 17"x11-1/8"x6" (HxWxbase).
---ZG-101	Univ. right angle bracket (13" H x 11" W x 7-7/16" base).
---ZG-102	Dual actuator mounting bracket.
---ZG-AF US	Classic AF/NF crankarm adaptor kit.
---ZG-AFB118	AFB(X)/NFB(X) crankarm adaptor kit.
---ZS-100	Weather shield - galvaneal (13" L x 8" W x 6" D).
---ZS-150	Weather shield - PC w/ foam seal (16" L x 8-3/8" W x 4" D).
---ZS-260	Explosion proof housing.
---ZS-300	NEMA 4X, 304 stainless steel enclosure.
---BAE165 US	165° F electric thermal sensor, SPST, normally closed.
---S2A-F US	Auxiliary switch, 2x SPDT, 3A (0.5A inductive) @250 VAC max.

### Typical Specification

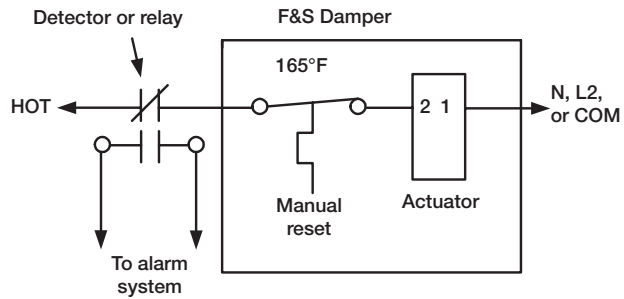
All smoke and combination fire and smoke dampers shall be provided with Belimo FSTF, FSLF, FSNF, or FSAF actuators. All substitutions must be approved before submission of bid. Damper and actuator shall have UL 555S Listing for 250°F &/or 350°F. Actuator shall have been tested to UL 2043 per requirements of IMC 602.2 and NEC 300.22 (c). Where position indication is required -S models with auxiliary switches or damper blade switches will be provided per code requirements.

### Wiring Diagrams

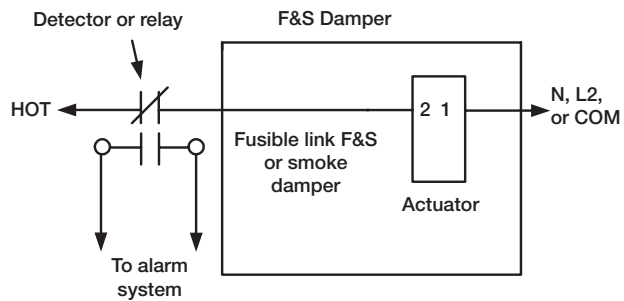
- Provide overload protection and disconnect as required.
- Actuators may be powered in parallel. Power consumption must be observed.
- Ground present on some models.



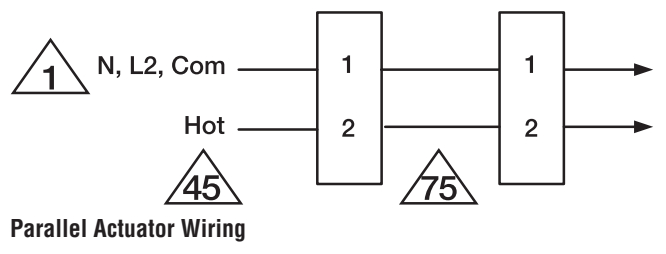
120 VAC



Typical containment damper control wiring



Typical smoke or fusible link damper wiring



Parallel Actuator Wiring

# FSAF230A

## On/Off, Spring Return Fail-Safe, 230 VAC



Technical Data	
Power Supply	230 VAC, ±10%, 50/60 Hz
Power consumption in operation	37 VA
Power consumption in rest position	10 W, 19 VA (60 Hz 12 VA), End stop 50 VA, 0.25 A slow blow fuse *
Shaft Diameter	1/2" to 1.05" round, centers on 3/4" with insert, 1.05" without insert
Electrical Connection	3 ft [1 m], 18 GA appliance cable with 1/2" conduit connector
Overload Protection	electronic throughout 0° to 95° rotation
Electrical Protection	grounded enclosure, 230V
Angle of rotation	95°
Torque motor	180 in-lb [20 Nm]
direction of rotation motor	reversible with CW/CCW mounting
direction of rotation spring-return	reversible with CW/CCW mounting
Position indication	visual indicator, 0° to 95° (0° is full spring return position)
Running time motor	<25 sec
Running time emergency control position	<15 sec
Ambient humidity	5 to 95% RH non-condensing
Ambient temperature	32...122°F [0...50°C]
Non-operating temperature	-40...176°F [-40...80°C]
Degree of Protection	IP40, NEMA 1
Housing material	zinc coated steel
Gears	steel, permanently lubricated
Agency Listing	cULus listed to UL60730-1A:02; UL 60730-2-14:02 and CAN/CSA-E60730-1:02; Listed to UL 2043 - suitable for use in air plenums per Section 300.22(c) of the NEC and Section 602.2 of the IMC
Noise level, motor	inaudible holding, running 70 dB (A)
Noise Level (Fail-Safe)	inaudible holding, spring 73 dB (A)
Maintenance	maintenance free
Quality Standard	ISO 9001, RoHS (EU-Directive 2011/65/EU)
Weight	6.84 lb [3.0 kg]

† UL File XAPX.E108966

**Fire & Smoke, 180 in-lb at 350°F for 30 min., 25 sec. drive, 15 sec. spring**

### Application

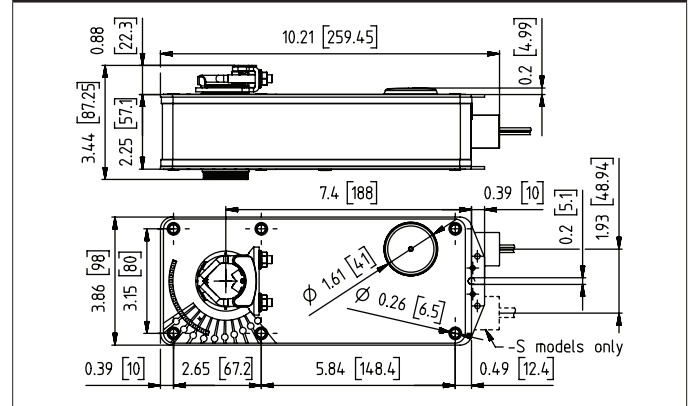
The FSAF\_A actuators provide true spring return operation for reliable fail-safe application and positive close-off on UL555S dampers. The spring return system provides constant torque to the damper with and without power applied to the actuator. The FSAF\_A series provides 95° of rotation and is provided with a graduated position indicator showing 0 to 95°.

### Operation

The FSAF\_A series actuators are mounted to the damper axle shaft or jackshaft (1/2" to 1.05") via a cold-weld clamp. Teeth in the clamp and V-bolt dig into the metal of both solid and hollow shafts maintaining a perfect connection. The specially designed clamp will not crush hollow shafts. The bottom end of the actuator is held by an anti-rotation strap or by a stud provided by the damper manufacturer. The actuator is mounted in its fail safe position with the damper blade(s) closed. Upon applying power, the actuator drives the damper to the open position. The internal spring is tensioned at the same time. If the power supply is interrupted, the spring moves the damper back to its fail-safe position.

Note on linkage kits. The correct leg kit for the FSAF\_A series is the older ZG-AF US as the actuator has a classic AF frame. However, the spline is the new generation type and the crank arm required is the KH-AFB.

### Dimensions (Inches[mm])



### Safety Notes

\* Neither UL nor Belimo require local over-current protection. The FSAF\_A actuators draw higher peak current when driving against any type of stop. After 10 seconds current drops to the lower holding level. If used, this requires the value of a local fuse or breaker to be increased to avoid nuisance opening or tripping. A 2 A slow blow should be used for 24 VAC. A 0.5 A slow blow should be used for 120 VAC. A 0.25 A slow blow should be used for 230 VAC and a 0.3 A slow blow for 208 VAC.

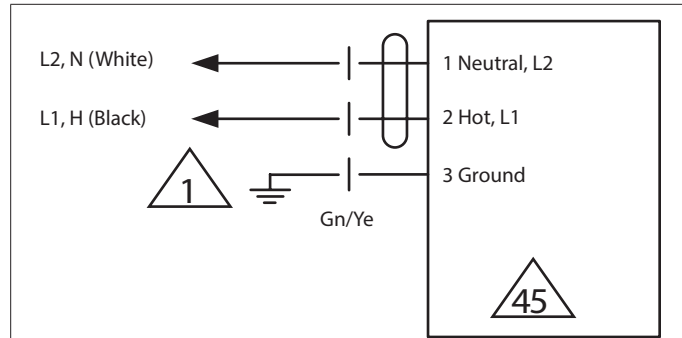
Accessories	
---AF-P	Anti-rotation bracket AF/NF.
---SH8	Push rod for KG6 & KG8 ball joints (36" L, 5/16" diameter).
---TOOL-06	8 mm and 10 mm wrench.
---ZG-100	Univ. right angle bracket 17"x11-1/8"x6" (HxWxbase).
---ZG-101	Univ. right angle bracket (13" H x 11" W x 7-7/16" base).
---ZG-102	Dual actuator mounting bracket.
---ZG-AF US	Classic AF/NF crankarm adaptor kit.
---ZG-AFB118	AFB(X)/NFB(X) crankarm adaptor kit.
---ZS-100	Weather shield - galvaneal (13" L x 8" W x 6" D).
---ZS-150	Weather shield - PC w/ foam seal (16" L x 8-3/8" W x 4" D).
---ZS-260	Explosion proof housing.
---ZS-300	NEMA 4X, 304 stainless steel enclosure.
---BAE165 US	165° F electric thermal sensor, SPST, normally closed.
---S2A-F US	Auxiliary switch, 2x SPDT, 3A (0.5A inductive) @250 VAC max.

### Typical Specification

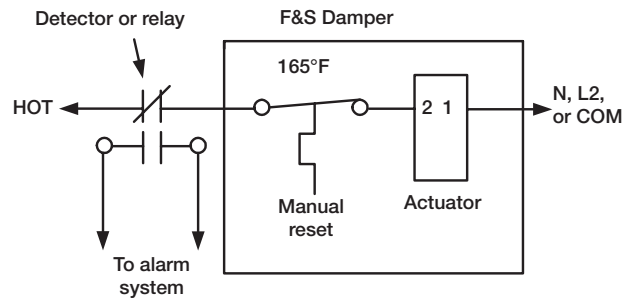
All smoke and combination fire and smoke dampers shall be provided with Belimo FSTF, FSLF, FSNF, or FSAF actuators. All substitutions must be approved before submission of bid. Damper and actuator shall have UL 555S Listing for 250°F &/or 350°F. Actuator shall have been tested to UL 2043 per requirements of IMC 602.2 and NEC 300.22 (c). Where position indication is required -S models with auxiliary switches or damper blade switches will be provided per code requirements.

### Wiring Diagrams

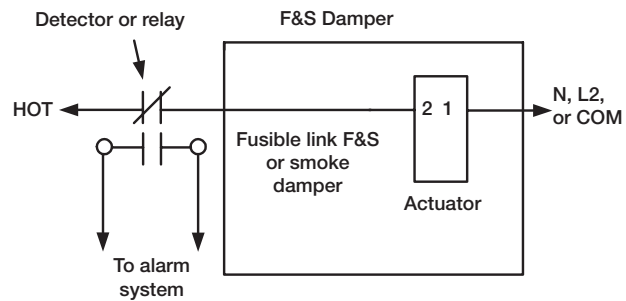
- Provide overload protection and disconnect as required.
- Actuators may be powered in parallel. Power consumption must be observed.
- Ground present on some models.



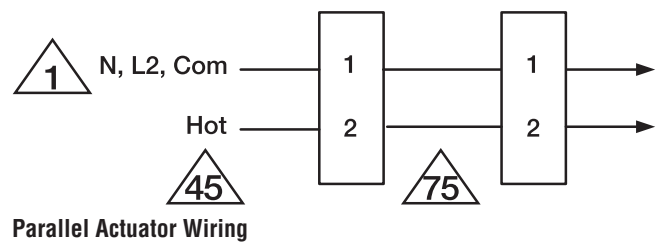
### 230 VAC



### Typical containment damper control wiring



### Typical smoke or fusible link damper wiring



### Parallel Actuator Wiring

# FSAF24A

On/Off, Spring Return, 24 VAC/DC



## Technical Data

Power Supply	24 VAC, ±10%, 50/60 Hz, 24 VDC, -0% / +50%
Power consumption in operation	32 VA
Power consumption in rest position	5 W, 8.5 VA, End stop 50 VA, 2 A slow blow fuse *
Transformer sizing	40 VA (class 2 power source)
Shaft Diameter	1/2" to 1.05" round, centers on 3/4" with insert, 1.05" without insert
Electrical Connection	3 ft [1 m], 18 GA appliance cable with 1/2" conduit connector
Overload Protection	electronic throughout 0° to 95° rotation
Electrical Protection	actuators are double insulated
Angle of rotation	95°
Torque motor	[20 Nm]
direction of rotation motor	reversible with CW/CCW mounting
direction of rotation spring-return	reversible with CW/CCW mounting
Position indication	visual indicator, 0° to 95° (0° is full spring return position)
Running time motor	<25 sec
Running time emergency control position	<15 sec
Ambient humidity	5 to 95% RH non-condensing
Ambient temperature	32...122°F [0...50°C]
Non-operating temperature	-40...176°F [-40...80°C]
Degree of Protection	IP40, NEMA 1
Housing material	zinc coated steel
Gears	steel, permanently lubricated
Agency Listing	cULus listed to UL60730-1A:02; UL 60730-2-14:02 and CAN/CSA-E60730-1:02; Listed to UL 2043 - suitable for use in air plenums per Section 300.22(c) of the NEC and Section 602.2 of the IMC
Noise level, motor	inaudible holding, running 70 dB (A)
Noise Level (Fail-Safe)	inaudible holding, spring 73 dB (A)
Maintenance	maintenance free
Quality Standard	ISO 9001, RoHS (EU-Directive 2011/65/EU)
Weight	5.87 lb [2.5 kg]

† UL File XAPX.E108966

**Fire & Smoke, 180 in-lb at 350°F for 30 min., 25 sec. drive, 15 sec. spring**

## Application

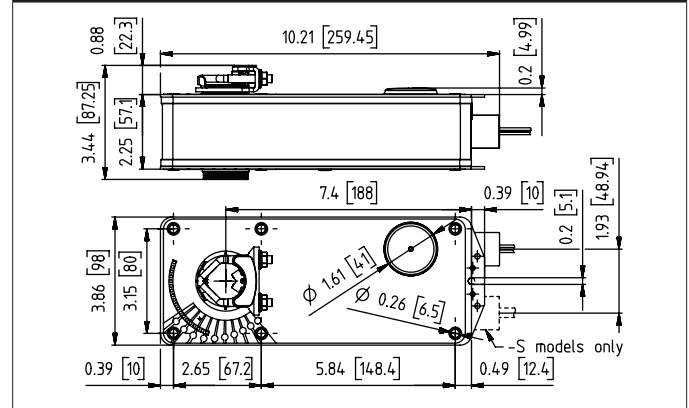
The FSAF\_A actuators provide true spring return operation for reliable fail-safe application and positive close-off on UL555S dampers. The spring return system provides constant torque to the damper with and without power applied to the actuator. The FSAF\_A series provides 95° of rotation and is provided with a graduated position indicator showing 0 to 95°.

## Operation

The FSAF\_A series actuators are mounted to the damper axle shaft or jackshaft (1/2" to 1.05") via a cold-weld clamp. Teeth in the clamp and V-bolt dig into the metal of both solid and hollow shafts maintaining a perfect connection. The specially designed clamp will not crush hollow shafts. The bottom end of the actuator is held by an anti-rotation strap or by a stud provided by the damper manufacturer. The actuator is mounted in its fail safe position with the damper blade(s) closed. Upon applying power, the actuator drives the damper to the open position. The internal spring is tensioned at the same time. If the power supply is interrupted, the spring moves the damper back to its fail-safe position.

Note on linkage kits. The correct leg kit for the FSAF\_A series is the older ZG-AF US as the actuator has a classic AF frame. However, the spline is the new generation type and the crank arm required is the KH-AFB.

## Dimensions (Inches[mm])



## Safety Notes

\* Neither UL nor Belimo require local over-current protection. The FSAF\_A actuators draw higher peak current when driving against any type of stop. After 10 seconds current drops to the lower holding level. If used, this requires the value of a local fuse or breaker to be increased to avoid nuisance opening or tripping. A 2 A slow blow should be used for 24 VAC. A 0.5 A slow blow should be used for 120 VAC. A 0.25 A slow blow should be used for 230 VAC and a 0.3 A slow blow for 208 VAC.

## Transformers:

Note that while a 24 V 100 VA transformer would handle 3 actuators run current, a 4 A breaker or plug fuse is insufficient. A 6 A slow blow would be required.



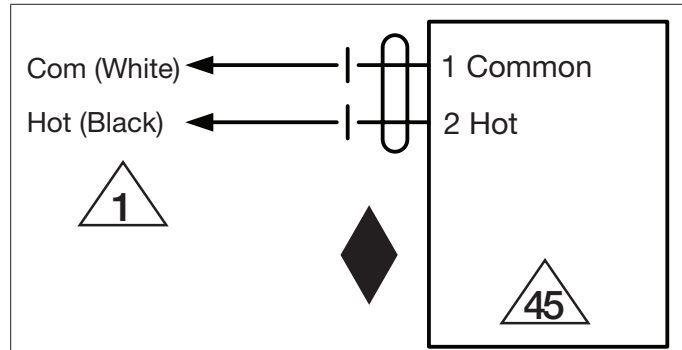
Accessories	
---AF-P	Anti-rotation bracket AF/NF.
---SH8	Push rod for KG6 & KG8 ball joints (36" L, 5/16" diameter).
---TOOL-06	8 mm and 10 mm wrench.
---ZG-100	Univ. right angle bracket 17"x11-1/8"x6" (HxWxbase).
---ZG-101	Univ. right angle bracket (13" H x 11" W x 7-7/16" base).
---ZG-102	Dual actuator mounting bracket.
---ZG-AF US	Classic AF/NF crankarm adaptor kit.
---ZG-AFB118	AFB(X)/NFB(X) crankarm adaptor kit.
---ZS-100	Weather shield - galvaneal (13" L x 8" W x 6" D).
---ZS-150	Weather shield - PC w/ foam seal (16" L x 8-3/8" W x 4" D).
---ZS-260	Explosion proof housing.
---ZS-300	NEMA 4X, 304 stainless steel enclosure.
---BAE165 US	165° F electric thermal sensor, SPST, normally closed.
---S2A-F US	Auxiliary switch, 2x SPDT, 3A (0.5A inductive) @250 VAC max.

**Typical Specification**

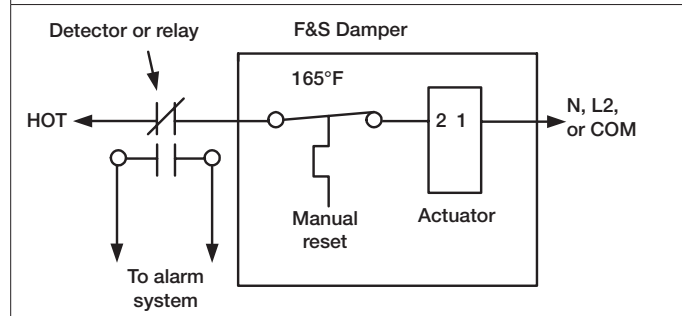
All smoke and combination fire and smoke dampers shall be provided with Belimo FSTF, FSLF, FSNF, or FSAF actuators. All substitutions must be approved before submission of bid. Damper and actuator shall have UL 555S Listing for 250°F &/or 350°F. Actuator shall have been tested to UL 2043 per requirements of IMC 602.2 and NEC 300.22 (c). Where position indication is required -S models with auxiliary switches or damper blade switches will be provided per code requirements.

**Wiring Diagrams**

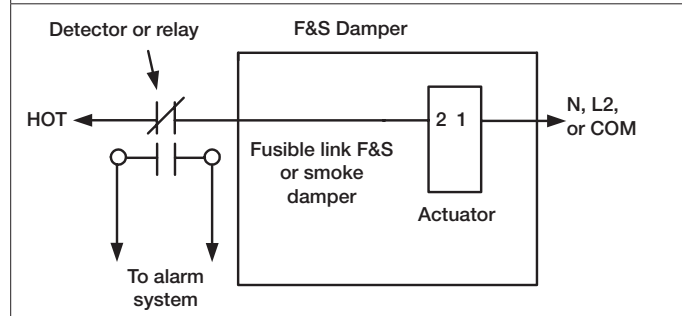
- Provide overload protection and disconnect as required.
- Actuators may be powered in parallel. Power consumption must be observed.
- Ground present on some models.
- Meets cULus requirements without the need of an electrical ground connection.



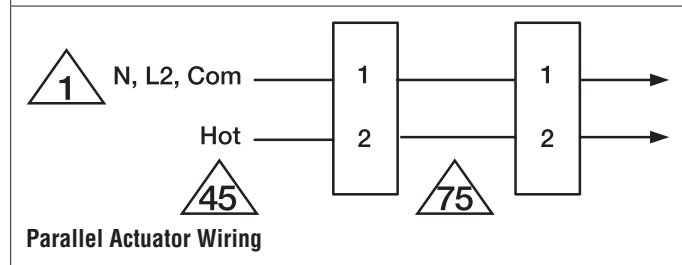
**24 VAC/DC**



**Typical containment damper control wiring**



**Typical smoke or fusible link damper wiring**



**Parallel Actuator Wiring**

# FSLF120 US

On/Off, Spring Return, 350°F [177°C] for a half hour, 15 Seconds Cycle Time



## Technical Data

Power Supply	120 VAC, ±10%, 50/60 Hz
Power consumption in operation	18 VA
Power consumption in rest position	4 W, 5.5 VA (50 Hz 8 VA), End stop 27 VA, 0.25 A slow blow fuse *
Shaft Diameter	3/8" to 1/2" round, centers on 1/2"
Electrical Connection	3 ft [1 m], 18 GA appliance cable with 1/2" conduit connector
Overload Protection	electronic throughout 0° to 95° rotation
Electrical Protection	grounded enclosure, 120V
Angle of rotation	95°
Torque motor	30 in-lb [3.5 Nm] from 32...350°F [0...177°C]
direction of rotation motor	reversible with CW/CCW mounting
direction of rotation spring-return	reversible with CW/CCW mounting
Position indication	visual indicator, 0° to 95° (0° is full spring return position)
Running time motor	<15 sec at rated voltage and torque 32...122°F [0...50°C]
Running time emergency control position	<15 sec
Ambient humidity	5 to 95% RH non-condensing
Ambient temperature	32...122°F [0...50°C]
Non-operating temperature	-40...176°F [-40...80°C]
Degree of Protection	IP30, NEMA 1
Housing material	zinc coated steel
Agency Listing	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, Listed to UL 2043 - suitable for use in air plenums per Section 300.22(C) of the NEC and Section 602 of the IMC. NYC Department of Buildings MEA 197-07-M California State Fire Marshal Listing 3210-1593:102
Noise Level (Fail-Safe)	45 dB (A) motor, 62 dB (A) spring, inaudible holding
Maintenance	maintenance free
Quality Standard	ISO 9001
Weight	4.13 lb [1.8 kg]

† UL File XAPX.E108966

## Fire & Smoke damper actuator

### Application

The type FSLF spring-return actuator is intended for the operation of smoke and combination fire and smoke dampers in ventilation and air-conditioning systems. The actuator will meet requirements of UL555 and UL555S when tested as an assembly with the damper and will meet requirements of UBC for 15 second opening and closing. Square footage of damper operated will depend on make and model and the temperature required.

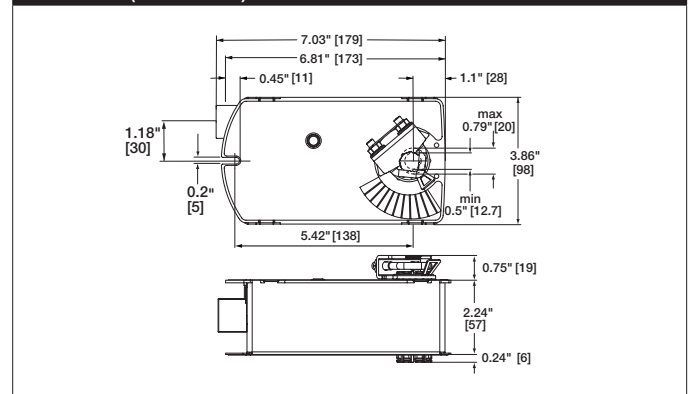
IMPORTANT 24VDC NOTE: The FSLF24 & -S models will not operate below 24VDC. A filtered and regulated power supply must be used.

### Operation

Mounting of the actuator to the damper axle shaft or jackshaft is via a cold-weld clamp. Teeth in the clamp and V-bolt dig into the metal of both solid and hollow shafts maintaining a perfect connection. The specially designed clamp will not crush hollow shafts. The bottom end of the actuator is held by an anti-rotation strap or by a stud provided by the damper manufacturer.

The actuator is mounted in its fail safe position with the damper blade(s) closed. Upon applying power, the actuator drives the damper to the open position. The internal spring is tensioned at the same time. If the power supply is interrupted, the spring moves the damper back to its fail-safe position.

### Dimensions (Inches[mm])



### Safety Notes

\* Neither UL nor Belimo require individual fusing of FSLF actuators.

The FSLF draws higher peak current when driving against its end stop or any other type of stop. Given the technology of fuses & breakers, this requires the value of fuse or breaker to be increased to avoid nuisance opening or tripping. A 1 amp slow blow should be used for 24VAC. A 0.25 amp slow blow should be used for 120VAC. A .125 amp slow blow should be used for 230V.

#### SAFETY NOTES

Wiring and installation must comply with all local electrical and mechanical codes.

The actuator contains no components which the user can replace or repair. Cables are not plenum rated and require flex conduit.

1/2" Threaded Connector: Screw a conduit fitting into the actuator's metal bushing. Jacket the actuator's input wiring with suitable flexible conduit. Properly terminate the conduit in a suitable junction box.

3/8" Flex Connector (-FC models): Mount the flexible conduit into the actuator's metal bushing by means of the provided screw with a torque of 1.2 Nm. Jacket the actuator's input wiring with suitable flexible conduit. Properly terminate the conduit in a suitable junction box.

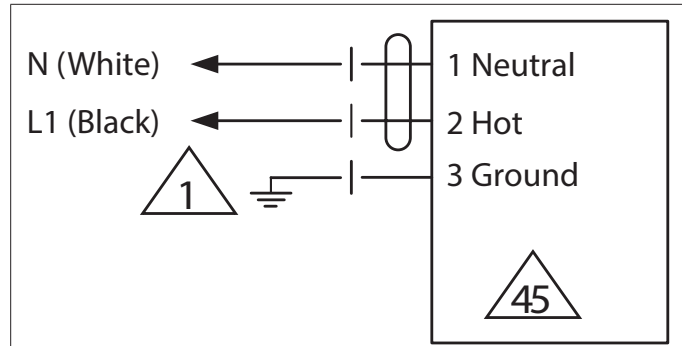
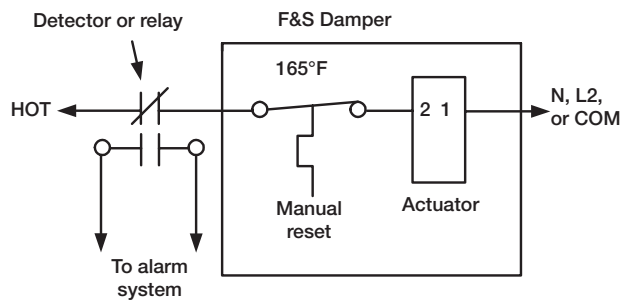
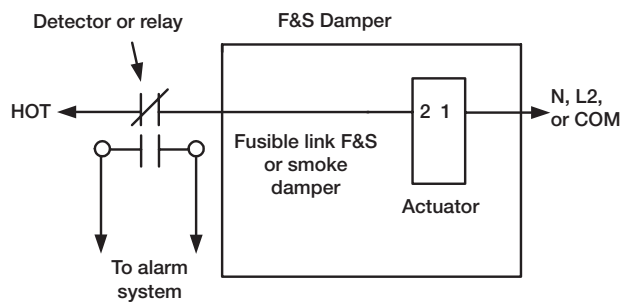
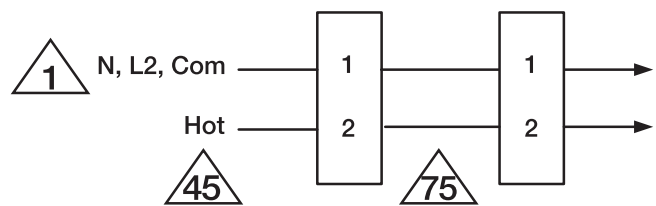
Accessories	
---BAE165 US	165° F electric thermal sensor, SPST, normally closed.
---S2A-F US	Auxiliary switch, 2x SPDT, 3A (0.5A inductive) @250 VAC max.

**Typical Specification**

All smoke and combination fire and smoke dampers shall be provided with Belimo FSTF, FSLF, FSNF, or FSAF actuators. All substitutions must be approved before submission of bid. Damper and actuator shall have UL 555S Listing for 250°F (350°F). Actuator shall have been tested to UL 2043 per requirements of IMC 602.2 and NEC 300.22 (c). Where position indication is required -S models with auxiliary switches or damper blade switches will be provided per code requirements.

**Wiring Diagrams**
**APPLICATION NOTES**

- Provide overload protection and disconnect as required.
- Actuators may be powered in parallel. Power consumption must be observed.
- Ground present on some models.


**120 VAC**

**Typical containment damper control wiring**

**Typical smoke or fusible link damper wiring**

**Parallel Actuator Wiring**

# FSLF230 US

On/Off, Spring Return, 350°F [177°C] for a half hour, 15 Seconds Cycle Time



## Technical Data

Power Supply	230 VAC, ±10%, 50/60 Hz
Power consumption in operation	17 VA
Power consumption in rest position	4 W, 8 VA (60 Hz 5.5 VA), End stop 27 VA, 0.125 A slow blow fuse *
Shaft Diameter	3/8" to 1/2" round, centers on 1/2"
Electrical Connection	3 ft [1 m], 18 GA, 3 color coded leads
Overload Protection	electronic throughout 0° to 95° rotation
Electrical Protection	grounded enclosure, 230V
Angle of rotation	95°
Torque motor	30 in-lb [3.5 Nm] from 32...350°F [0...177°C]
direction of rotation motor	reversible with CW/CCW mounting
direction of rotation spring-return	reversible with CW/CCW mounting
Position indication	visual indicator, 0° to 95° (0° is full spring return position)
Running time motor	<15 sec at rated voltage and torque 32...122°F [0...50°C]
Running time emergency control position	<15 sec
Ambient humidity	5 to 95% RH non-condensing
Ambient temperature	32...122°F [0...50°C]
Non-operating temperature	-40...176°F [-40...80°C]
Degree of Protection	IP30, NEMA 1
Housing material	zinc coated steel
Agency Listing	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, Listed to UL 2043 - suitable for use in air plenums per Section 300.22(C) of the NEC and Section 602 of the IMC. NYC Department of Buildings MEA 197-07-M California State Fire Marshal Listing 3210-1593:102
Noise Level (Fail-Safe)	45 dB (A) motor, 62 dB (A) spring, inaudible holding
Maintenance	maintenance free
Quality Standard	ISO 9001
Weight	4.12 lb [1.8 kg]

† UL File XAPX.E108966

## Fire & Smoke damper actuator

### Application

The type FSLF spring-return actuator is intended for the operation of smoke and combination fire and smoke dampers in ventilation and air-conditioning systems. The actuator will meet requirements of UL555 and UL555S when tested as an assembly with the damper and will meet requirements of UBC for 15 second opening and closing. Square footage of damper operated will depend on make and model and the temperature required.

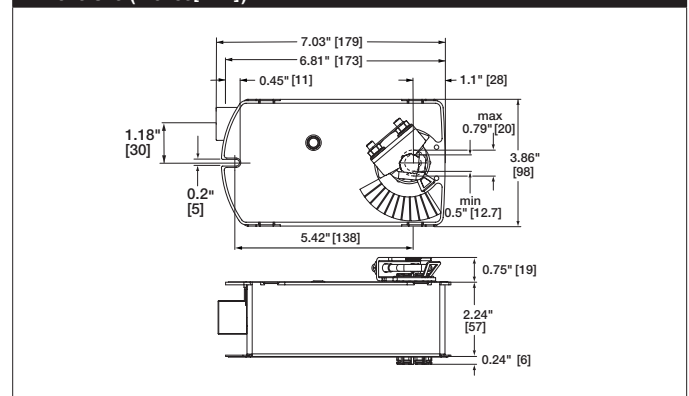
**IMPORTANT 24VDC NOTE:** The FSLF24 & -S models will not operate below 24VDC. A filtered and regulated power supply must be used.

### Operation

Mounting of the actuator to the damper axle shaft or jackshaft is via a cold-weld clamp. Teeth in the clamp and V-bolt dig into the metal of both solid and hollow shafts maintaining a perfect connection. The specially designed clamp will not crush hollow shafts. The bottom end of the actuator is held by an anti-rotation strap or by a stud provided by the damper manufacturer.

The actuator is mounted in its fail safe position with the damper blade(s) closed. Upon applying power, the actuator drives the damper to the open position. The internal spring is tensioned at the same time. If the power supply is interrupted, the spring moves the damper back to its fail-safe position.

## Dimensions (Inches[mm])



## Safety Notes

\* Neither UL nor Belimo require individual fusing of FSLF actuators.

The FSLF draws higher peak current when driving against its end stop or any other type of stop. Given the technology of fuses & breakers, this requires the value of fuse or breaker to be increased to avoid nuisance opening or tripping. A 1 amp slow blow should be used for 24VAC. A 0.25 amp slow blow should be used for 120VAC. A 1.25 amp slow blow should be used for 230V.

### SAFETY NOTES

Wiring and installation must comply with all local electrical and mechanical codes.

The actuator contains no components which the user can replace or repair. Cables are not plenum rated and require flex conduit.

1/2" Threaded Connector: Screw a conduit fitting into the actuator's metal bushing. Jacket the actuator's input wiring with suitable flexible conduit. Properly terminate the conduit in a suitable junction box.

3/8" Flex Connector (-FC models): Mount the flexible conduit into the actuator's metal bushing by means of the provided screw with a torque of 1.2 Nm. Jacket the actuator's input wiring with suitable flexible conduit. Properly terminate the conduit in a suitable junction box.

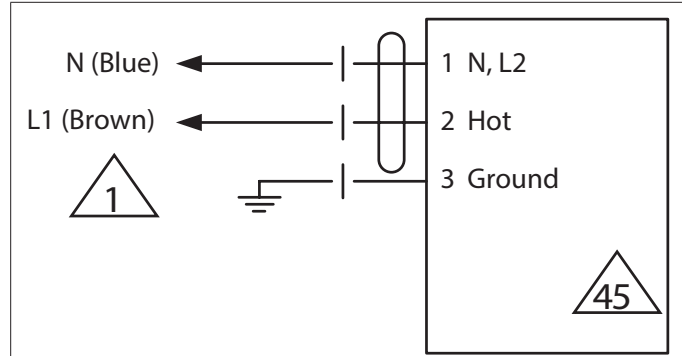
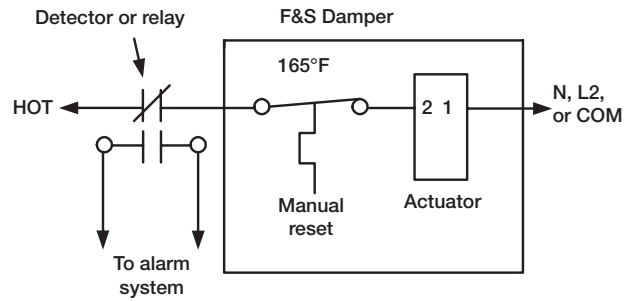
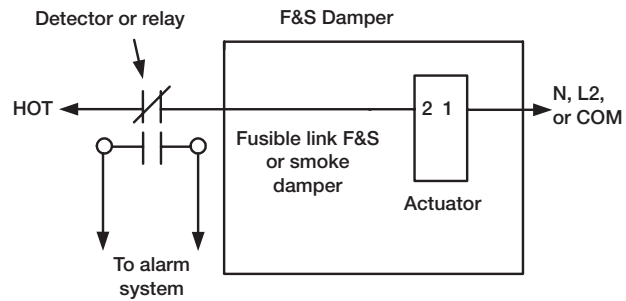
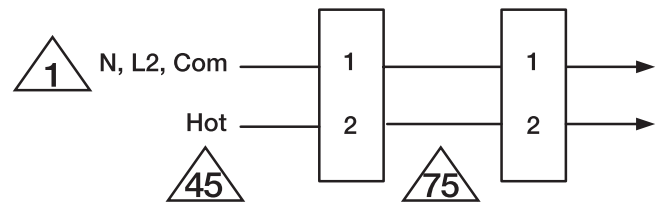
Accessories	
---BAE165 US	165° F electric thermal sensor, SPST, normally closed.
---S2A-F US	Auxiliary switch, 2x SPDT, 3A (0.5A inductive) @250 VAC max.

**Typical Specification**

All smoke and combination fire and smoke dampers shall be provided with Belimo FSTF, FSLF, FSNF, or FSAF actuators. All substitutions must be approved before submission of bid. Damper and actuator shall have UL 555S Listing for 250°F (350°F). Actuator shall have been tested to UL 2043 per requirements of IMC 602.2 and NEC 300.22 (c). Where position indication is required -S models with auxiliary switches or damper blade switches will be provided per code requirements.

**Wiring Diagrams**
**APPLICATION NOTES**

- Provide overload protection and disconnect as required.
- Actuators may be powered in parallel. Power consumption must be observed.
- Ground present on some models.


**230 VAC**

**Typical containment damper control wiring**

**Typical smoke or fusible link damper wiring**

**Parallel Actuator Wiring**

# FSLF24 US

On/Off, Spring Return, 350°F [177°C] for a half hour, 15 Seconds Cycle Time



## Technical Data

Power Supply	24 VAC, ±10%, 50/60 Hz, 24 VDC, -0% / +50%
Power consumption in operation	15 VA
Power consumption in rest position	2.5 W, 3.5 VA, End stop 25 VA, 1 A slow blow fuse *
Transformer sizing	24 VA (class 2 power source)
Shaft Diameter	3/8" to 1/2" round, centers on 1/2"
Electrical Connection	3 ft [1 m], 18 GA, 2 color coded leads
Overload Protection	electronic throughout 0° to 95° rotation
Electrical Protection	actuators are double insulated
Angle of rotation	95°
Torque motor	30 in-lb [3.5 Nm] from 32...350°F [0...177°C]
direction of rotation motor	reversible with CW/CCW mounting
direction of rotation spring-return	reversible with CW/CCW mounting
Position indication	visual indicator, 0° to 95° (0° is full spring return position)
Running time motor	<15 sec at rated voltage and torque 32...122°F [0...50°C]
Running time emergency control position	<15 sec
Ambient humidity	5 to 95% RH non-condensing
Ambient temperature	32...122°F [0...50°C]
Non-operating temperature	-40...176°F [-40...80°C]
Degree of Protection	IP30, NEMA 1
Housing material	zinc coated steel
Agency Listing	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, Listed to UL 2043 - suitable for use in air plenums per Section 300.22(C) of the NEC and Section 602 of the IMC. NYC Department of Buildings MEA 197-07-M California State Fire Marshal Listing 3210-1593:102
Noise Level (Fail-Safe)	45 dB (A) motor, 62 dB (A) spring, inaudible holding
Maintenance	maintenance free
Quality Standard	ISO 9001
Weight	3.46 lb [1.7 kg]

† UL File XAPX.E108966

## Fire & Smoke damper actuator

### Application

The type FSLF spring-return actuator is intended for the operation of smoke and combination fire and smoke dampers in ventilation and air-conditioning systems. The actuator will meet requirements of UL555 and UL555S when tested as an assembly with the damper and will meet requirements of UBC for 15 second opening and closing. Square footage of damper operated will depend on make and model and the temperature required.

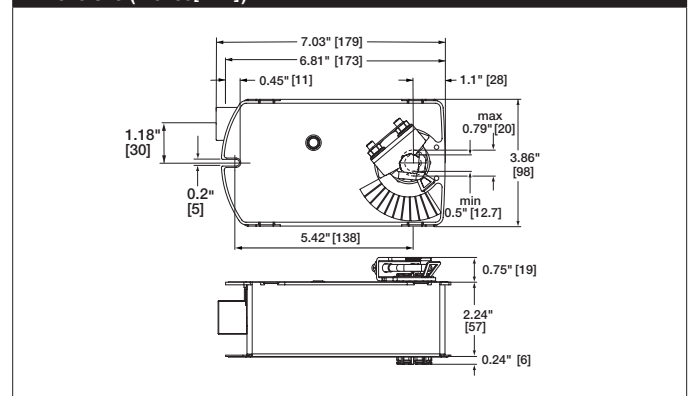
**IMPORTANT 24VDC NOTE:** The FSLF24 & -S models will not operate below 24VDC. A filtered and regulated power supply must be used.

### Operation

Mounting of the actuator to the damper axle shaft or jackshaft is via a cold-weld clamp. Teeth in the clamp and V-bolt dig into the metal of both solid and hollow shafts maintaining a perfect connection. The specially designed clamp will not crush hollow shafts. The bottom end of the actuator is held by an anti-rotation strap or by a stud provided by the damper manufacturer.

The actuator is mounted in its fail safe position with the damper blade(s) closed. Upon applying power, the actuator drives the damper to the open position. The internal spring is tensioned at the same time. If the power supply is interrupted, the spring moves the damper back to its fail-safe position.

## Dimensions (Inches[mm])



## Safety Notes

\* Neither UL nor Belimo require individual fusing of FSLF actuators.

The FSLF draws higher peak current when driving against its end stop or any other type of stop. Given the technology of fuses & breakers, this requires the value of fuse or breaker to be increased to avoid nuisance opening or tripping. A 1 amp slow blow should be used for 24VAC. A 0.25 amp slow blow should be used for 120VAC. A .125 amp slow blow should be used for 230V.

### SAFETY NOTES

Wiring and installation must comply with all local electrical and mechanical codes.

The actuator contains no components which the user can replace or repair. Cables are not plenum rated and require flex conduit.

1/2" Threaded Connector: Screw a conduit fitting into the actuator's metal bushing. Jacket the actuator's input wiring with suitable flexible conduit.

Properly terminate the conduit in a suitable junction box.

3/8" Flex Connector (-FC models): Mount the flexible conduit into the actuator's metal bushing by means of the provided screw with a torque of 1.2 Nm. Jacket the actuator's input wiring with suitable flexible conduit. Properly terminate the conduit in a suitable junction box.

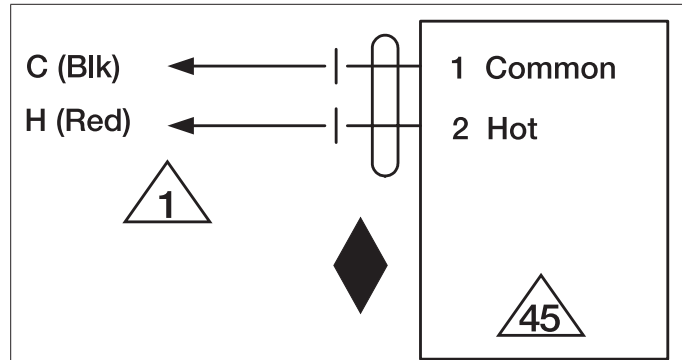
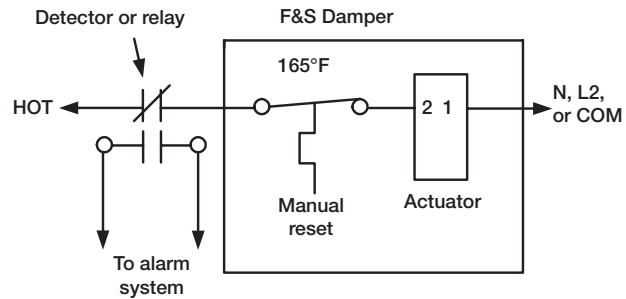
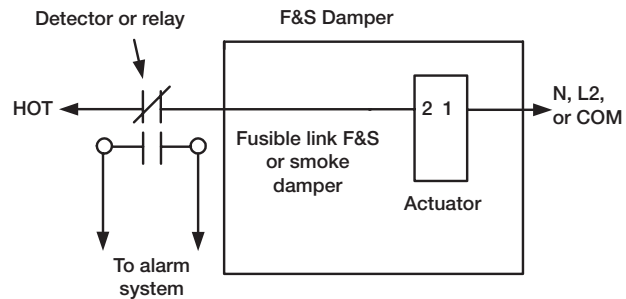
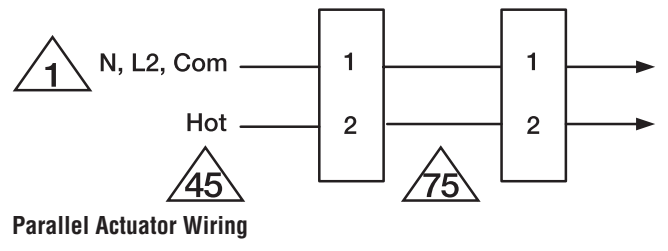
Accessories	
---BAE165 US	165° F electric thermal sensor, SPST, normally closed.
---S2A-F US	Auxiliary switch, 2x SPDT, 3A (0.5A inductive) @250 VAC max.

**Typical Specification**

All smoke and combination fire and smoke dampers shall be provided with Belimo FSTF, FSLF, FSNF, or FSAF actuators. All substitutions must be approved before submission of bid. Damper and actuator shall have UL 555S Listing for 250°F (350°F). Actuator shall have been tested to UL 2043 per requirements of IMC 602.2 and NEC 300.22 (c). Where position indication is required -S models with auxiliary switches or damper blade switches will be provided per code requirements.

**Wiring Diagrams**
**APPLICATION NOTES**

- Provide overload protection and disconnect as required.
- Actuators may be powered in parallel. Power consumption must be observed.
- Ground present on some models.


**24 VAC**

**Typical containment damper control wiring**

**Typical smoke or fusible link damper wiring**

**Parallel Actuator Wiring**

# FSNF120 US

On/Off, Spring Return, 350°F [177°C] for half hour, 120VAC, 15 Seconds Cycle Time



Technical Data	
Power Supply	120 VAC, ±10%, 50/60 Hz
Power consumption in operation	27 VA
Power consumption in rest position	6 W, 9 VA (50 Hz 15 VA), End stop 55 VA, 0.5 A slow blow fuse *
Shaft Diameter	1/2" to 1.05" round, centers on 1/2" and 3/4" with insert, 1.05" without insert
Electrical Connection	18 GA, 3 ft [1 m], 3 color coded wires
Overload Protection	electronic throughout 0° to 95° rotation
Electrical Protection	grounded enclosure, 120V
Angle of rotation	95°
Torque motor	70 in-lb [8 Nm] from 32...350°F [0...177°C]
direction of rotation motor	reversible with CW/CCW mounting
direction of rotation spring-return	reversible with cw/ccw mounting
Position indication	visual indicator, 0° to 95° (0° is full spring return position)
Running Time (Motor)	15 sec between 32...350°F [0...177°C], <15 sec at rated voltage & torque
Running Time (Fail-Safe)	15 sec
Ambient humidity	5...95% r.H. non-condensing
Ambient temperature	32...122°F [0...50°C]
Non-operating temperature	-40...176°F [-40...80°C]
Degree of Protection	IP40, NEMA 1
Housing material	zinc coated steel
Gears	steel, permanently lubricated
Agency Listing	cULus listed to UL873 and CAN/CSA C22.2 No.24, UL 2043 Listed for air plenum installation per NEC 300.22 and IMC Section 602 NYC Department of Buildings MEA 197-07-M.California State Fire Marshal Listing 3210-1593:101.
Noise level, motor	45 dB (A) motor, 62 dB (A) spring, inaudible holding
Maintenance	maintenance free
Quality Standard	ISO 9001
Weight	6.58 lb [3.0 kg]

† UL File XAPX.E108966

## Fire & Smoke damper actuator

### Application

The type FSNF spring-return actuator is intended for the operation of smoke and combination fire and smoke dampers in ventilation and air-conditioning systems. The actuator will meet requirements of UL555 and UL555S when tested as an assembly with the damper and will meet requirements of UBC for 15 second opening and closing at 350°F. Square footage of damper operated will depend on make and model and the temperature required.

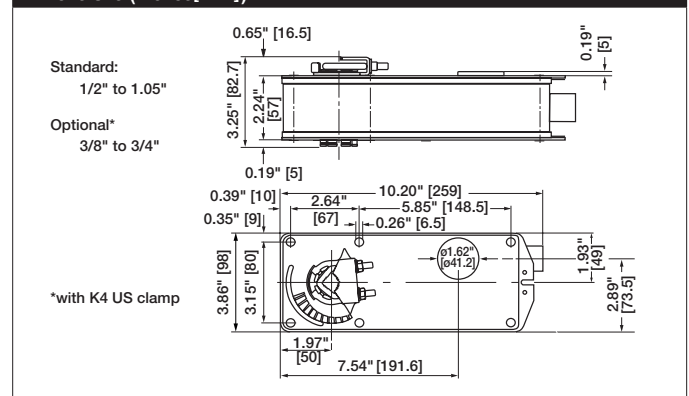
IMPORTANT 24VDC NOTE: The FSNF24 & -S models will not operate below 24VDC. A filtered and regulated power supply must be used.

### Operation

Mounting of the actuator to the damper axle shaft or jackshaft (3/8" to 1.05") is via a cold-weld clamp. Teeth in the clamp and V-bolt dig into the metal of both solid and hollow shafts maintaining a perfect connection. The specially designed clamp will not crush hollow shafts. The bottom end of the actuator is held by an anti-rotation strap or by a stud provided by the damper manufacturer.

The actuator is mounted in its fail safe position with the damper blade(s) closed. Upon applying power, the actuator drives the damper to the open position. The internal spring is tensioned at the same time. If the power supply is interrupted, the spring moves the damper back to its fail-safe position.

### Dimensions (Inches[mm])



### Safety Notes

\* Neither UL nor Belimo require local over-current protection. The FSNF actuators draw higher peak current when driving against any type of stop. If used, this requires the value of a local fuse or breaker to be increased to avoid nuisance opening or tripping. A 2.5 amp slow blow should be used for 24VAC. A 0.5 amp slow blow should be used for 120 VAC. A 0.25 amp slow blow should be used for 230V and a 0.3 amp slow blow for 208 VAC. Transformers: Note that while a 24V 100VA transformer would handle 2 actuators, a 4 A breaker or plug fuse is insufficient. A 5 amp slow blow would be required. Belimo Fire & Smoke actuators have passed the AMCA 520 and UL 555S Long Term Holding test. No special cycling is required during prolonged periods when actuator is driven open and held there. Periodic testing of dampers and actuators per local codes and NFPA 80 and NFPA 105 are required.

The actuator contains no components which the user can replace or repair. A 1/2" threaded connector is standard. FSNFxx-FC models have a 3/8" Flex Connector. Other than the connector, these actuators are identical to the conduit connector version.

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**Accessories**

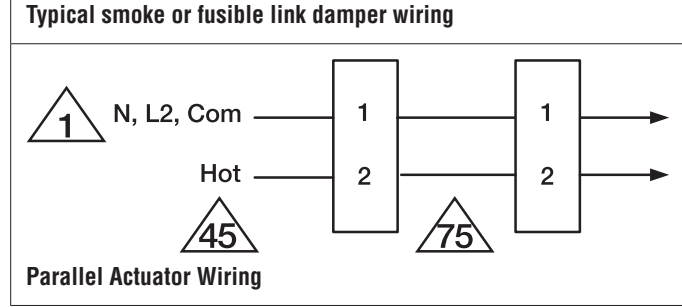
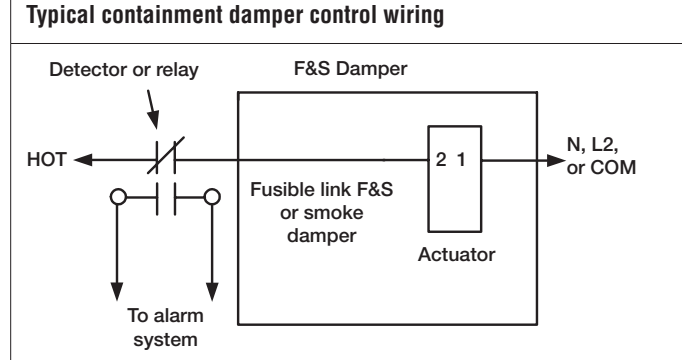
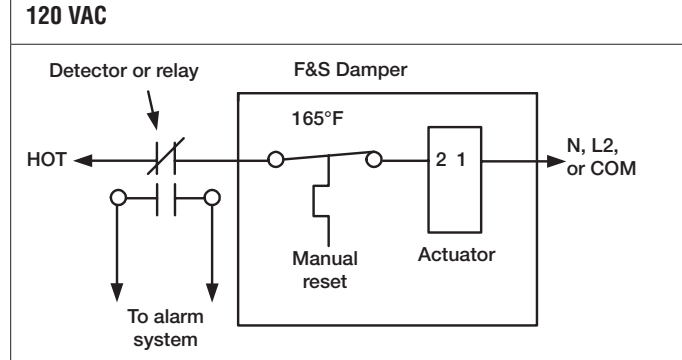
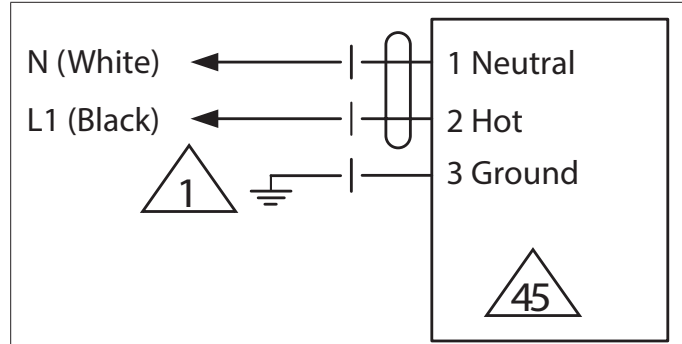
AF-P	Anti-rotation bracket AF/NF.
IND-AF2	End stop indicator
K4-1 US	Classic AF/NF jackshaft clamp (up to 1.05").
KH-AF-1 US	Classic AF/NF crankarm for Jackshaft to 1.05".
SH8	Push rod for KG6 & KG8 ball joints (36" L, 5/16" diameter).
ZDB-AF2 US	Angle of rotation limiter for Classic AF/NF.
ZG-100	Univ. right angle bracket 17"x11-1/8"x6" (HxWxbase).
ZG-101	Univ. right angle bracket 13x11x7-7/16" (HxWxbase).
ZG-AF US	Classic AF/NF crankarm adaptor kit.
ZG-AF108	Classic AF/NF crankarm adaptor kit with ZG-108.
ZG-DC1	Damper clip for damper blade, 3.5" width.
ZG-DC2	Damper clip for damper blade, 6" width.
ZS-100	Weather shield - galvaneal 13x8x6" (LxWxD).
ZS-150	Weather shield - PC w/ foam seal 16x8-3/8x4" (LxWxD).
ZS-260	Explosion proof housing.
ZS-300	NEMA 4X, 304 stainless steel enclosure.
BAE165 US	165° F electric thermal sensor, SPST, normally closed.
S2A-F US	Auxiliary switch, 2x SPDT, 3A (0.5A inductive) @250 VAC max.

**Typical Specification**

All smoke and combination fire and smoke dampers shall be provided with Belimo FSTF, FSLF, FSNF, or FSAF actuators. All substitutions must be approved before submission of bid. Damper and actuator shall have UL 555S Listing for 250°F (350°F). Actuator shall have been tested to UL 2043 per requirements of IMC 602.2 and NEC 300.22 (c). Where position indication is required -S models with auxiliary switches or damper blade switches will be provided per code requirements.

**Wiring Diagrams**
**INSTALLATION NOTES**

- Provide overload protection and disconnect as required.
- Actuators may be powered in parallel. Power consumption must be observed.
- Ground present on some models.



# FSNF230 US

On/Off, Spring Return, 350°F [177°C] for half hour, 230VAC, 15 Seconds Cycle Time



Technical Data	
Power Supply	230 VAC, ±10%, 50/60 Hz
Power consumption in operation	27 VA
Power consumption in rest position	5 W, 9 VA (60 Hz 6.5 VA), End stop 55 VA, 0.25 A slow blow fuse *
Shaft Diameter	1/2" to 1.05" round, centers on 1/2" and 3/4" with insert, 1.05" without insert
Electrical Connection	18 GA, 3 ft [1 m], 3 color coded wires
Overload Protection	electronic throughout 0° to 95° rotation
Electrical Protection	grounded enclosure, 230V
Angle of rotation	95°
Torque motor	70 in-lb [8 Nm] from 32...350°F [0...177°C]
direction of rotation motor	reversible with CW/CCW mounting
direction of rotation spring-return	reversible with cw/ccw mounting
Position indication	visual indicator, 0° to 95° (0° is full spring return position)
Running Time (Motor)	15 sec between 32...350°F [0...177°C], <15 sec at rated voltage & torque
Running Time (Fail-Safe)	15 sec
Ambient humidity	5...95% r.H. non-condensing
Ambient temperature	32...122°F [0...50°C]
Non-operating temperature	-40...176°F [-40...80°C]
Degree of Protection	IP40, NEMA 1
Housing material	zinc coated steel
Gears	steel, permanently lubricated
Agency Listing	cULus listed to UL873 and CAN/GSA C22.2 No.24, UL 2043 Listed for air plenum installation per NEC 300.22 and IMC Section 602 NYC Department of Buildings MEA 197-07-M.California State Fire Marshal Listing 3210-1593:101.
Noise level, motor	45 dB (A) motor, 62 dB (A) spring, inaudible holding
Maintenance	maintenance free
Quality Standard	ISO 9001
Weight	6.58 lb [3.0 kg]

† UL File XAPX.E108966

## Fire & Smoke damper actuator

### Application

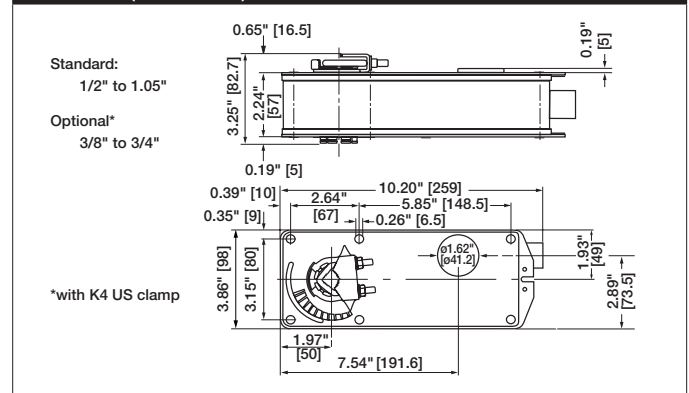
The type FSNF spring-return actuator is intended for the operation of smoke and combination fire and smoke dampers in ventilation and air-conditioning systems. The actuator will meet requirements of UL555 and UL555S when tested as an assembly with the damper and will meet requirements of UBC for 15 second opening and closing. Square footage of damper operated will depend on make and model and the temperature required.

### Operation

Mounting of the actuator to the damper shaft or jackshaft (3/8" to 1.05") is via a cold-weld clamp. Teeth in the clamp and V-bolt dig into the metal of both solid and hollow shafts maintaining a perfect connection. The specially designed clamp will not crush hollow shafts. The bottom end of the actuator is held by an anti-rotation strap or by a stud provided by the damper manufacturer.

The actuator is mounted in its fail safe position with the damper blade(s) closed. Upon applying power, the actuator drives the damper to the open position. The internal spring is tensioned at the same time. If the power supply is interrupted, the spring moves the damper back to its fail-safe position.

### Dimensions (Inches[mm])



### Safety Notes

\* Neither UL nor Belimo require local over-current protection. The FSNF actuators draw higher peak current when driving against any type of stop. If used, this requires the value of a local fuse or breaker to be increased to avoid nuisance opening or tripping. A 2.5 amp slow blow should be used for 24VAC. A 0.5 amp slow blow should be used for 120 VAC. A 0.25 amp slow blow should be used for 230V and a 0.3 amp slow blow for 208 VAC. Transformers: Note that while a 24V 100VA transformer would handle 2 actuators, a 4 A breaker or plug fuse is insufficient. A 5 amp slow blow would be required. Belimo Fire & Smoke actuators have passed the AMCA 520 and UL 555S Long Term Holding test. No special cycling is required during prolonged periods when actuator is driven open and held there. Periodic testing of dampers and actuators per local codes and NFPA 80 and NFPA 105 are required. The actuator contains no components which the user can replace or repair. A 1/2" threaded connector is standard. FSNFxx-FC models have a 3/8" Flex Connector. Other than the connector, these actuators are identical to the conduit connector version.

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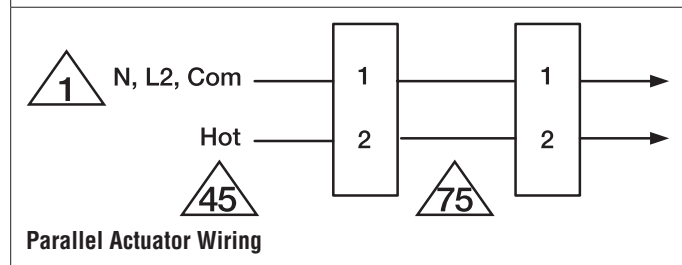
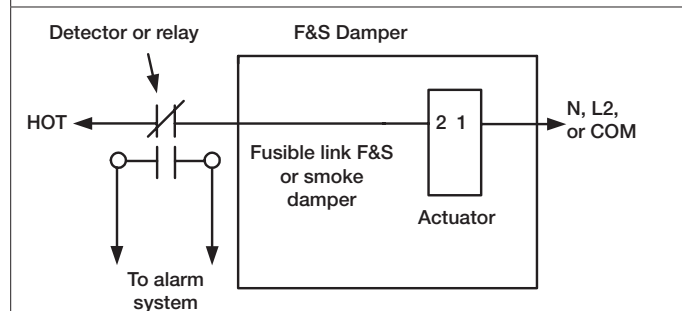
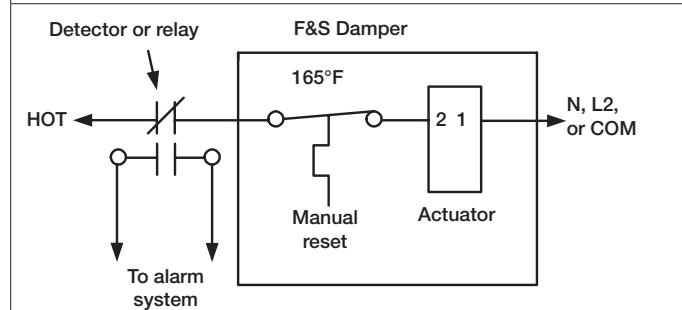
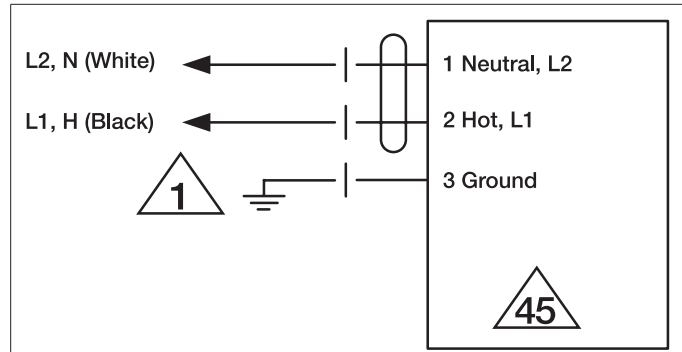
Accessories	
AF-P	Anti-rotation bracket AF/NF.
IND-AF2	End stop indicator
K4-1 US	Classic AF/NF jackshaft clamp (up to 1.05").
KH-AF-1 US	Classic AF/NF crankarm for Jackshaft to 1.05".
SH8	Push rod for KG6 & KG8 ball joints (36" L, 5/16" diameter).
ZDB-AF2 US	Angle of rotation limiter for Classic AF/NF.
ZG-100	Univ. right angle bracket 17"x11-1/8"x6" (HxWxbase).
ZG-101	Univ. right angle bracket 13x11x7-7/16" (HxWxbase).
ZG-AF US	Classic AF/NF crankarm adaptor kit.
ZG-AF108	Classic AF/NF crankarm adaptor kit with ZG-108.
ZG-DC1	Damper clip for damper blade, 3.5" width.
ZG-DC2	Damper clip for damper blade, 6" width.
ZS-100	Weather shield - galvaneal 13x8x6" (LxWxD).
ZS-150	Weather shield - PC w/ foam seal 16x8-3/8x4" (LxWxD).
ZS-260	Explosion proof housing.
ZS-300	NEMA 4X, 304 stainless steel enclosure.
BAE165 US	165° F electric thermal sensor, SPST, normally closed.
S2A-F US	Auxiliary switch, 2x SPDT, 3A (0.5A inductive) @250 VAC max.

**Typical Specification**

All smoke and combination fire and smoke dampers shall be provided with Belimo FSTF, FSLF, FSNF, or FSAF actuators. All substitutions must be approved before submission of bid. Damper and actuator shall have UL 555S Listing for 250°F (350°F). Actuator shall have been tested to UL 2043 per requirements of IMC 602.2 and NEC 300.22 (c). Where position indication is required -S models with auxiliary switches or damper blade switches will be provided per code requirements.

**Wiring Diagrams**
**INSTALLATION NOTES**

- Provide overload protection and disconnect as required.
- Actuators may be powered in parallel. Power consumption must be observed.
- Ground present on some models.



# FSNF24 US

On/Off, Spring Return, 350°F [177°C] for a half hour, 15 Seconds Cycle Time



Technical Data	
Power Supply	24 VAC, ±20%, 50/60 Hz, 24 VDC, 0% / +50%
Power consumption in operation	27 VA
Power consumption in rest position	3 W, 6.5 VA, End stop 55 VA, 2.5 A slow blow fuse *
Transformer sizing	40 VA (class 2 power source)
Shaft Diameter	1/2" to 1.05" round, centers on 1/2" and 3/4" with insert, 1.05" without insert
Electrical Connection	18 GA, 3 ft [1 m], 2 color coded wires
Overload Protection	electronic throughout 0° to 95° rotation
Electrical Protection	actuators are double insulated
Angle of rotation	95°
Torque motor	70 in-lb [8 Nm] from 32...350°F [0...177°C]
direction of rotation motor	reversible with CW/CCW mounting
direction of rotation spring-return	reversible with cw/ccw mounting
Position indication	visual indicator, 0° to 95° (0° is full spring return position)
Running Time (Motor)	15 sec between 32...350°F [0...177°C], <15 sec at rated voltage & torque
Running Time (Fail-Safe)	15 sec
Ambient humidity	5...95% r.H. non-condensing
Ambient temperature	32...122°F [0...50°C]
Non-operating temperature	-40...176°F [-40...80°C]
Degree of Protection	IP40, NEMA 1
Housing material	zinc coated steel
Gears	steel, permanently lubricated
Agency Listing	cULus listed to UL873 and CAN/CSA C22.2 No.24, UL 2043 Listed for air plenum installation per NEC 300.22 and IMC Section 602 NYC Department of Buildings MEA 197-07-M.California State Fire Marshal Listing 3210-1593:101.
Noise level, motor	45 dB (A) motor, 62 dB (A) spring, inaudible holding
Maintenance	maintenance free
Quality Standard	ISO 9001
Weight	5.71 lb [2.8 kg]

† UL File XAPX.E108966

## Fire & Smoke damper actuator

### Application

The type FSNF spring-return actuator is intended for the operation of smoke and combination fire and smoke dampers in ventilation and air-conditioning systems. The actuator will meet requirements of UL555 and UL555S when tested as an assembly with the damper and will meet requirements of UBC for 15 second opening and closing at 350°F. Square footage of damper operated will depend on make and model and the temperature required.

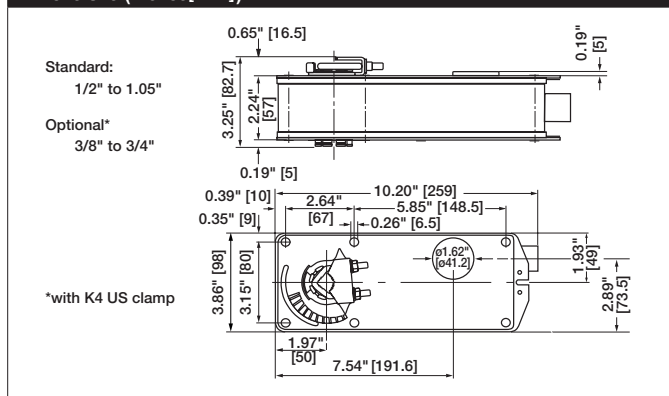
**IMPORTANT 24VDC NOTE:** The FSNF24 & -S models will not operate below 24VDC. A filtered and regulated power supply must be used.

### Operation

Mounting of the actuator to the damper axle shaft or jackshaft (3/8" to 1.05") is via a cold-weld clamp. Teeth in the clamp and V-bolt dig into the metal of both solid and hollow shafts maintaining a perfect connection. The specially designed clamp will not crush hollow shafts. The bottom end of the actuator is held by an anti-rotation strap or by a stud provided by the damper manufacturer.

The actuator is mounted in its fail safe position with the damper blade(s) closed. Upon applying power, the actuator drives the damper to the open position. The internal spring is tensioned at the same time. If the power supply is interrupted, the spring moves the damper back to its fail-safe position.

### Dimensions (Inches[mm])



### Safety Notes

\* Neither UL nor Belimo require local over-current protection. The FSNF actuators draw higher peak current when driving against any type of stop. If used, this requires the value of a local fuse or breaker to be increased to avoid nuisance opening or tripping. A 2.5 amp slow blow should be used for 24VAC. A 0.5 amp slow blow should be used for 120 VAC. A 0.25 amp slow blow should be used for 230V and a 0.3 amp slow blow for 208 VAC. Transformers: Note that while a 24V 100VA transformer would handle 2 actuators, a 4 A breaker or plug fuse is insufficient. A 5 amp slow blow would be required. Belimo Fire & Smoke actuators have passed the AMCA 520 and UL 555S Long Term Holding test. No special cycling is required during prolonged periods when actuator is driven open and held there. Periodic testing of dampers and actuators per local codes and NFPA 80 and NFPA 105 are required.

The actuator contains no components which the user can replace or repair. A 1/2" threaded connector is standard. FSNFxx-FC models have a 3/8" Flex Connector. Other than the connector, these actuators are identical to the conduit connector version.

⚠ **WARNING:** For Belimo Products sold in California, these Products do or may contain chemicals which are known to the State of California to cause cancer and or birth defects or other reproductive harms. For more information see [www.p65warnings.ca.gov](http://www.p65warnings.ca.gov).

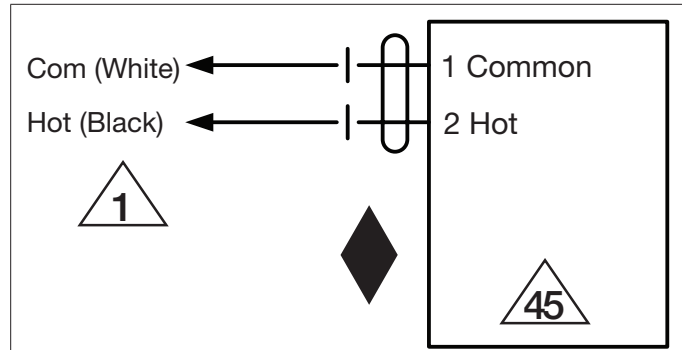
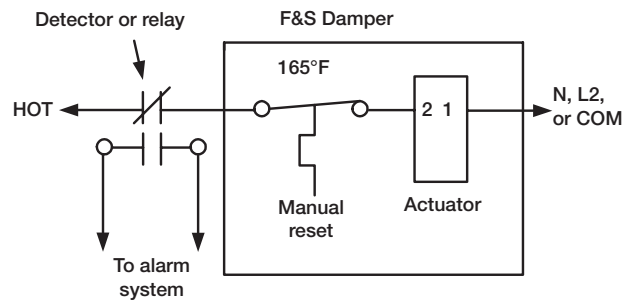
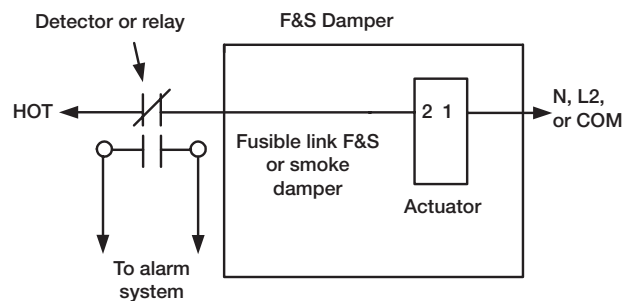
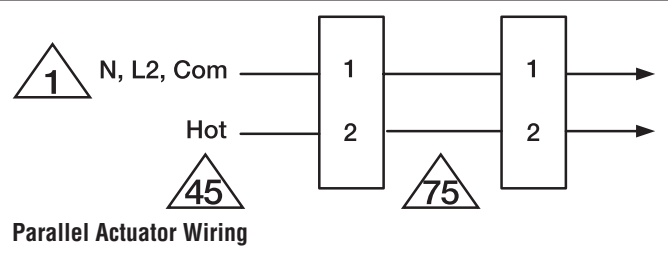
Accessories	
AF-P	Anti-rotation bracket AF/NF.
IND-AF2	End stop indicator
K4-1 US	Classic AF/NF jackshaft clamp (up to 1.05").
KH-AF-1 US	Classic AF/NF crankarm for Jackshaft to 1.05".
SH8	Push rod for KG6 & KG8 ball joints (36" L, 5/16" diameter).
ZDB-AF2 US	Angle of rotation limiter for Classic AF/NF.
ZG-100	Univ. right angle bracket 17"x11-1/8"x6" (HxWxbase).
ZG-101	Univ. right angle bracket 13x11x7-7/16" (HxWxbase).
ZG-AF US	Classic AF/NF crankarm adaptor kit.
ZG-AF108	Classic AF/NF crankarm adaptor kit with ZG-108.
ZG-DC1	Damper clip for damper blade, 3.5" width.
ZG-DC2	Damper clip for damper blade, 6" width.
ZS-100	Weather shield - galvaneal 13x8x6" (LxWxD).
ZS-150	Weather shield - PC w/ foam seal 16x8-3/8x4" (LxWxD).
ZS-260	Explosion proof housing.
ZS-300	NEMA 4X, 304 stainless steel enclosure.
BAE165 US	165° F electric thermal sensor, SPST, normally closed.
S2A-F US	Auxiliary switch, 2x SPDT, 3A (0.5A inductive) @250 VAC max.

**Typical Specification**

All smoke and combination fire and smoke dampers shall be provided with Belimo FSTF, FSLF, FSNF, or FSAF actuators. All substitutions must be approved before submission of bid. Damper and actuator shall have UL 555S Listing for 250°F (350°F). Actuator shall have been tested to UL 2043 per requirements of IMC 602.2 and NEC 300.22 (c). Where position indication is required -S models with auxiliary switches or damper blade switches will be provided per code requirements.

**Wiring Diagrams**
**INSTALLATION NOTES**

- Provide overload protection and disconnect as required.
- Actuators may be powered in parallel. Power consumption must be observed.
- Ground present on some models.
- Meets cULus requirements without the need of an electrical ground connection.


**24 VAC/DC**

**Typical containment damper control wiring**

**Typical smoke or fusible link damper wiring**

**Parallel Actuator Wiring**

# FSTF120 US

## On/Off, Spring Return Fail-Safe, 120 VAC



Technical Data	
Power Supply	120 VAC, ±10%, 50/60 Hz
Power consumption in operation	2 W, 3.5 VA
Power consumption in rest position	1.5 W, 2.5 VA
Shaft Diameter	1/4" to 1/2" round, centers on 1/2"
Electrical Connection	3 ft [1 m], 18 GA appliance cable with 1/2" conduit connector
Overload Protection	electronic throughout 0° to 95° rotation
Electrical Protection	actuators are double insulated
Angle of rotation	95°
Torque motor	18 in-lb [2 Nm]
direction of rotation motor	reversible with CW/CCW mounting
direction of rotation spring-return	reversible with CW/CCW mounting
Position indication	visual indicator, 0° to 95° (0° is full spring return position)
Running time motor	<75 sec @ 250°F [121°C]
Running time emergency control position	<25 sec @ 32...122°F [0...50°C]
Ambient humidity	5 to 95% RH non-condensing
Ambient temperature	32...122°F [0...50°C]
Non-operating temperature	-40...176°F [-40...80°C]
Degree of Protection	IP42, NEMA 2, UL Enclosure Type 2
Housing material	UL94-5VA
Agency Listing	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, Listed to UL 2043 - suitable for use in air plenums per Section 300.22(C) of the NEC and Section 602 of the IMC. California State Fire Marshal Listing 3210-1593:104
Noise level, motor	<45 dB (A)
Noise Level (Fail-Safe)	<62 dB (A)
Maintenance	maintenance free
Quality Standard	ISO 9001
Weight	1.59 lb [0.60 kg]

Part no.	Clamp side spring return
FSTF120 US	CW
FSTF120.1 US	CW (bulk pack)
FSTF120.1 CCW	CCW (bulk pack)
FSTF120-S US CW	CW
FSTF120-S.1 US	CW (bulk pack)
FSTF120-S.1 CCW	CCW (bulk pack)
FSTF24-S.1 US	CW (bulk pack)

† UL File XAPX.E108966

**Torque 18 in-lb, 250°F for 30 min, for fire and smoke dampers**

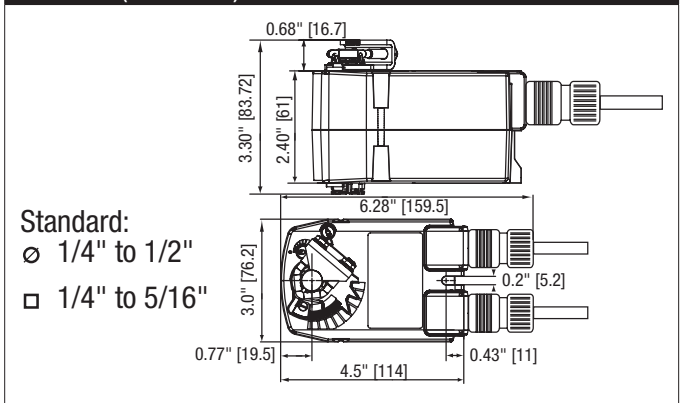
### Application

The type FSTF spring-return actuator is intended for the operation of smoke and combination fire and smoke dampers in ventilation and air-conditioning systems. The actuator will meet requirements of UL555 and UL555S when tested as an assembly with the damper. Square footage of damper operated will depend on make and model per damper manufacturer UL testing.

### Operation

Mounting of the actuator to the damper axle shaft or jackshaft is via a cold-weld clamp. Teeth in the clamp and V-bolt dig into the metal of both solid and hollow shafts maintaining a perfect connection. The specially designed clamp will not crush hollow shafts. The bottom end of the actuator is held by an anti-rotation strap or by a stud provided by the damper manufacturer. The actuator is mounted in its fail safe position with the damper blade(s) typically closed. Upon applying power, the actuator drives the damper to the open position. The internal spring is tensioned at the same time. If the power supply is interrupted, the spring moves the damper back to its fail-safe position.

### Dimensions (Inches[mm])



### Safety Notes

Screw a conduit fitting into the actuator's bushing. Jacket the actuator's input and output wiring with suitable flexible conduit. Properly terminate the conduit in a suitable junction box.

#### Retrofit Safety Note

Use of the FSTF for replacement of other makes of actuators is limited in damper area. The FSLF is preferred for direct coupled applications. The FSTF may be applied for linkage applications on dampers 1.5 sq.ft. and smaller at velocities under 2000 fpm.

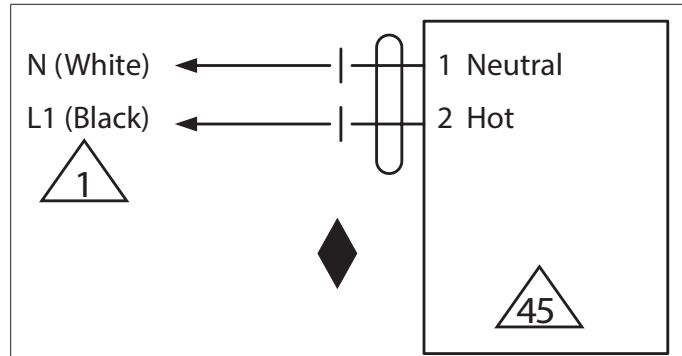
Accessories	
---KH-TF US	TFB(X) crankarm with 5/16" slot.
---KH-TF-1 US	TFB(X) crankarm with 1/4" slot.
KH-TF-1.1 US	TFB(X) crankarm for Shafts with 1/4" slot.
---TF-P	Anti-rotation bracket TF/NKQ/AM/NM/LM.
---TOOL-06	8 mm and 10 mm wrench.
---ZG-TF2	TFB(X) crankarm adaptor kit (T bracket included).
---ZG-TF112	TFB(X) crankarm adaptor kit (includes ZG-113).
---ZS-100	Weather shield - galvaneal (13" L x 8" W x 6" D).
---ZS-150	Weather shield - PC w/ foam seal (16" L x 8-3/8" W x 4" D).
---BAE165 US	165° F electric thermal sensor, SPST, normally closed.

### Typical Specification

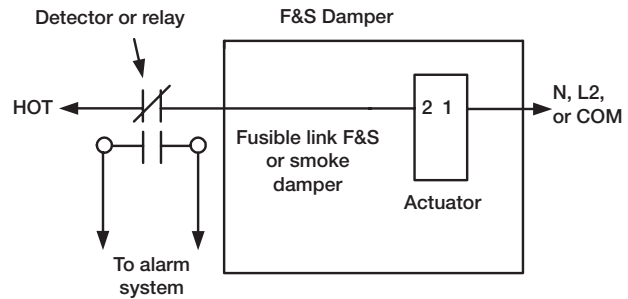
All smoke and combination fire and smoke dampers shall be provided with Belimo FSTF, FSLF, FSNF, or FSAF actuators. All substitutions must be approved before submission of bid. Damper and actuator shall have UL 555S Listing for 250°F &/or 350°F. Actuator shall have been tested to UL 2043 per requirements of IMC 602.2 and NEC 300.22 (c). Where position indication is required -S models with auxiliary switches or damper blade switches will be provided per code requirements.

### Wiring Diagrams

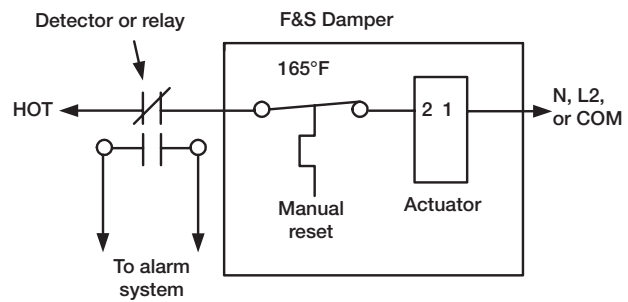
- Provide overload protection and disconnect as required.
- Actuators may be powered in parallel. Power consumption must be observed.
- Ground present on some models.
- Meets cULus requirements without the need of an electrical ground connection.



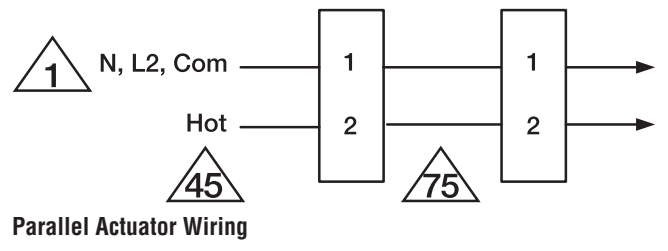
120 VAC



Typical smoke or fusible link damper wiring



Typical containment damper control wiring



# FSTF230 US

On/Off, Spring Return Fail-Safe, 230 VAC



Technical Data	
Power Supply	230 VAC, ±10%, 50/60 Hz
Power consumption in operation	5 W
Power consumption in rest position	4.5 VA
Shaft Diameter	1/4" to 1/2" round, centers on 1/2"
Electrical Connection	3 ft [1 m], 18 GA appliance cable with 1/2" conduit connector
Overload Protection	electronic throughout 0° to 95° rotation
Electrical Protection	actuators are double insulated
Angle of rotation	95°
Torque motor	18 in-lb [2 Nm]
direction of rotation motor	reversible with CW/CCW mounting
direction of rotation spring-return	reversible with CW/CCW mounting
Position indication	visual indicator, 0° to 95° (0° is full spring return position)
Running time motor	<75 sec @ 250°F [121°C]
Running time emergency control position	<25 sec @ 32...122°F [0...50°C]
Ambient humidity	5 to 95% RH non-condensing
Ambient temperature	32...122°F [0...50°C]
Non-operating temperature	-40...176°F [-40...80°C]
Degree of Protection	IP42, NEMA 2, UL Enclosure Type 2
Housing material	UL94-5VA
Agency Listing	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, Listed to UL 2043 - suitable for use in air plenums per Section 300.22(C) of the NEC and Section 602 of the IMC. California State Fire Marshal Listing 3210-1593:104
Noise level, motor	<45 dB (A)
Noise Level (Fail-Safe)	<62 dB (A)
Maintenance	maintenance free
Quality Standard	ISO 9001
Weight	1.6 lb [0.60 kg]

Part no.	Clamp side spring return
FSTF120 US	CW
FSTF120.1 US	CW (bulk pack)
FSTF120.1 CCW	CCW (bulk pack)
FSTF120-S US CW	CW
FSTF120-S.1 US	CW (bulk pack)
FSTF120-S.1 CCW	CCW (bulk pack)
FSTF24-S.1 US	CW (bulk pack)

† UL File XAPX.E108966

## Torque 18 in-lb, 250°F for 30 min, for fire and smoke dampers

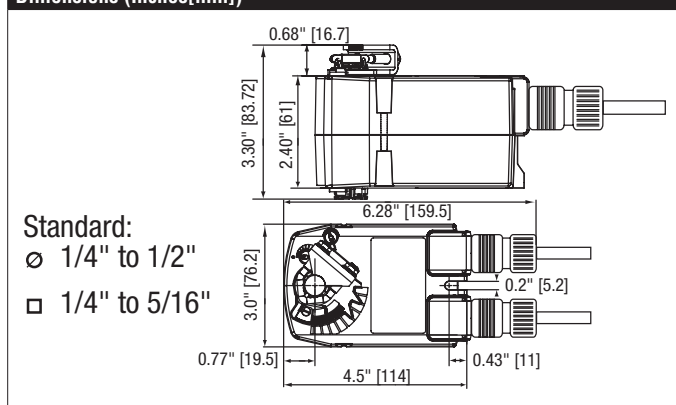
### Application

The type FSTF spring-return actuator is intended for the operation of smoke and combination fire and smoke dampers in ventilation and air-conditioning systems. The actuator will meet requirements of UL555 and UL555S when tested as an assembly with the damper. Square footage of damper operated will depend on make and model per damper manufacturer UL testing.

### Operation

Mounting of the actuator to the damper axle shaft or jackshaft is via a cold-weld clamp. Teeth in the clamp and V-bolt dig into the metal of both solid and hollow shafts maintaining a perfect connection. The specially designed clamp will not crush hollow shafts. The bottom end of the actuator is held by an anti-rotation strap or by a stud provided by the damper manufacturer. The actuator is mounted in its fail safe position with the damper blade(s) typically closed. Upon applying power, the actuator drives the damper to the open position. The internal spring is tensioned at the same time. If the power supply is interrupted, the spring moves the damper back to its fail-safe position.

### Dimensions (Inches[mm])



### Safety Notes

Screw a conduit fitting into the actuator's bushing. Jacket the actuator's input and output wiring with suitable flexible conduit. Properly terminate the conduit in a suitable junction box.

#### Retrofit Safety Note

Use of the FSTF for replacement of other makes of actuators is limited in damper area. The FSLF is preferred for direct coupled applications. The FSTF may be applied for linkage applications on dampers 1.5 sq.ft. and smaller at velocities under 2000 fpm.



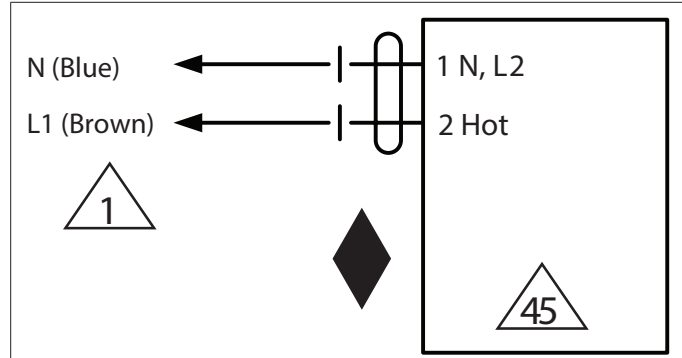
Accessories	
---KH-TF US	TFB(X) crankarm with 5/16" slot.
---KH-TF-1 US	TFB(X) crankarm with 1/4" slot.
KH-TF-1.1 US	TFB(X) crankarm for Shafts with 1/4" slot.
---TF-P	Anti-rotation bracket TF/NKQ/AM/NM/LM.
---TOOL-06	8 mm and 10 mm wrench.
---ZG-TF2	TFB(X) crankarm adaptor kit (T bracket included).
---ZG-TF112	TFB(X) crankarm adaptor kit (includes ZG-113).
---ZS-100	Weather shield - galvaneal (13" L x 8" W x 6" D).
---ZS-150	Weather shield - PC w/ foam seal (16" L x 8-3/8" W x 4" D).
---BAE165 US	165° F electric thermal sensor, SPST, normally closed.

### Typical Specification

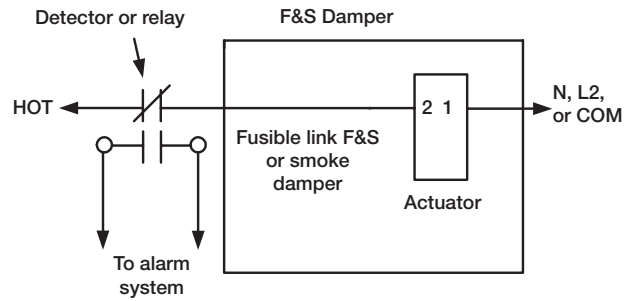
All smoke and combination fire and smoke dampers shall be provided with Belimo FSTF, FSLF, FSNF, or FSAF actuators. All substitutions must be approved before submission of bid. Damper and actuator shall have UL 555S Listing for 250°F &/or 350°F. Actuator shall have been tested to UL 2043 per requirements of IMC 602.2 and NEC 300.22 (c). Where position indication is required -S models with auxiliary switches or damper blade switches will be provided per code requirements.

### Wiring Diagrams

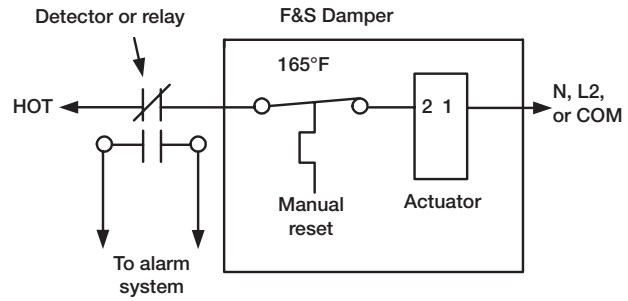
- Provide overload protection and disconnect as required.
- Actuators may be powered in parallel. Power consumption must be observed.
- Ground present on some models.
- Meets cULus requirements without the need of an electrical ground connection.



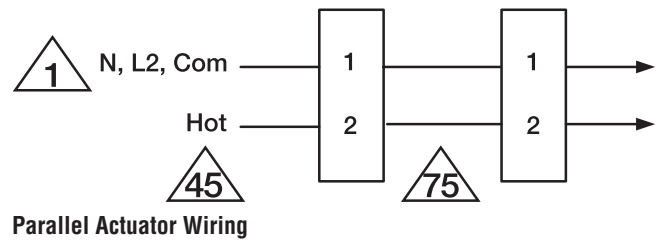
230 VAC



Typical smoke or fusible link damper wiring



Typical containment damper control wiring



# FSTF24 US

On/Off, Spring Return, Fail-Safe, 24VAC/DC



Technical Data	
Power Supply	24 VAC, ±20%, 50/60 Hz, 24 VDC, -10% / +20%
Power consumption in operation	2 W, 3 VA
Power consumption in rest position	1.5 W, 2 VA
Transformer sizing	5 VA (class 2 power source)
Shaft Diameter	1/4" to 1/2" round, centers on 1/2"
Electrical Connection	3 ft [1 m], 18 GA appliance cable with 1/2" conduit connector
Overload Protection	electronic throughout 0° to 95° rotation
Electrical Protection	actuators are double insulated
Angle of rotation	95°
Torque motor	18 in-lb [2 Nm]
direction of rotation motor	reversible with CW/CCW mounting
direction of rotation spring-return	reversible with CW/CCW mounting
Position indication	visual indicator, 0° to 95° (0° is full spring return position)
Running time motor	<75 sec @ 250°F [121°C]
Running time emergency control position	<25 sec @ 32...122°F [0...50°C]
Ambient humidity	5 to 95% RH non-condensing
Ambient temperature	32...122°F [0...50°C]
Non-operating temperature	-40...176°F [-40...80°C]
Degree of Protection	IP42, NEMA 2, UL Enclosure Type 2
Housing material	UL94-5VA
Agency Listing	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, Listed to UL 2043 - suitable for use in air plenums per Section 300.22(C) of the NEC and Section 602 of the IMC. California State Fire Marshal Listing 3210-1593:104
Noise level, motor	<45 dB (A)
Noise Level (Fail-Safe)	<62 dB (A)
Maintenance	maintenance free
Quality Standard	ISO 9001
Weight	1.61 lb [0.60 kg]

Part no.	Clamp side spring return
FSTF120 US	CW
FSTF120.1 US	CW (bulk pack)
FSTF120.1 CCW	CCW (bulk pack)
FSTF120-S US CW	CW
FSTF120-S.1 US	CW (bulk pack)
FSTF120-S.1 CCW	CCW (bulk pack)
FSTF24-S.1 US	CW (bulk pack)

† UL File XAPX.E108966

## Torque 18 in-lb, 250°F for 30 min, for fire and smoke dampers

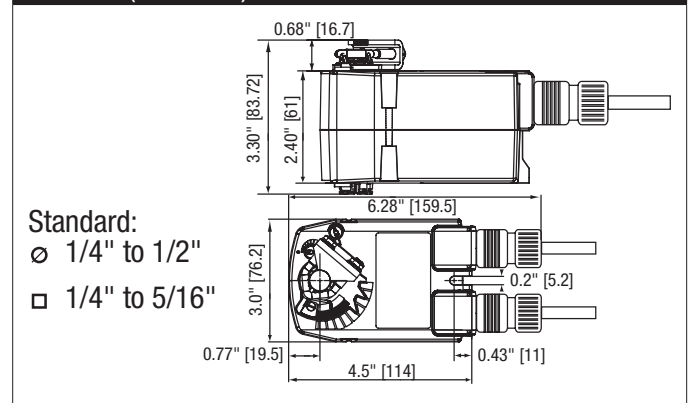
### Application

The type FSTF spring-return actuator is intended for the operation of smoke and combination fire and smoke dampers in ventilation and air-conditioning systems. The actuator will meet requirements of UL555 and UL555S when tested as an assembly with the damper. Square footage of damper operated will depend on make and model per damper manufacturer UL testing.

### Operation

Mounting of the actuator to the damper axle shaft or jackshaft is via a cold-weld clamp. Teeth in the clamp and V-bolt dig into the metal of both solid and hollow shafts maintaining a perfect connection. The specially designed clamp will not crush hollow shafts. The bottom end of the actuator is held by an anti-rotation strap or by a stud provided by the damper manufacturer. The actuator is mounted in its fail safe position with the damper blade(s) typically closed. Upon applying power, the actuator drives the damper to the open position. The internal spring is tensioned at the same time. If the power supply is interrupted, the spring moves the damper back to its fail-safe position.

### Dimensions (Inches[mm])



### Safety Notes

Screw a conduit fitting into the actuator's bushing. Jacket the actuator's input and output wiring with suitable flexible conduit. Properly terminate the conduit in a suitable junction box.

#### Retrofit Safety Note

Use of the FSTF for replacement of other makes of actuators is limited in damper area. The FSLF is preferred for direct coupled applications. The FSTF may be applied for linkage applications on dampers 1.5 sq.ft. and smaller at velocities under 2000 fpm.

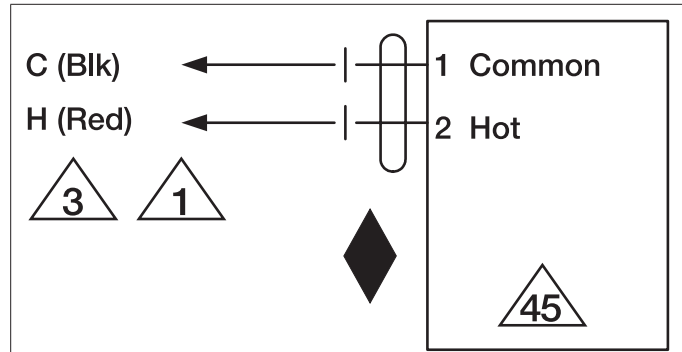
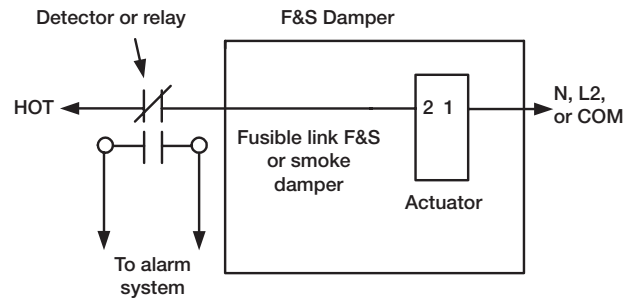
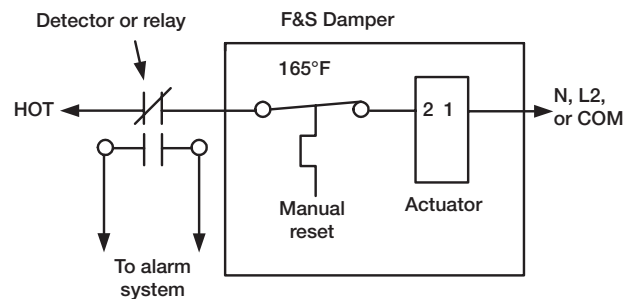
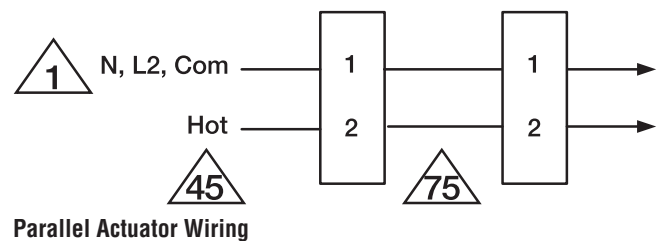
Accessories	
---KH-TF US	TFB(X) crankarm with 5/16" slot.
---KH-TF-1 US	TFB(X) crankarm with 1/4" slot.
KH-TF-1.1 US	TFB(X) crankarm for Shafts with 1/4" slot.
---TF-P	Anti-rotation bracket TF/NKQ/AM/NM/LM.
---TOOL-06	8 mm and 10 mm wrench.
---ZG-TF2	TFB(X) crankarm adaptor kit (T bracket included).
---ZG-TF112	TFB(X) crankarm adaptor kit (includes ZG-113).
---ZS-100	Weather shield - galvaneal (13" L x 8" W x 6" D).
---ZS-150	Weather shield - PC w/ foam seal (16" L x 8-3/8" W x 4" D).
---BAE165 US	165° F electric thermal sensor, SPST, normally closed.

**Typical Specification**

All smoke and combination fire and smoke dampers shall be provided with Belimo FSTF, FSLF, FSNF, or FSAF actuators. All substitutions must be approved before submission of bid. Damper and actuator shall have UL 555S Listing for 250°F &/or 350°F. Actuator shall have been tested to UL 2043 per requirements of IMC 602.2 and NEC 300.22 (c). Where position indication is required -S models with auxiliary switches or damper blade switches will be provided per code requirements.

**Wiring Diagrams**

- Provide overload protection and disconnect as required.
- Actuators may also be powered by 24 VDC.
- Actuators may be powered in parallel. Power consumption must be observed.
- Ground present on some models.
- Meets cULus requirements without the need of an electrical ground connection.


**24 VAC/DC**

**Typical smoke or fusible link damper wiring**

**Typical containment damper control wiring**

**Parallel Actuator Wiring**



**POSITION INDICATOR PACKAGE**

FOR COMBINATION FIRE/SMOKE AND SMOKE DAMPERS  
FOR USE WITH BELIMO AND HONEYWELL ACTUATORS

**MODEL: MLS-300**

**APPLICATION:**

When ordered with the MLS-300 Position Indicator Switch Pack, Nailor combination fire/smoke and smoke dampers that utilize factory installed Belimo or Honeywell fire/smoke actuators will be supplied as standard with an actuator that has an integral internal mounted switch pack. The auxiliary switches provide an on/off signal at two points in the actuator stroke and this signal can be routed to a Fire Fighter’s Smoke Control Station for remote open/closed damper position status in Smoke Control Management Applications. Alternatively, they may be field wired to a local accessible damper control panel (Nailor DCP16). Both provide a means to cycle test the damper as part of a scheduled building maintenance program.

**ELECTRICAL SWITCH RATINGS:**

**Honeywell:**

**Models MS4104F1210, MS4109F1210, MS4604F1210, MS4609F1210:**

Ratings (maximum load): 120 VAC/24 VDC, 3A resistive  
Settings (fixed): 7° nominal stroke, 85° nominal stroke

**Model MS8104F1210, MS8109F1210:**

Ratings (maximum load): 24 VAC/DC, 3A resistive  
Settings (fixed): 7° nominal stroke, 85° nominal stroke

**Model MS4120F1204, MS4620F1203, MS8120F1200:**

Ratings (maximum load): 250 VAC, 5A resistive  
Settings (fixed): 7° nominal stroke, 85° nominal stroke

**Belimo:**

**Model FSTF120-S, FSTF24-S, FSTF230-S:**

2 x SPST 3A resistive, 0.5A inductive @ 120 VAC,  
Settings (fixed): One switch at 10°, one switch at 80°

**Models FSLF24-S, FSLF120-S, FSLF230-S:**

2 x SPST 3A resistive, 0.5A inductive @ 120/250 VAC,  
1mA @ 5 VDC,  
Settings (fixed): One switch at 10°, one switch at 85°

**Models FSNF24-S, FSNF120-S, FSNF230-S:**

2 x SPDT 7A resistive, 2.5A inductive @ 120/250 VAC,  
Settings (fixed): One switch at 10°, one at 85°

**Model FSAFA24-S, FSAFA120-S, FSAF230A-S:**

2 x SPST 6A resistive, 2.5A inductive @ 120/250 VAC,  
Settings (fixed): One switch fixed at 10°, one at 85°

**Model FSAFB24-SR-S:**

2 x SPST 3A resistive, 0.5A inductive @ 120/250 VAC,  
Settings: One switch set at + 10°, one adjustable from 10° to 90°



**Fig. 1 - Typical Honeywell Fire/Smoke Actuator with auxiliary switches (MLS-300)**



**Fig. 2 - Typical Belimo Fire/Smoke Actuator with auxiliary switches (MLS-300)**

Refer to manufacturer’s submittal and installation and operating manual for complete details and wiring diagrams.

<b>SCHEDULE TYPE:</b>				
<b>PROJECT:</b>				
<b>ENGINEER:</b>	<b>DATE</b>	<b>B SERIES</b>	<b>SUPERSEDES</b>	<b>DRAWING NO.</b>
<b>CONTRACTOR:</b>	12 - 29 - 17	FD - ACC	4 - 28 - 14	MLS-300-3

## OpenAir™ GJD Series Electronic Damper Actuators for UL Listed Fire/Smoke and Smoke Control Dampers 2-Position, 30-second Run Time, 15-second Spring Return Time

Product Number	Operating Voltage			3-ft Plenum Cable	EFL Capability	Two Fixed Auxiliary Switches
	24 Vac ± 20%, 24 Vdc + 20%, - 10%	120 Vac ± 10%	230 Vac ± 10%			
GJD121.1U	•			•	•	
GJD126.1U	•			•	•	•
GJD221.1U		•		•	•	
GJD226.1U		•		•	•	•
GJD321.1U			•	•	•	
GJD326.1U			•	•	•	•

### Technical Data

Torque:	20 lb-in (2 Nm) (minimum)
Stall Torque:	35 lb-in (4 Nm) (minimum)
Run time for 90°:	30 seconds (nominal)
Spring Return:	15 seconds (maximum)
Nominal angle of rotation:	95°
Operating voltage:	24 Vac ±20%/ 24Vdc+20%-10% 120 Vac ±10%/ 230 Vac ±10%
<b>CAUTION:</b> Continuous use at voltages above the recommended tolerances may damage the actuator.	
Power Consumption:	<b>Running</b> <b>Holding</b>
GJD12x.1U, GJD22x.1U:	~10VA/5.0 W                      ~5VA/3.0 W
GJD32x.1U:	~12VA/5.0 W                      ~7VA/3.0 W
Damper shaft size:	1/2-inch (13 mm) round
Damper shaft length, minimum:	1.4-inch (36 mm) min. length
Agency listings:	UL60730 cUL CSA 60730 CE conformity for Residential, Commercial, and Industrial environments. Australian RCM conformity
Ambient temperature, operating:	0°F to 130°F (-18°C to 55°C), 250°F (121°C) one time per UL555S
Ambient temperature, storage/transport:	-40°F to 158°F (-40°C to 70°C)
Ambient humidity (non-condensing):	Maximum 95% rh non-condensing
Plenum-rated cable:	400°F (200°C)
Enclosure:	NEMA 1/IP40
Housing material:	Plenum-rated plastic
Pre-cabled connection:	18 AWG, 3 ft 3 x 3/8-in flexible conduit connector
Dimensions (Approximate):	5.61" H x 2.83" W x 2.48" D (142.6 mm H x 72 mm W x 63 mm D)
Weight:	1.32 lbs. (0.60 kg)
Country of Origin	USA

### Description

The OpenAir direct-coupled, 2-position, spring return electronic damper actuators are UL listed for smoke control dampers or for combination fire/smoke rated dampers. Actuators are designed to operate reliably in smoke control systems requiring Underwriter's Laboratories, Inc. UL555/555S rating when tested as an assembly with the damper and will meet requirements of UBC for 30-second opening and 15-second closing at 250°F (121°C).



### Features

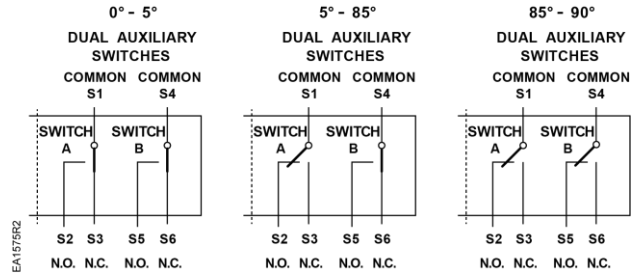
- Optional built-in auxiliary switches with fixed switch points at 5° and 85° rotation.
- Built-in Electronic Fusible Link (EFL) capability with three temperature ratings; 165°F, 212°F, and 250°F
- Reversible, fail-safe spring return
- Plenum-rated
- Pre-cabled
- 30-second operation at rated torque, temperature, and voltage
- Fixed Dual End Switches
  - 24 Vdc, 24 Vac to 250 Vac
  - 6A resistive
  - 2FLA/12 LRA
  - SPST
  - Fixed 5° and 85°

### Accessories

Electronic Fuse Link (24 Vac)	
ASK791.165	165°F (74°C)
ASK791.212	212°F (100°F)
ASK791.250	250°F (121°C)

## Maintenance

The National Fire Protection Association NFPA 92A Standard for Recommended Practice for Smoke-Control System and UL 864 Standard for Control Units and Accessories for Fire Alarm Systems, require weekly self-test for **dedicated** smoke control equipment used in a smoke control system. The National Fire Protection Association NFPA 72 Standard for National Fire Alarm Codes states that all life safety systems are to be functionally checked at least annually. The GJD actuator is designed such that no special cycling during long-term holding is required. The GJD actuator complies with the AMCA Standard 520 testing revision.



## Electronic Fusible Link

## Wiring Diagrams

**NOTE:** Actuators may be connected in parallel. Power consumption must be observed.

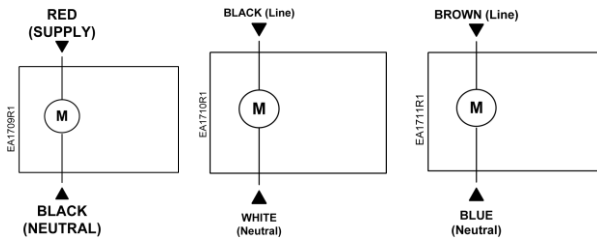


Figure 1.  
24 Vac/dc.

Figure 2  
120 Vac.

Figure 3.  
230 Vac.

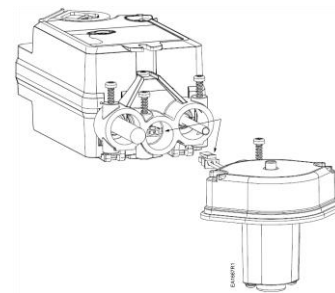


Figure 4. GJD Actuator and EFL.

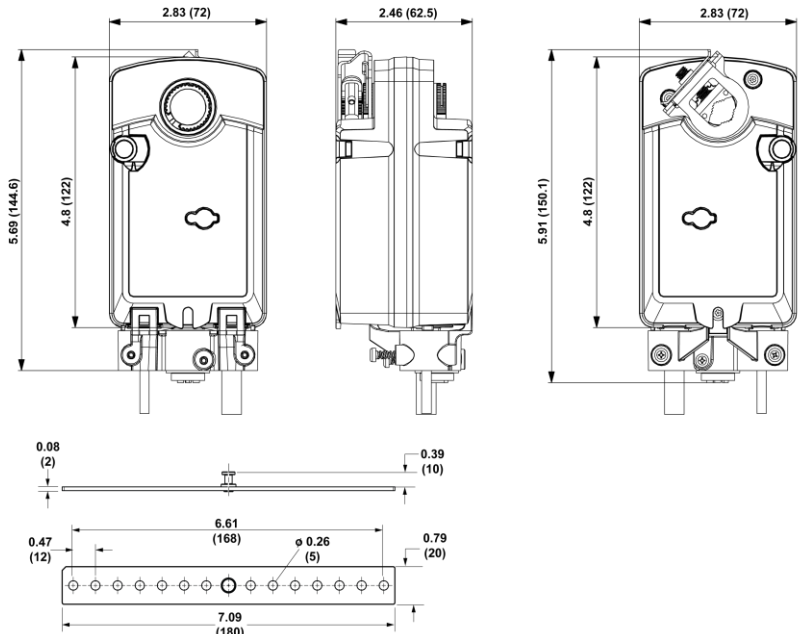


Figure 5. GJD Series Damper Actuator and Mounting Bracket Dimensions in Inches (Millimeters).

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## OpenAir™ GJD Series Electronic Damper Actuator Designed for UL Listed Fire/Smoke and Smoke Control Dampers

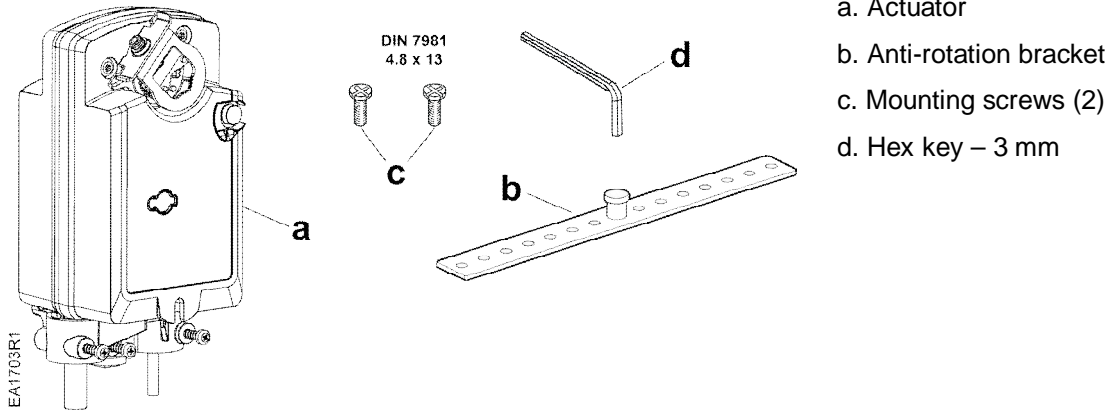


Figure 1. GJD Actuator Parts.

### Product Description

Step-by-step description for direct-coupled mounting of the OpenAir GJD fast-acting two-position rotary electronic damper actuator. Actuator is intended for control of approved fire and smoke leakage-rated HVAC dampers.

### Product Numbers

GJD121.1U  
 GJD126.1U  
 GJD221.1U  
 GJD226.1U  
 GJD321.1U  
 GJD326.1U

### Required Tools

- 3 mm hex wrench (provided)
- No. 2 Phillips screwdriver
- Marker or pencil
- Small, needle-nose pliers (for EFL installation)

### Prerequisites



**WARNING:**  
 Do not open the actuator housing.

**CAUTION:**  
 Continuous use at voltages above the recommended tolerances may damage the actuator.

### Warning/Caution Notations

<b>WARNING:</b>		Personal injury or loss of life may occur if you do not follow a procedure as specified.
<b>CAUTION:</b>		Equipment damage or loss of data may occur if you do not follow a procedure as specified.

### Installation

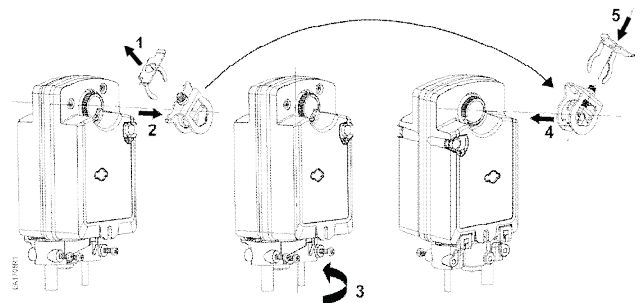


Figure 2. Actuator Mounting Orientation.

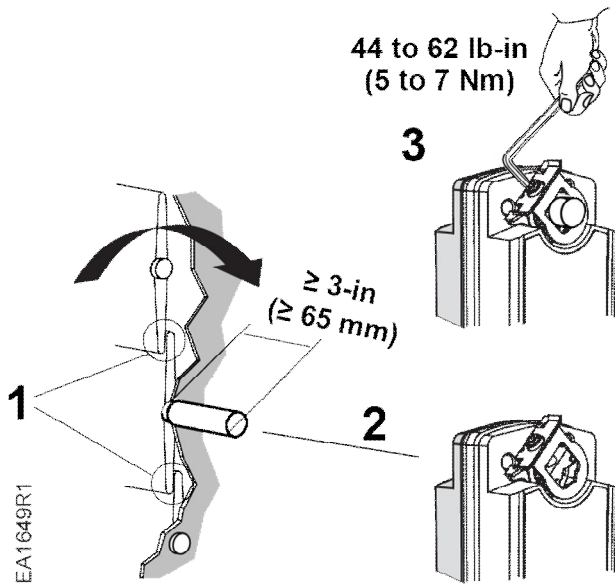


Figure 3. Shaft Length and Proper Shaft Adapter Location.

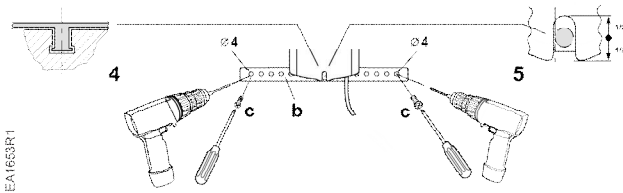


Figure 4. Anti-Rotation Bracket.

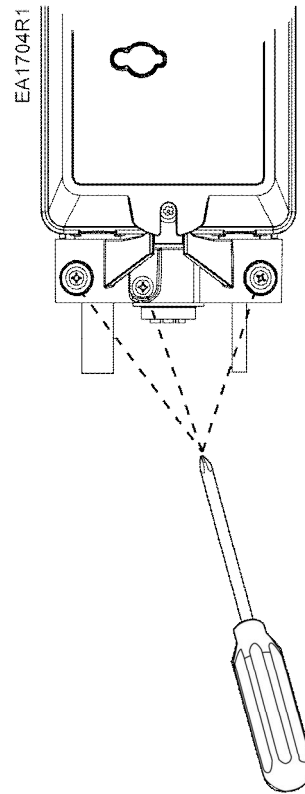


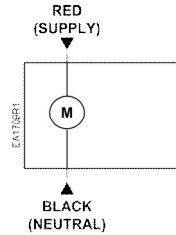
Figure 5. If using flexible conduit, insert the conduit into the proper opening and then tighten the conduit screws using a No. 2 Phillips Screwdriver.



## Wiring Diagrams

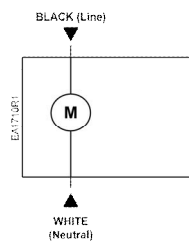
NOTE: All wiring must conform to NEC and local codes and regulations.

### 24 Vac/dc



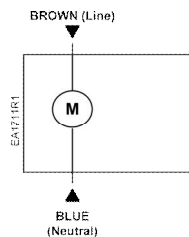
Function	Color
Supply	Red
Neutral	Black

### 120 Vac



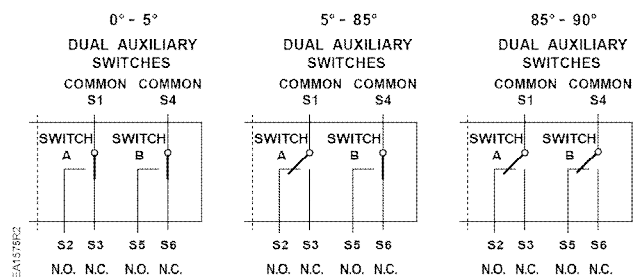
Function	Color
Line	Black
Neutral	White

### 230 Vac



Function	Color
Line	Brown
Neutral	Blue

## Auxiliary Switches



Actuator Position	Switch A Common S1 Connected to	Switch B Common S4 Connected to
0° to 5°	S3	S6
5° to 85°	S2	S6
85° to 90°	S2	S5



### CAUTION:

Mixed switch operation to the switching outputs of both dual end switches (5° and 85°) is not permitted.

Either AC line voltage from the same phase must be applied to all six outputs of the fixed dual end switches, or UL-Class 2 voltage must be applied to all six outputs.

## Wiring, Continued

### Electronic Fusible Link (EFL)

All GJD Electronic Damper Actuators are EFL-capable. EFLs are purchased separately. See Table 1.

**Table 1. Electronic Fusible Link Product Numbers.**

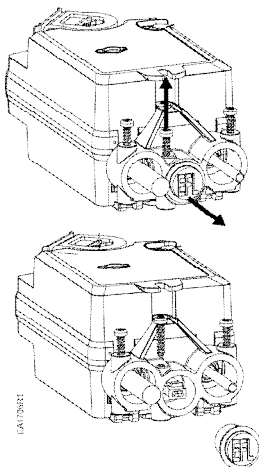
Part Number	Operation
ASK791.165	165°F (74°C)
ASK791.212	212°F (100°C)
ASK791.250	250°F (121°C)

#### NOTE:

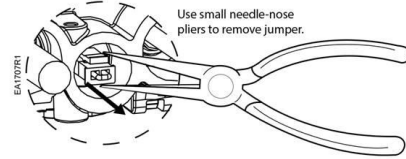
All EFLs are low voltage and do not need to be wired in conduit.

To install an EFL, do the following:

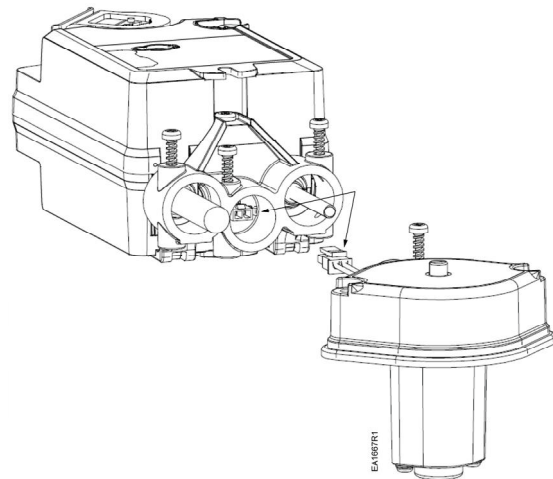
1. Remove and discard the plug marked **EFL**.



2. Using a small, needle-nose pliers or flat-blade screwdriver, remove the jumper.



3. Insert the quick connect from the EFL.



#### NOTE:

If you are not using an EFL, do not modify the actuator.

### Maintenance



#### CAUTION:

The GJD actuator does not require any periodic cycling to function properly as an integral part of an active smoke control damper system. **The National Fire Alarm Code NFPA 72 states that all life safety systems are to be functionally checked at least annually.** Check the smoke control damper/actuator every time you functionally check your smoke detectors, emergency lights, and/or power generators for operation.

## Dimensions

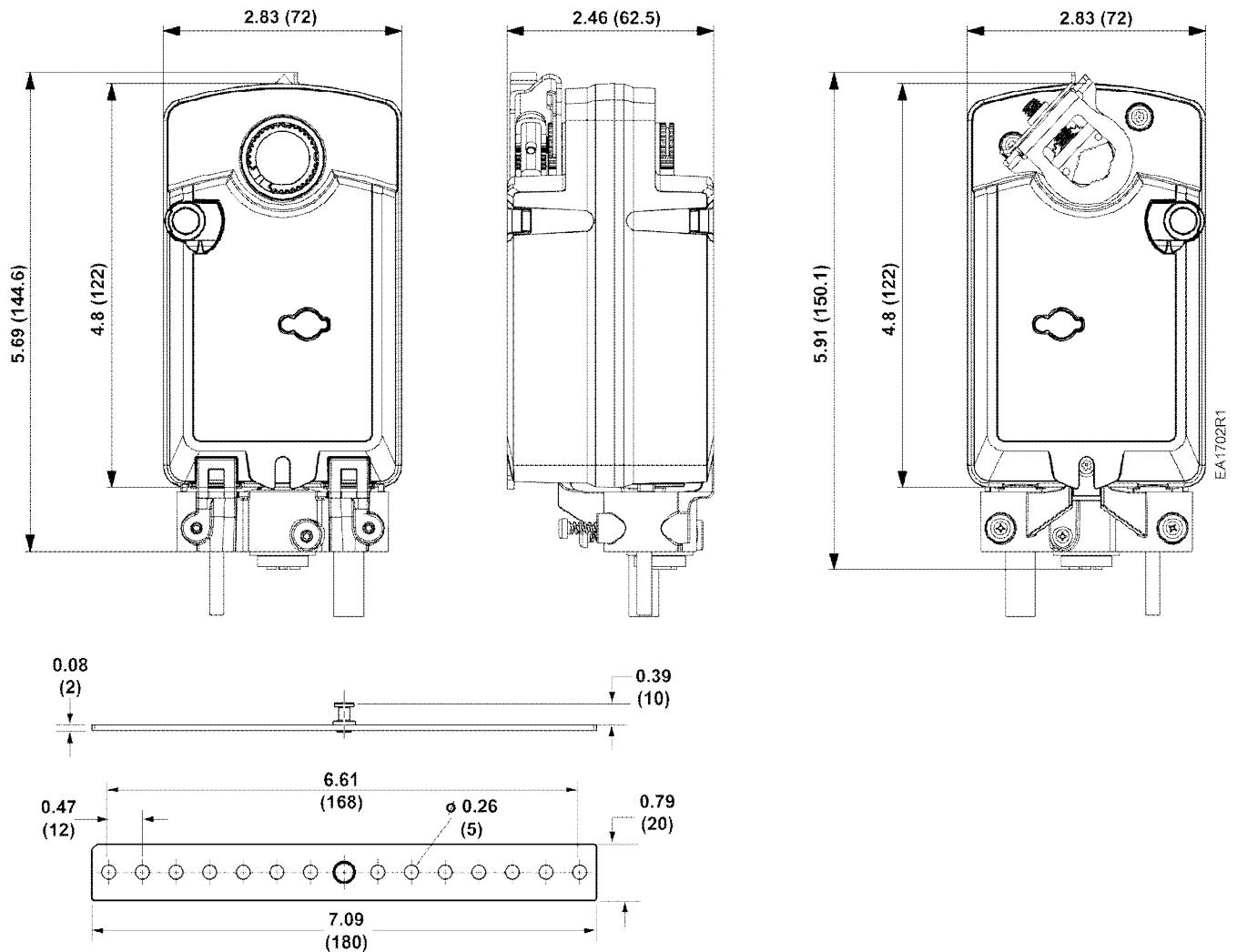


Figure 6. Dimensions of GJD OpenAir Actuator in Inches (mm).

## References

Technical Instructions  
 OpenAir Electric Damper Actuator Designed  
 for UL Listed Fire/Smoke and Smoke Control  
 Dampers

A6V11275901

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**"QUICK-SET" RETAINING ANGLES BOTH SIMPLIFY AND SPEED INSTALLATION,  
 SAVING BOTH TIME AND MONEY.**

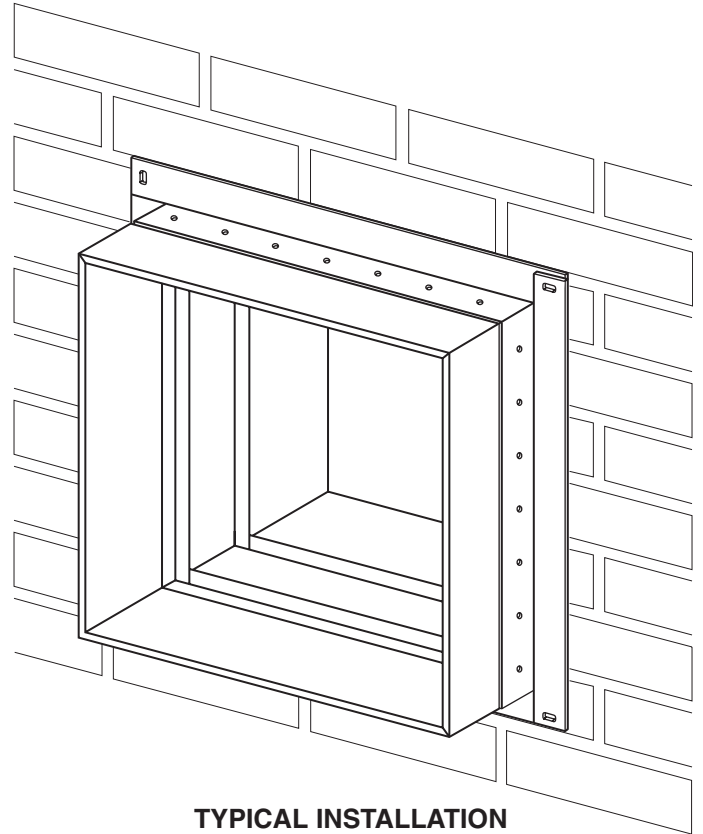
**BENEFITS:**

- One piece angles are fastened together in the corners. Only two sets of angles to handle per damper (rather than four separate angles per side).
- Angles are shipped with damper - no sorting or matching.
- Provided with pre-drilled fastening holes on 2" (51) centers to ensure correct angle/sleeve attachment.
- Factory fabricated by Nailor to suit the individual fire damper.
- Reduced cost when compared to conventional retaining angles.
- Dampers can ship directly to the job site complete with all necessary installation sheet metal hardware (saves on double handling at contractor's shop).
- Help ensure a correct installation as per U.L. approved installation instructions.

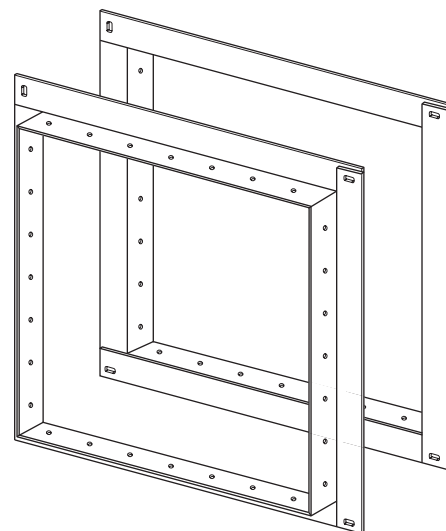
The majority of installing contractors view fire damper installation as a costly time consuming and troublesome procedure. Eight conventional angles must be custom fabricated for each damper either in a sheet metal shop or at the job site and sized to suit each individual damper. Invariably, they are mislaid or lost and must be matched to each factory supplied damper.

The Nailor "Quick-Set" solution solves the majority of problems. They are pre-formed to fit and ship with the individual damper for ultimate convenience. "Quick-Set" angles are supplied with correctly spaced pre-drilled screw-holes to ensure a quick, easy and accurate installation for all integral sleeve Nailor fire and combination fire/smoke dampers - no measuring required.

"Quick-Set" retaining angles provide the "complete" installation package. Simple, fast, convenient.



**TYPICAL INSTALLATION**



**TYPICAL PAIR OF PRE-ASSEMBLED  
 'QUICK-SET' RETAINING ANGLES**



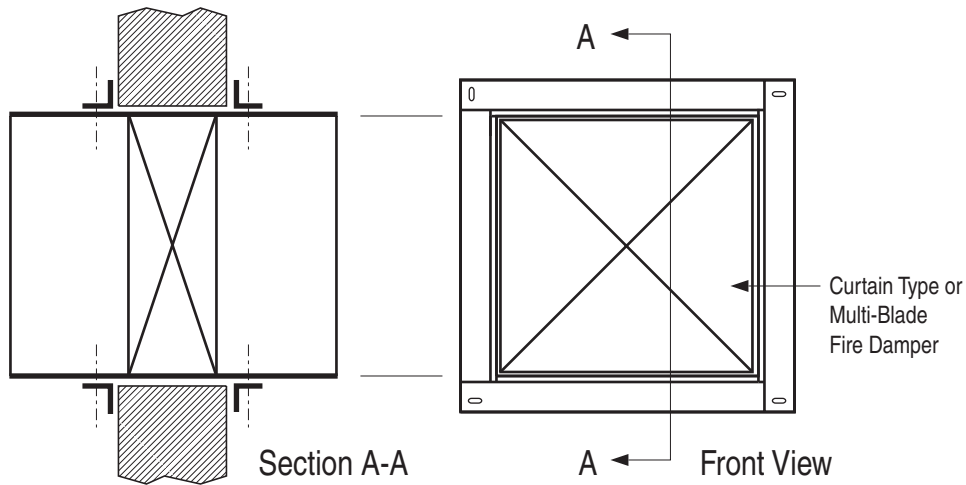


FIGURE 1. TYPICAL TWO SIDED INSTALLATION.

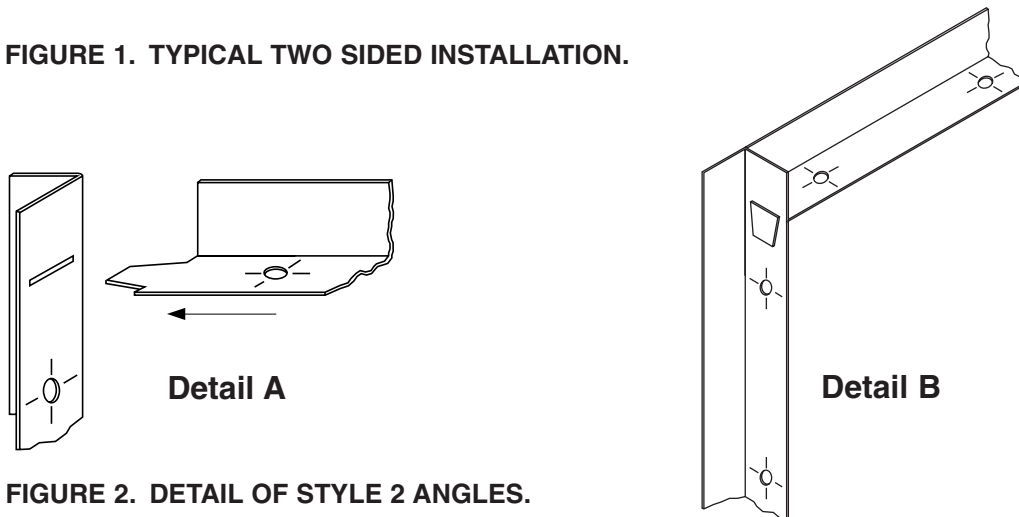


FIGURE 2. DETAIL OF STYLE 2 ANGLES.

**APPLICATION:**

The Nailor Quick-Set Retaining Angle System may be used in lieu of conventional retaining angles on all Nailor Fire and Combination Fire / Smoke Dampers.

Quick-Set angles are supplied in one of two styles, dependent upon fire resistance label, damper size and installation method.

**Style 1:** 1 1/2" x 1 1/2" x 20 ga. (38 x 38 x 1.0) Four sides are connected together with rivets in three corners.

Standard for the majority of applications with the following limitations:

- 1 1/2 hour label fire dampers
- Maximum Size: 36" x 36" (914 x 914)
- Two sided installation only

**Style 2:** 1 1/2" x 1 1/2" x 16 ga. (38 x 38 x 1.6) Slot and tab design. The retaining angle assembly for each side has four angles, each with a tab end and a slot end (Detail A). The tabs are to be inserted into the slots and knocked down either before or after fastening to the sleeve (Detail B).

- 1 1/2 or 3 hour label fire dampers
- Maximum Size: 90" x 48" (2286 x 1219) or 48" x 90" (1219 x 2286)
- Single side (1 1/2 hour only. Refer to Single Side Retaining Angles Supplementary Installation Instructions for size limitations) or two sided installation

**Refer to the Following Installation Instructions:**

Curtain Type Fire Dampers (D)0100 & (D)0500	FDINST
Curtain Type Fire Dampers 0200 & 0500 Thinline	FDTINST
Multi-Blade Fire Dampers 1200 & 1250	MBFDINST
Combination Fire/Smoke Dampers 1220	1220INST
Combination Fire/Smoke Dampers 1270	1270INST
Single Side Retaining Angles	FDSSRAINST



Dimensions are in inches (mm).



Houston, Texas  
Tel: 281-590-1172  
Fax: 281-590-3086

Las Vegas, Nevada  
Tel: 702-648-5400  
Fax: 702-638-0400

Toronto, Canada  
Tel: 416-744-3300  
Fax: 416-744-3360

Calgary, Canada  
Tel: 403-279-8619  
Fax: 403-279-5035