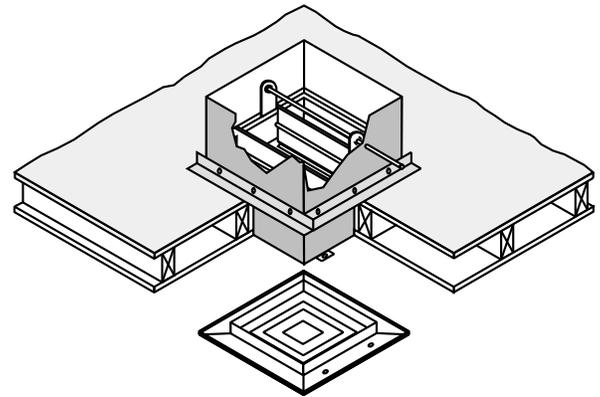
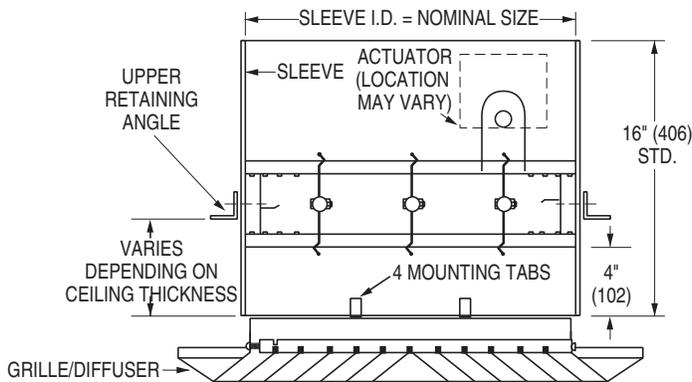




**TUNNEL CORRIDOR COMBINATION
FIRE/SMOKE DAMPER WITH STEEL
GRILLE/DIFFUSER
MODEL: 1271C-1**



QUALIFICATIONS:

- **UL 555 CLASSIFIED CORRIDOR DAMPER, 1 hr. Fire Resistance Rating (File #15441).**
- **UL 555S CLASSIFIED SMOKE DAMPER, Class I or II at 250°F or 350°F elevated temp. (File #9492).**
- **California State Fire Marshal: Fire Damper Listing No. 3225-0935:106.**
- **Meets the requirements of NFPA 90A, NFPA 92A for Fire/Smoke Dampers.**
- **Meets the requirements of City of Los Angeles, Uniform Building Code.**
- **Maximum velocity 2000 fpm @ 4" w.g.**

STANDARD SPECIFICATION:

- 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 vee groove or double-skin design.
- Sleeve:** 16" x 20 ga. (406 x 1.0) standard.
- Upper Retaining Angles:** 1 1/2" x 1 1/2" x 16 ga. (38 x 38 x 1.6) galvanized steel (by Nailor).
- Linkage:** Concealed in frame.
- Bearings:** 1/2" (13) dia. self-lubricating oilite bronze.
- Axles:** 1/2" (13) dia. plated steel double bolted to blades.
- Jamb Seals:** Cambered stainless steel.
- Blade Seals:** Stainless steel on vee groove blade.
- Heat Responsive Device (Controlled Closure):**
250°F (121°C) std. 165°F (74°C), 212°F (100°C) and, with ERL only, 350°F (176°C) available. ERL (Electric Resettable Link) is standard on all dampers with electric actuators. PRL (Pneumatic Replaceable Link) is standard on all dampers with pneumatic actuators.
- Compatible Steel Supply or Return Air Grille/Diffuser**
(various models available).
- Minimum Size:** 8" x 8" (203 x 203).
- Maximum Size:** 24" x 24" (610 x 610).

LEAKAGE CLASS / ELEVATED TEMPERATURE:

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

ACTUATOR SELECTION:

- Electric** **Pneumatic Model** _____ .

Actuators are mounted for Fail Closed (Normally Closed) operation in accordance with code requirements.

ACTUATOR LOCATION:

- Out of airstream In the airstream

OPTIONS:

- 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.
- Non-standard sleeve length or gauge.**
Specify: _____ inches (mm) x _____ ga.
- Factory mounted upper retaining angles.**
Specify overall ceiling thickness: _____ inches (mm).
- SRT Square-to-Round Transition Collar.**
(top of damper) Dia. = _____ .
- Special Features.**
Specify: _____ .

GRILLE/DIFFUSER SELECTION:

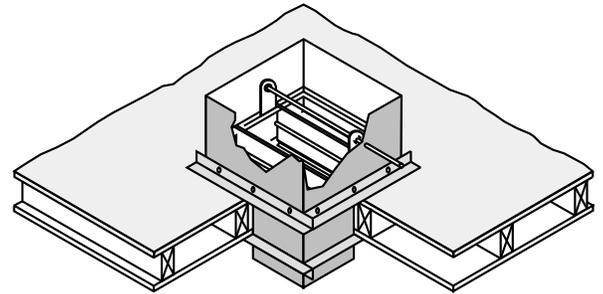
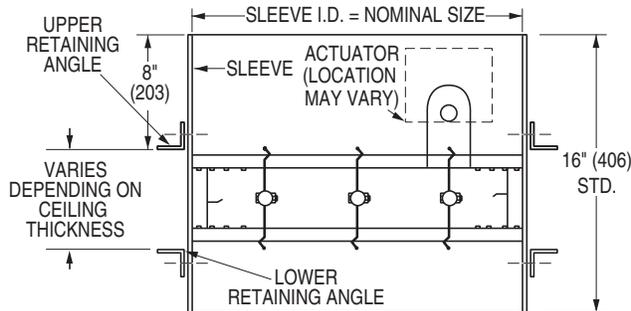
- Compatible Steel Supply or Return Grille/Diffuser by Nailor. (see attached submittal dwg. for model selection).
- Grille/Diffuser by others.

For installation instructions, see IOM-TCFSDINST.

SCHEDULE TYPE:		Dimensions are in inches (mm).			
PROJECT:					
ENGINEER:	DATE	B SERIES	SUPERSEDES	DRAWING NO.	
CONTRACTOR:	6 - 16 - 16	1270C	1 - 19 - 05	1270C-1	



**TUNNEL CORRIDOR COMBINATION
FIRE/SMOKE DAMPER FOR
DUCTED INSTALLATION
MODEL: 1271C-2**



QUALIFICATIONS:

- **UL 555 CLASSIFIED CORRIDOR DAMPER, 1 hr. Fire Resistance Rating (File #15441).**
- **UL 555S CLASSIFIED SMOKE DAMPER, Class I or II at 250°F or 350°F elevated temp. (File #9492).**
- **California State Fire Marshal: Fire Damper Listing No. 3225-0935:106.**
- **Meets the requirements of NFPA 90A, NFPA 92A for Fire/Smoke Dampers.**
- **Meets the requirements of City of Los Angeles, Uniform Building Code.**
- **Maximum velocity 2000 fpm @ 4" w.g.**

STANDARD SPECIFICATION:

- 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 vee groove or double-skin design.
- Sleeve:** 16" x 20 ga. (406 x 1.0) standard.
- Upper Retaining Angles:** 1 1/2" x 1 1/2" x 16 ga. (38 x 38 x 1.6) galvanized steel (by Nailor).
- Lower Retaining Angles:** 1 1/2" x 1 1/2" x 16 ga. (38 x 38 x 1.6) galvanized steel by installing contractor (optionally by Nailor).
- Linkage:** Concealed in frame.
- Bearings:** 1/2" (13) dia. self-lubricating oilite bronze.
- Axles:** 1/2" (13) dia. plated steel double bolted to blades.
- Jamb Seals:** Cambered stainless steel.
- Blade Seals:** Stainless steel on vee groove blade.
- Heat Responsive Device (Controlled Closure):**
250°F (121°C) std. 165°F (74°C), 212°F (100°C) and, with ERL only, 350°F (176°C) available.
ERL (Electric Resettable Link) is standard on all dampers with electric actuators. PRL (Pneumatic Replaceable Link) is standard on all dampers with pneumatic actuators.

Minimum Size: 8" x 8" (203 x 203).
Maximum Size: 24" x 24" (610 x 610).

LEAKAGE CLASS / ELEVATED TEMPERATURE:

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

ACTUATOR SELECTION:

- Electric** **Pneumatic Model** _____ .

Actuators are mounted for Fail Closed (Normally Closed) operation in accordance with code requirements.

ACTUATOR LOCATION:

- Out of airstream In the airstream

OPTIONS:

- 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.
- Non-standard sleeve length or gauge.**
Specify: _____ inches (mm) x _____ ga.
- Factory mounted upper retaining angles.**
- Lower retaining angles by Nailor.**
(Shipped loose for field attachment).
- Special Features.**
Specify: _____ .

Square-to-Round Transition Collars:

(Factory mounted and caulked to UL requirements).

- SRT** (top of damper) Dia. = _____ .
- SRB** (bottom of damper) Below ceiling for round neck diffuser steel duct/flex duct connection.
Dia. = _____ .
- SR2** (top and bottom) Dia. = _____ .

For installation instructions, see IOM-TCFSDINST.

SCHEDULE TYPE:		Dimensions are in inches (mm).			
PROJECT:					
ENGINEER:	DATE	B SERIES	SUPERSEDES	DRAWING NO.	
CONTRACTOR:	6 - 16 - 16	1270C	1 - 19 - 05	1270C-2	

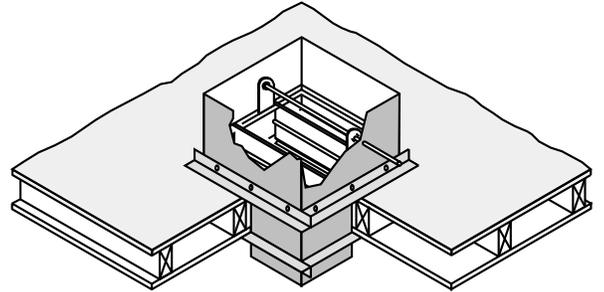


**TUNNEL CORRIDOR OR COMBINATION
FIRE/SMOKE DAMPER
VEE GROOVE BLADE
MODEL: 1271C-3**

QUALIFICATIONS:

- **UL 555 CLASSIFIED CORRIDOR DAMPER, 1 hr. Fire Resistance Rating (File #9492).**
- **UL 555 CLASSIFIED FIRE DAMPER, 1 1/2 hr. Fire Resistance Rating (File #9492).**
- **UL 555S CLASSIFIED SMOKE DAMPER, Class I or II at 250°F or 350°F elevated temp. (File #9492).**
- **California State Fire Marshal Listing No. 3225-0935:106.**
- **Meets the requirements of NFPA 90A, NFPA 92A for Fire/Smoke Dampers.**
- **Meets the requirements of City of Los Angeles, Uniform Building Code.**
- **Maximum velocity 2000 fpm @ 4" w.g. (up to 4000 fpm @ 8" w.g. with specific actuators. Consult Nailor).**

Model 1271C-3 is both a 1 hr. rated corridor damper for use in corridor ceilings and a standard 1 1/2 hr. rated combination fire/smoke damper for use in walls and floors. The dual rating makes it ideal for stocking as the unit can be supplied when either type of damper is required by the local customer. Model 1271C-3 is supplied complete with upper retaining angles as well as mounting tabs for use with a steel grille/diffuser. The damper may be installed using the single-side retaining angles method. Lower retaining angles are available for ducted corridor or standard wall/floor combination fire/smoke applications when the two-sided angles installation is utilized.



STANDARD SPECIFICATION:

- 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 vee groove or double-skin design.
- Sleeve:** 16" x 20 ga. (406 x 1.0) standard.
- Upper Retaining Angles:** 1 1/2" x 1 1/2" x 16 ga. (38 x 38 x 1.6) galvanized steel (by Nailor).
- Lower Retaining Angles:** 1 1/2" x 1 1/2" x 16 ga. (38 x 38 x 1.6) galvanized steel by installing contractor (optionally by Nailor) when required.
- Linkage:** Concealed in frame.
- Bearings:** 1/2" (13) dia. self-lubricating oilite bronze.
- Axles:** 1/2" (13) dia. plated steel double bolted to blades.
- Jamb Seals:** Cambered stainless steel.
- Blade Seals:** Stainless steel on vee groove blade.
- Heat Responsive Device (Controlled Closure):**
250°F (121°C) std. 165°F (74°C), 212°F (100°C) and, with ERL only, 350°F (176°C) available.
ERL (Electric Resettable Link) is standard on all dampers with electric actuators. PRL (Pneumatic Replaceable Link) is standard on all dampers with pneumatic actuators.
- Minimum Size:** 8" x 8" (203 x 203).
- Maximum Size:** 24" x 24" (610 x 610).

LEAKAGE CLASS / ELEVATED TEMPERATURE:

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

ACTUATOR SELECTION:

- Electric** **Pneumatic** Model _____ .

Actuators are mounted for Fail Closed (Normally Closed) operation in accordance with code requirements.

ACTUATOR LOCATION:

- Out of airstream In the airstream

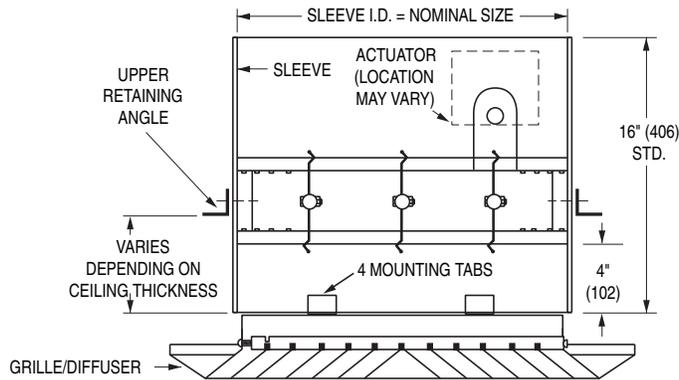
OPTIONS:

- 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.
- Factory mounted upper retaining angles.**
- Lower retaining angles by Nailor.** (Shipped loose for field attachment).
- Special Features.**
Specify: _____ .

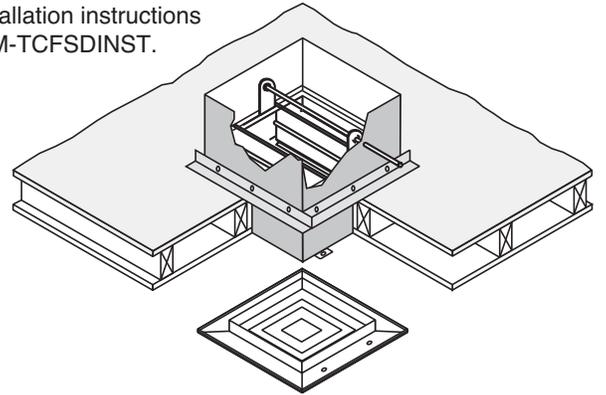
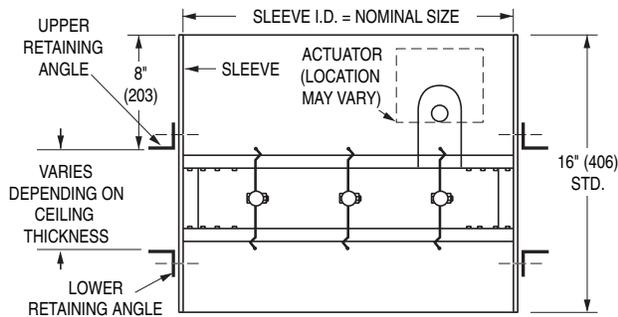
For installation instructions, see IOM-TCFSDINST (Tunnel Corridor damper) or IOM-1270INST (Combination Fire/Smoke damper).

For supplementary installation instructions for Single-Side Retaining Angles see IOM-FDSSRAINST.

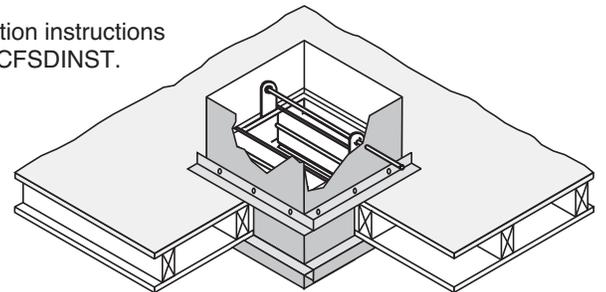
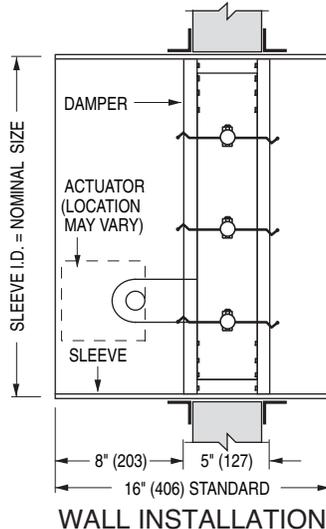
SCHEDULE TYPE:		Page 1 of 2			
PROJECT:		Dimensions are in inches (mm).			
ENGINEER:	DATE	B SERIES	SUPERSEDES	DRAWING NO.	
CONTRACTOR:	6 - 16 - 16	1270C	12 - 19 - 05	1270C-3	

MODEL 1271C-3 APPLICATIONS:
TUNNEL CORRIDOR DAMPER WITH STEEL GRILLE/DIFFUSER:


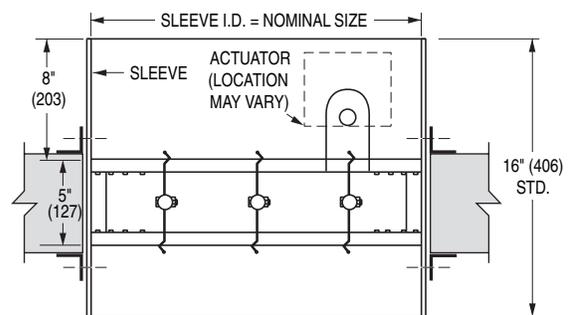
For installation instructions see IOM-TCFSDINST.


TUNNEL CORRIDOR DAMPER FOR DUCTED INSTALLATIONS:


For installation instructions see IOM-TCFSDINST.


COMBINATION FIRE/SMOKE DAMPER FOR WALLS AND FLOORS:


For installation instructions see IOM-1270INST.


SCHEDULE TYPE:
PROJECT:
ENGINEER:
CONTRACTOR:

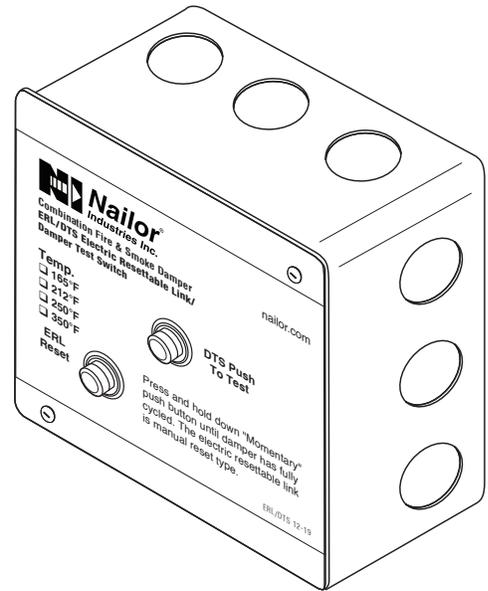
 Page 2 of 2
 Dimensions are in inches (mm).

DATE	B SERIES	SUPERSEDES	DRAWING NO.
6 - 16 - 16	1270C	12 - 19 - 05	1270C-3

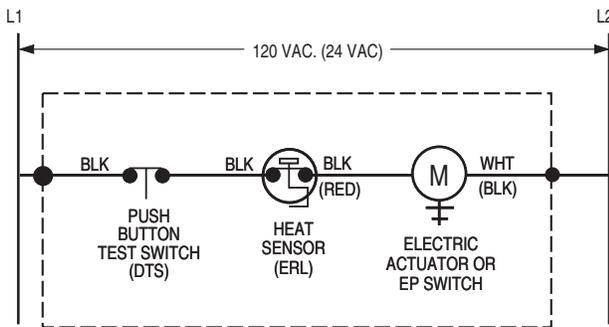
The DTS (Damper Test Switch) is an optional "momentary" push button test switch available on all Nailor smoke and combination fire/smoke dampers. The DTS provides the ability to "cycle test" the damper by pushing and holding down the button until the damper has cycled and closure has been visually verified, 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

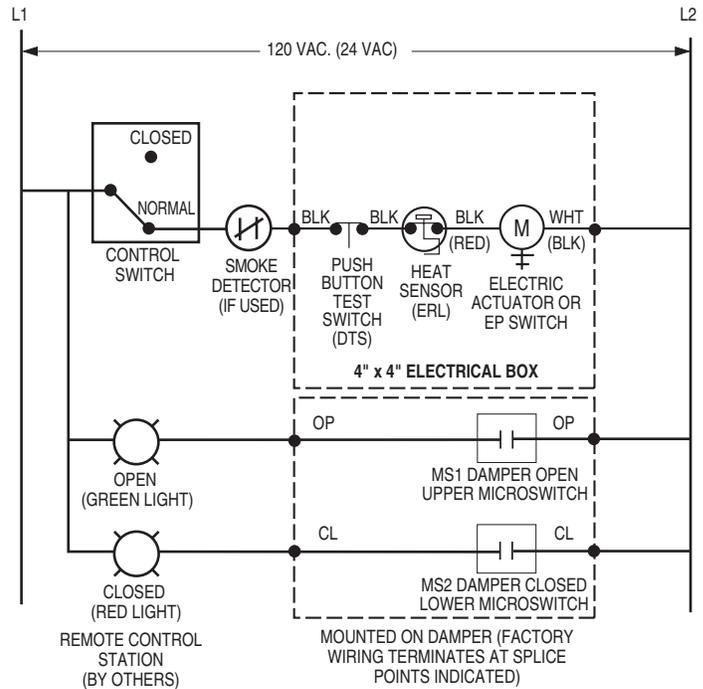


Figure 2. DTS/ERL with MLS-300 Belimo (actuator aux. switches) Position Indicator Package

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

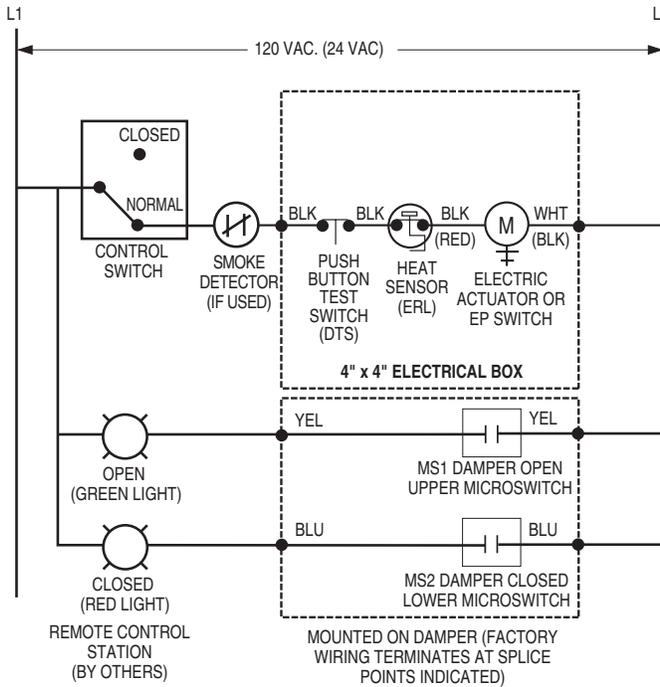


Figure 3. DTS/ERL with MLS-300 Nailor or Honeywell (actuator aux. switches) Position Indicator Package

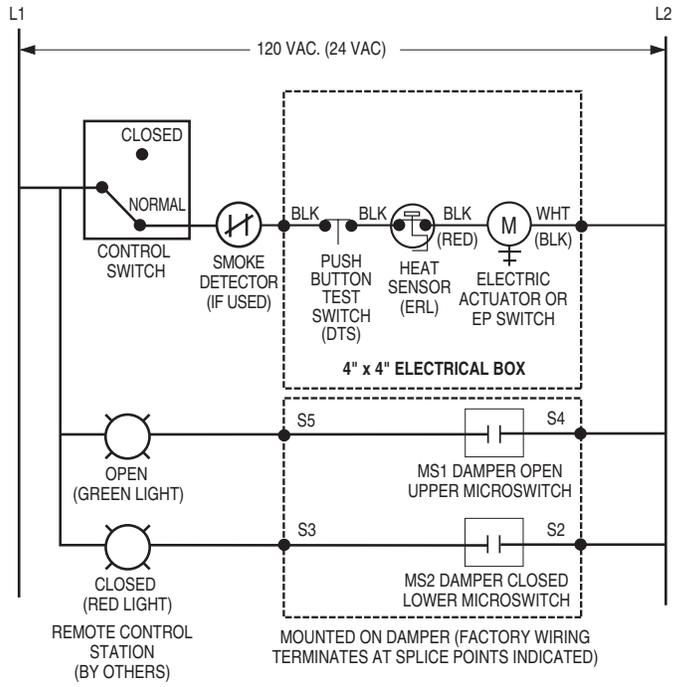
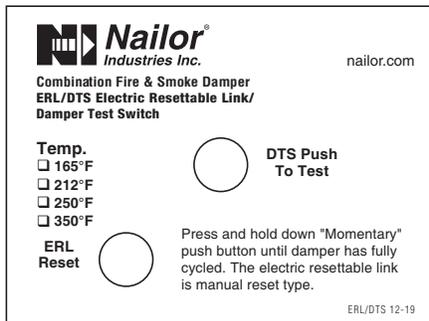
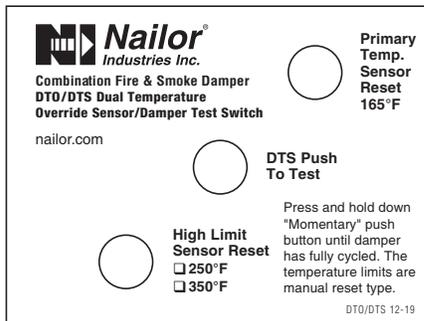


Figure 4. DTS/ERL with MLS-300 Siemens GJD Series (actuator auxiliary switches) Position Indicator Package

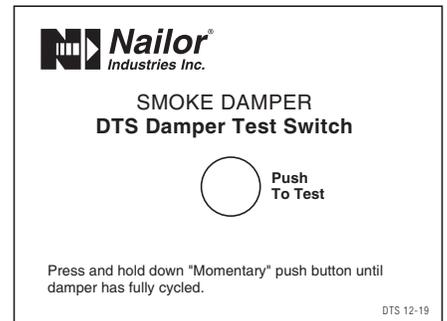
DTS LABEL VARIATIONS:



ERL/DTS Combination Fire/Smoke Damper



DTO/DTS Combination Fire/Smoke Damper



DTS Smoke Damper

SCHEDULE TYPE

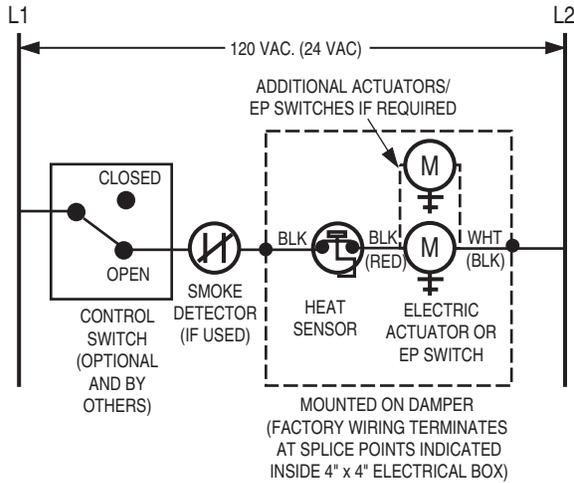
PROJECT

ENGINEER

CONTRACTOR



ELECTRIC RESETTABLE LINK FOR COMBINATION FIRE / SMOKE DAMPERS MODEL: ERL



APPLICATION AND OPERATION:

The ERL Electric Resettable Link (heat sensor) is standard on all Nailor combination fire/smoke dampers with an electric actuator. The ERL is a thermally responsive bimetal disc/thermostat that opens and closes electrical contacts at a specific calibrated temperature. The ERL is a UL Classified Heat Responsive Device. The standard ERL has a fixed temperature setting of 250°F (121°C) which is the UL listed elevated/degradation temperature of the damper/actuator assembly. A 350°F (177°C) elevated temperature classification and ERL is available as an option.

[A 165°F and 212°F (74°C and 100°C) ERL are also available. Local codes have specified 165°F (74°C) widely in the past.]

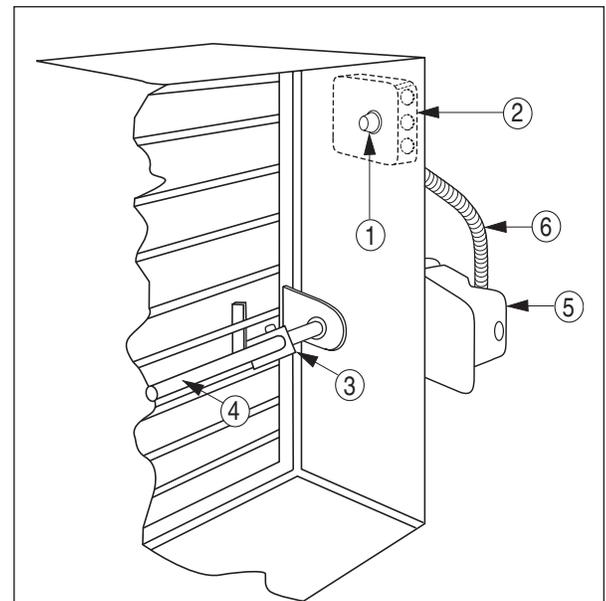
The ERL's function is to sense an abnormally high temperature, as caused by a fire and allow the damper to close in order to prevent the spread of fire and smoke. The sensor interrupts power to the actuator and the actuator's spring return mechanism causes the damper to close and lock.

In smoke control mode, when a signal is detected via a normally closed smoke detector connection, the damper will close and remain closed until the smoke signal ceases. The system will then reset when power is re-applied and the damper will open. The damper may be closed at anytime by placing a control switch (optional and by others) in the closed position.

The ERL in combination with all Nailor qualified electric or pneumatic actuators provides controlled closure and eliminates the instantaneous damper closure associated with traditional fusible links that can cause damage to the ductwork.

The ERL sensor is of the manual reset type and can be reset after the temperature has cooled down below the sensor set point. Exposure to actual fire conditions may render these devices unusable. In this case, it is recommended that a careful inspection of the damper, actuator and ERL be performed.

The ERL requires factory installation and wiring together with the associated actuator to meet UL requirements. If the damper is provided with a pneumatic actuator, an EP switch is required.



DESCRIPTION:

1. ERL 165, 212, 250, 350 Electric Resettable Link (heat sensor)
2. Electrical Junction Box (and EP Switch with Pneumatic Actuator)
3. Over-Center Knee Lock
4. Jackshaft
5. Actuator
6. Flexible Conduit

SCHEDULE TYPE

PROJECT

ENGINEER

CONTRACTOR

Dimensions are in inches (mm).

DATE

B SERIES

SUPERSEDES

DRAWING NO.

9 - 9 - 20

FD-ACC

9 - 23 - 02

ERL

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.

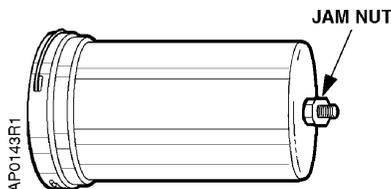


Figure 1. Actuator Jam Nut Location.

Required Tools

- Flat-blade screwdriver
- Adjustable crescent wrench
- Pliers

Warning/Caution Notations

WARNING		Personal injury/loss of life may occur if the user does not follow a procedure as specified.
CAUTION		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).

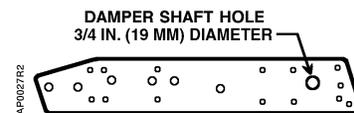


Figure 2. Actuator Mounting Plate.

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

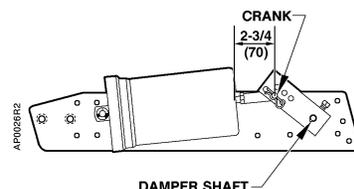


Figure 3. Extended Shaft Mounting.

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 ¹	331-2905 ¹	331-2906 ¹	331-2961 ¹	331-2909 ¹
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 ²	Universal kit	331-3000	331-3001	331-3002	331-2973 ¹	331-3004
Actuator, integral pivot with pivot post, and positioning relay ²	Universal kit with positioning relay	—	—	—	332-2973	—

¹ UL Recognized Components for Fire/Smoke Applications.

² 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.

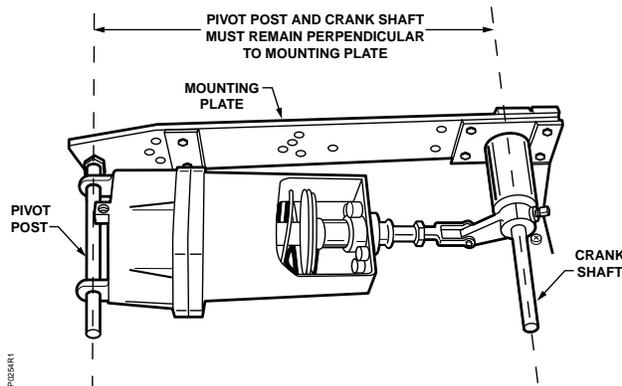


Figure 4. Perpendicular Mounting.

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.

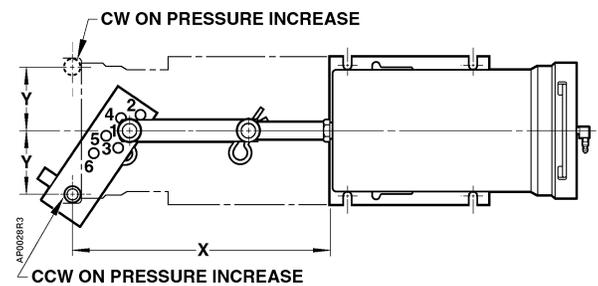


Figure 5. Fixed Mounted Actuator Assembly.

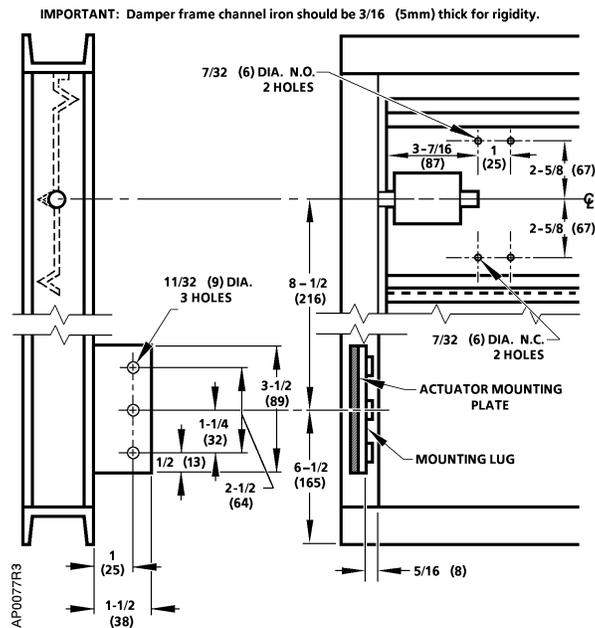
Frame Mounting

Expected Installation Time: 3 hours

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

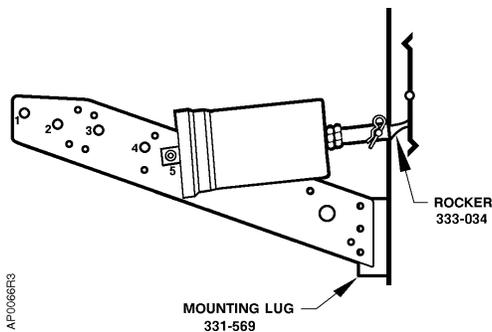
Mounting lug: 331-569

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.



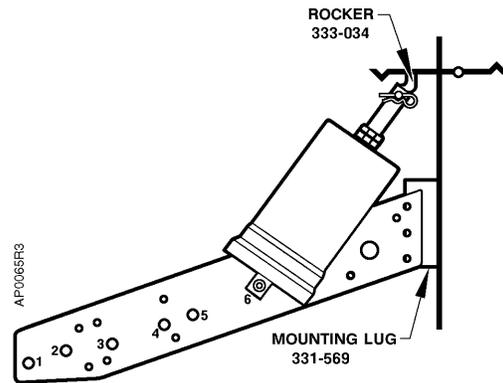
**Figure 6. Frame Mounting Dimensions.
 Dimensions in Inches (Millimeters).**

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 ¹
Actuator, integral pivot and forward travel stops	Pivot	—		331-2988
Actuator with clevis	Pivot ²	331-2857	331-2858	331-2856 ¹
Actuator with clevis and positioning relay	Pivot ²	—	—	332-2856
Actuator, integral pivot with pivot post ³	Extended Shaft	331-3012	331-3013	331-3011 ¹
Actuator, integral pivot with pivot post and positioning relay ³	Extended Shaft with Positioning Relay	—	—	332-3011

¹ UL Recognized Components for Fire/Smoke Applications.

² Also order frame mounting kit accessories.

³ 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).

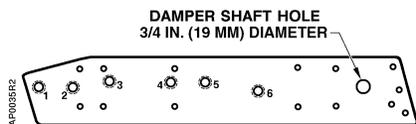


Figure 1. Actuator Mounting Plate.

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

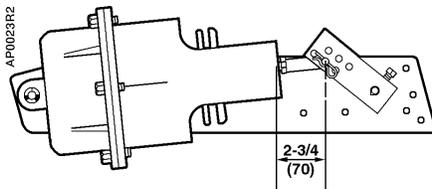


Figure 2. Extended Shaft Mounting.

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

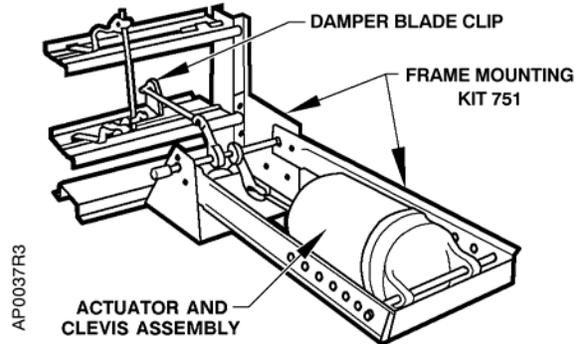


Figure 3. One-section Damper.

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.

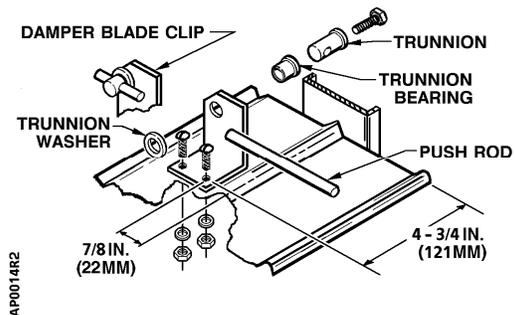


Figure 4. Damper Blade Clip.

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)

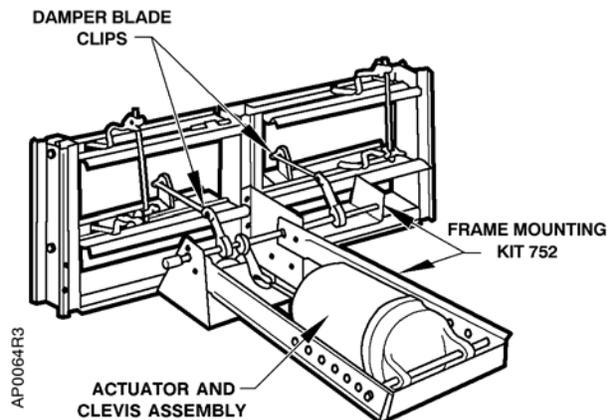


Figure 5. Two-section Damper.

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).

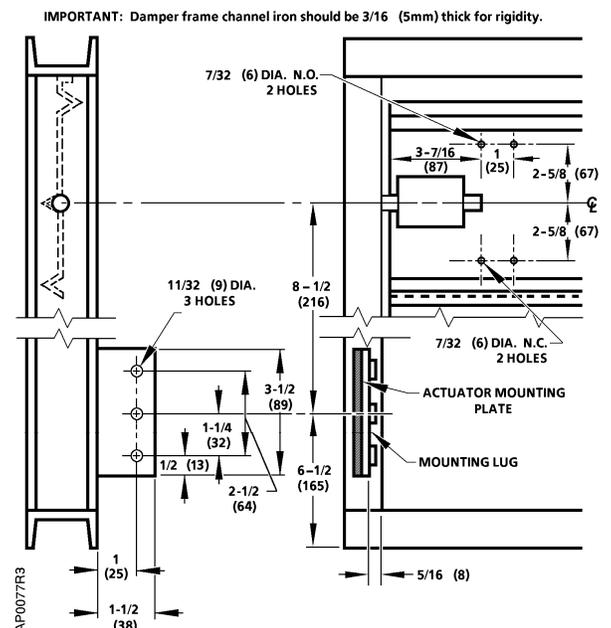


Figure 6. Frame Mounting-Type B Dimensions. Dimensions in Inches (Millimeters).

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.

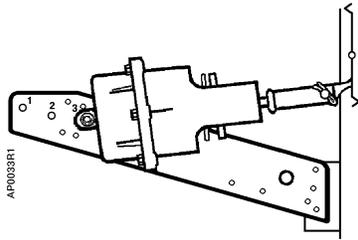


Figure 7. No. 6 Actuator Frame Mounting, Normally Closed Damper.

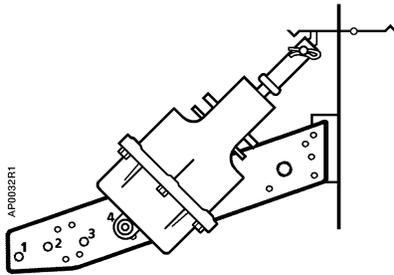


Figure 8. No. 6 Actuator Frame Mounting, Normally Open Damper.

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.

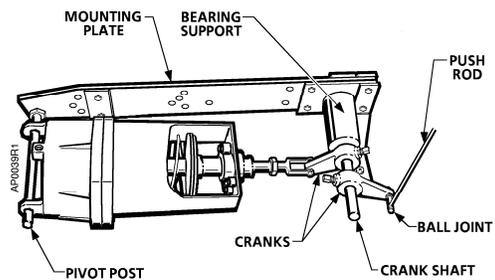


Figure 9. Extended Shaft Remote Mounting Assembly.

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 ^a
MS4620F1005	230	None
MS4620F1203	230	2 SPST ^a
MS8120F1002	24	None
MS8120F1200	24	2 SPST ^a
S2024-F (MS8120S1006)	24	None
S20230-F (MS4620S1009)	230	
S2024-F-SW2 (MS8120S1204)	24	2 SPDT ^a
S20230-F-SW2 (MS4620S1207)	230	

^a 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)

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

M S 41 20 F 1 2 XX

Table 3. Actuator Selection (S20 Series).

S	Fail Safe Function (Spring Return)
20	20 Nm (175 lb-in.)
24	24 Vac 2-position Control; Reversible Mount Spring Return
230	230 Vac 2-position Control; Reversible Mount Spring Return
F	Fire and Smoke Actuator
	No Auxiliary Switches
-SW2	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. ^a	X	X		
CE		X	X	
C-TICK		X	X	X

^a Plenum applications require that conductors be enclosed in conduit (see Wiring section for conduit details).

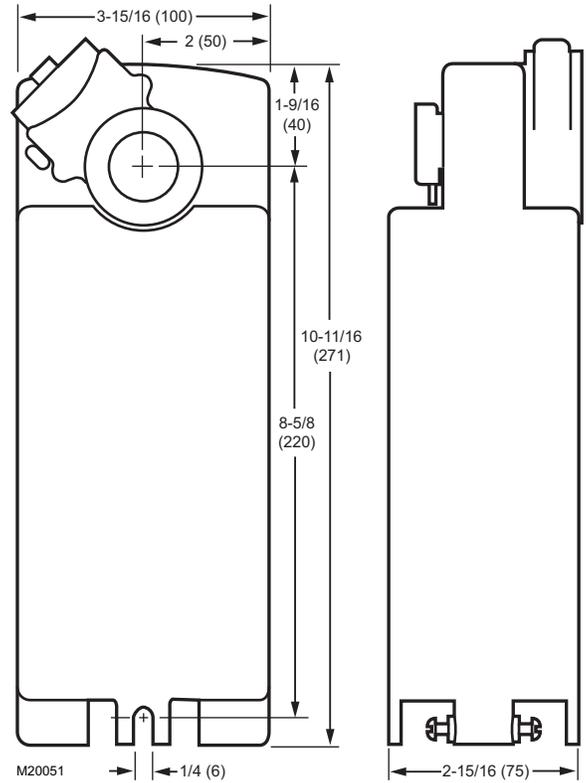


Fig. 1. Dimensional drawing of actuator in in. (mm).

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.

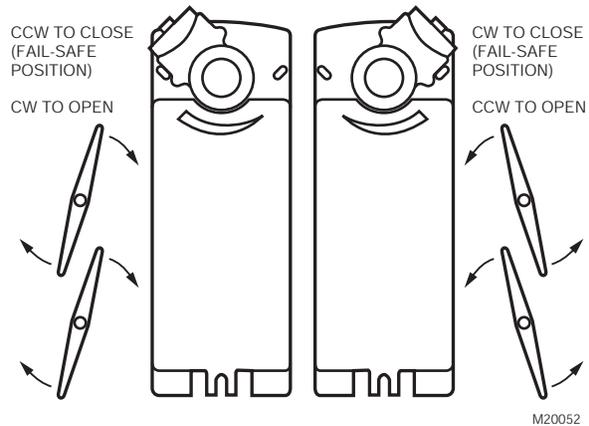


Fig. 2. Spring Return DCA mounting orientation.

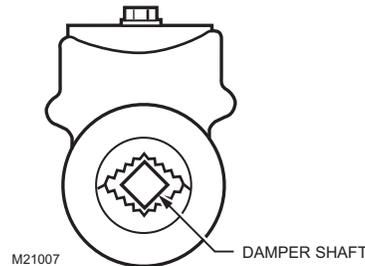


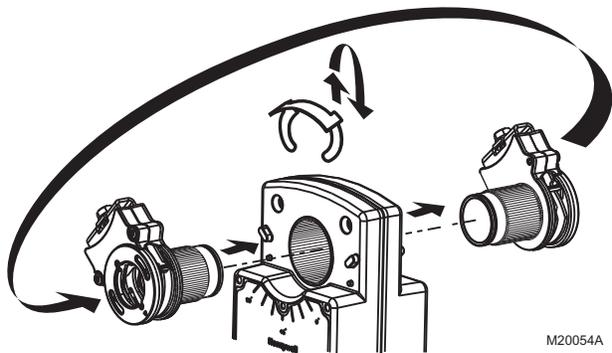
Fig. 3. Proper mounting to square damper shaft.

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

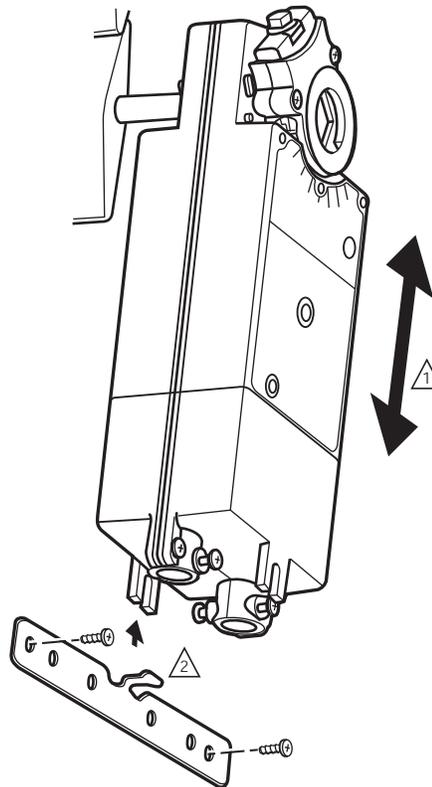
Actuator Damage Hazard.
Using actuator as shaft bearing causes device damage.
 Use actuator only to supply rotational torque. Avoid any side loads to actuator output coupling bearings.

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.

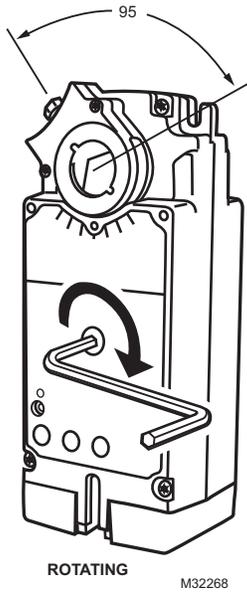


Fig. 6. Manual positioning.

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.

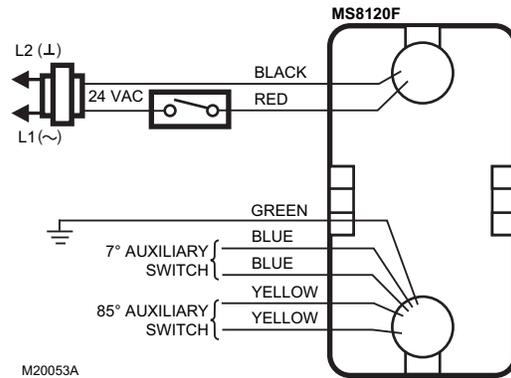


Fig. 7. Typical 24 Vac wiring (MS Series).

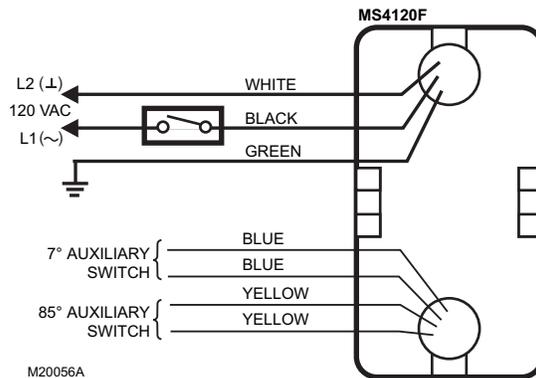


Fig. 8. Typical 120 Vac wiring (MS Series).

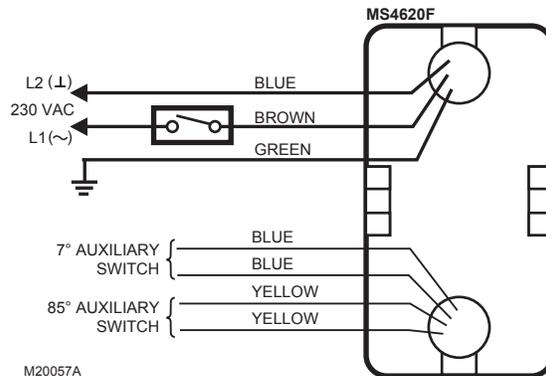


Fig. 9. Typical 230 Vac wiring (MS Series).

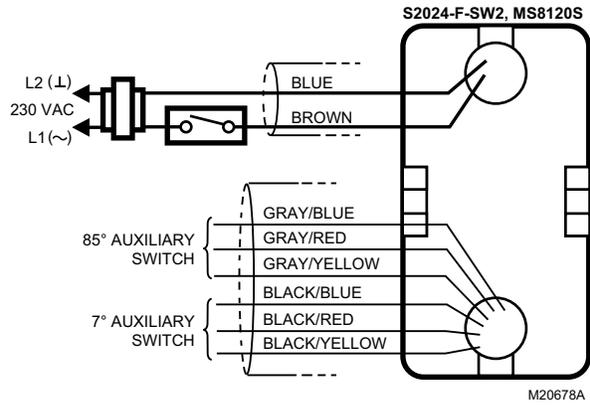


Fig. 10. Typical 24 Vac wiring (S20 Series).

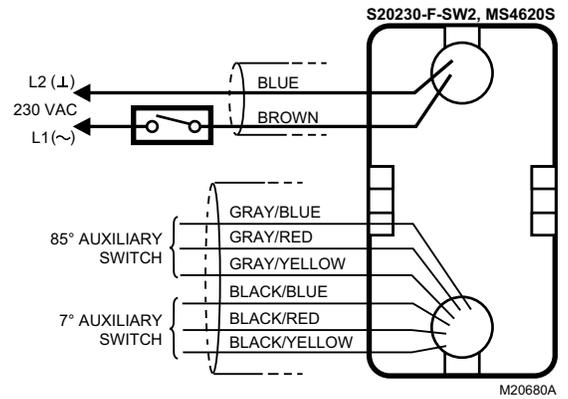


Fig. 11. Typical 230 Vac wiring (S20 Series).

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.

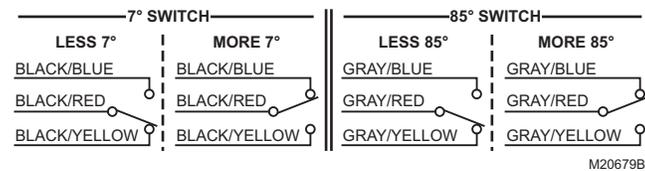


Fig. 12. SPDT auxiliary switch operation.

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.

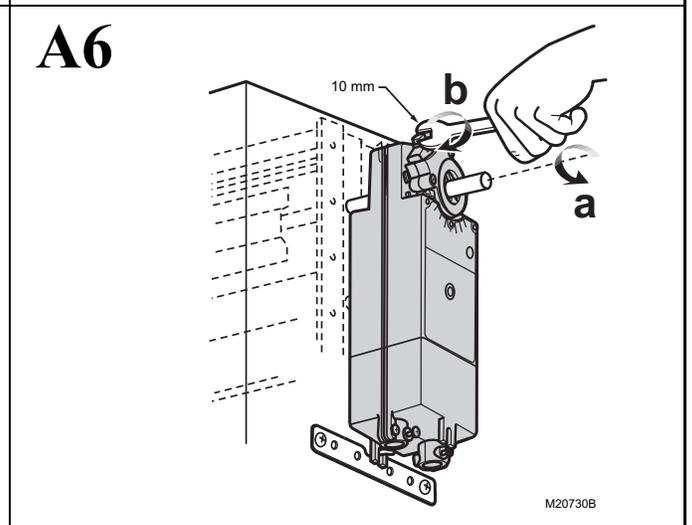
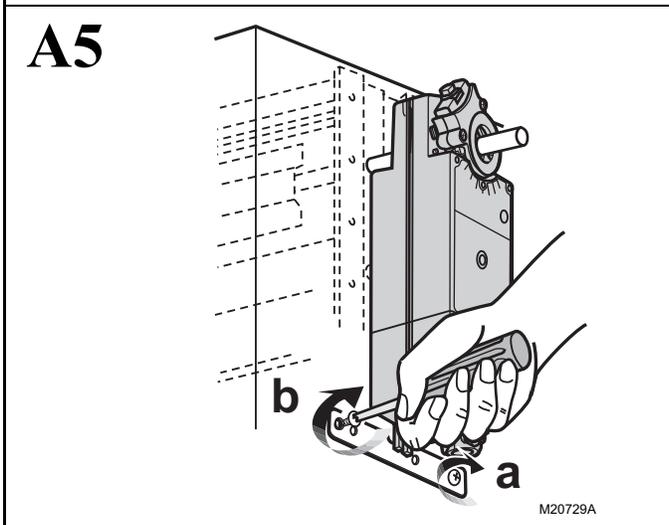
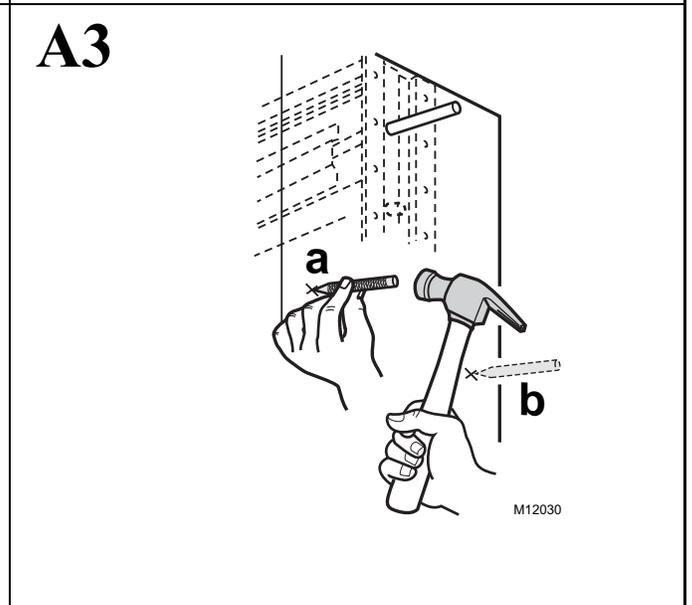
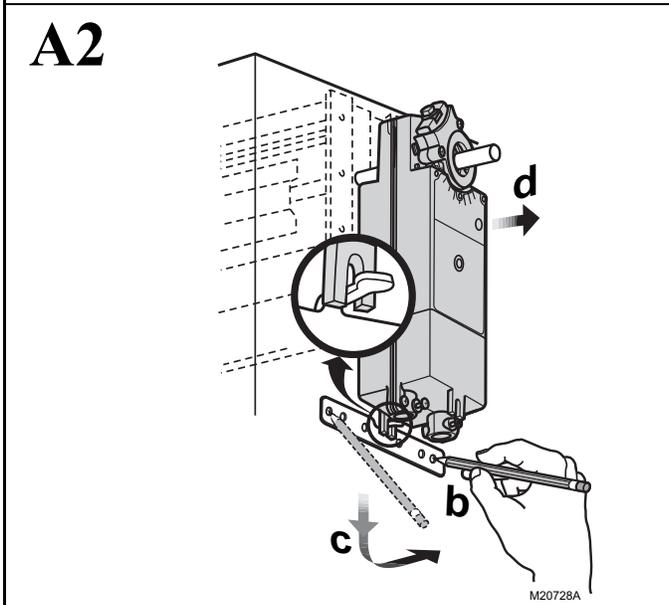
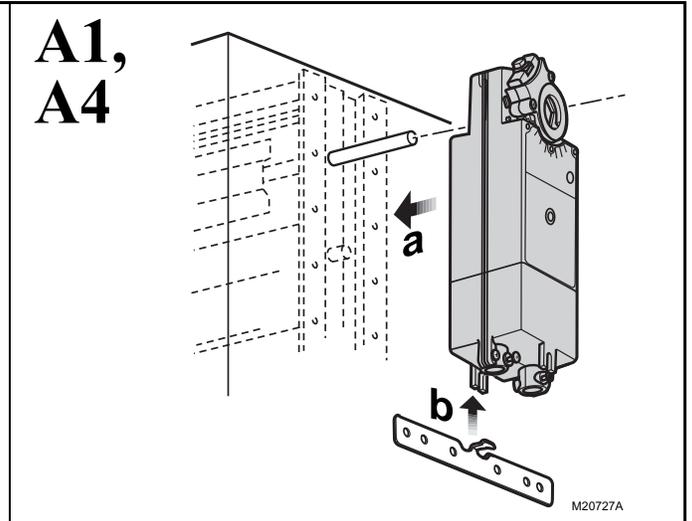
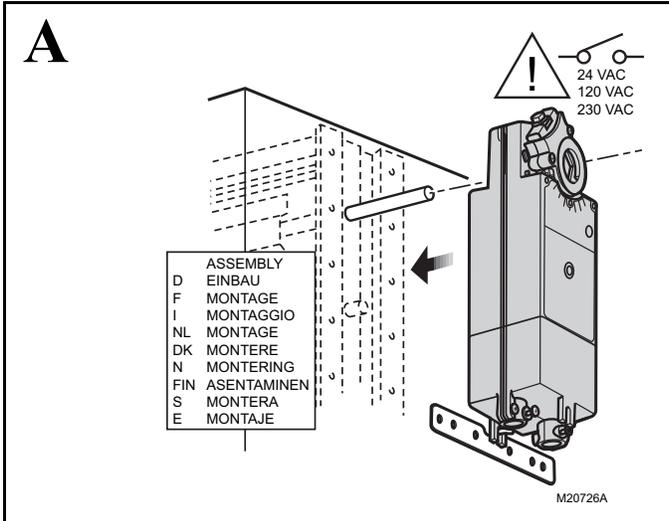
MS8120F; S2024-F (24 Vac models)

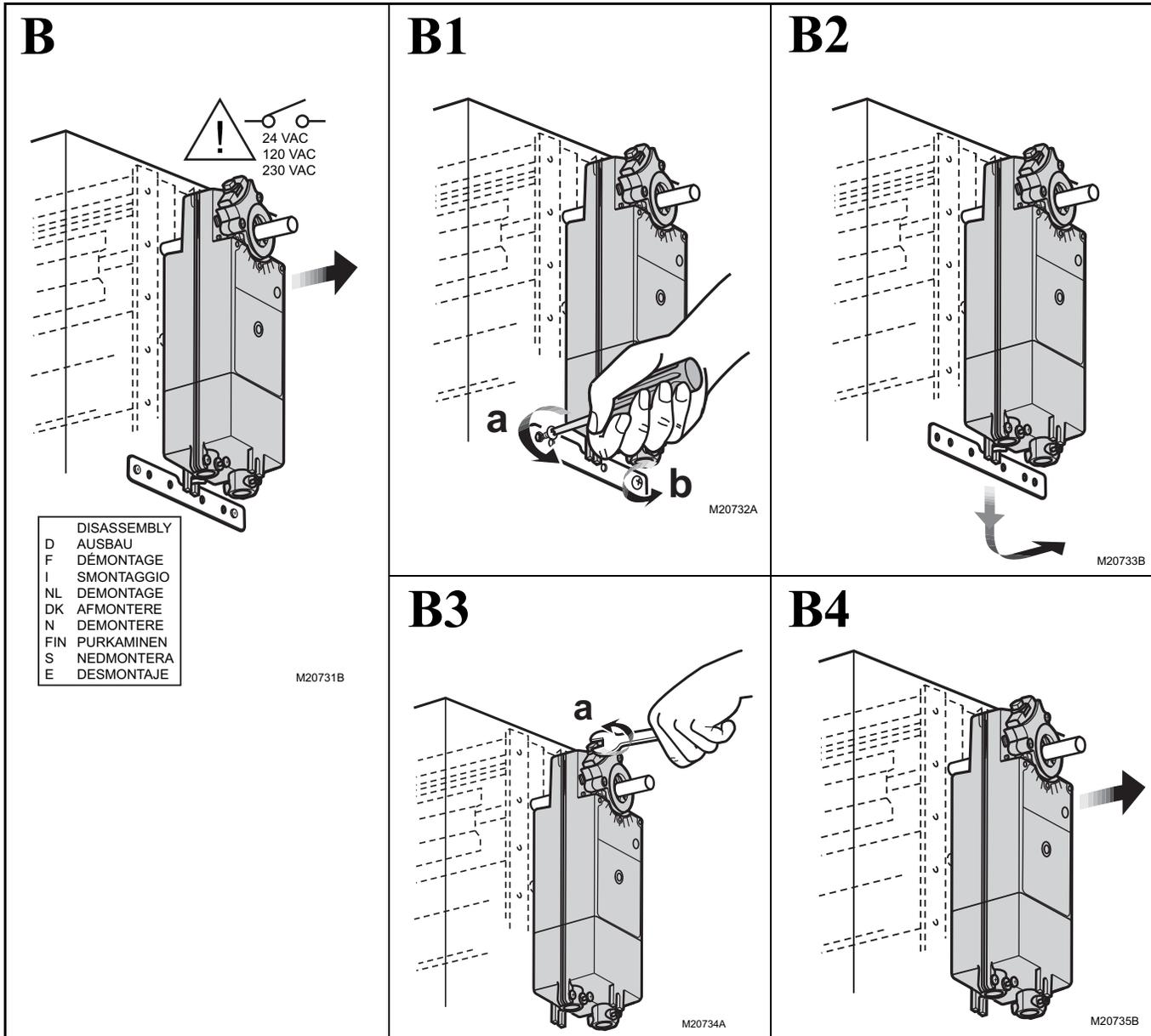
1. Check damper position.
2. Connect 24 Vac to the red and black leadwires to drive the damper to the open position. The actuator should drive the damper.
3. If the actuator does not run, remove power for at least two seconds.
4. If the actuator spring returns, allow it to close entirely, then return 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

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

PRODUCT DATA



FEATURES

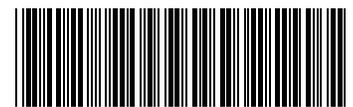
- 30 lb-in. (3.4 N•m) or 80 lb-in. (9 N•m) minimum driving torque at 350°F (176°C).
- Reversible mounting facilitates use in either clockwise (cw) or counterclockwise (ccw) spring rotation.
- Integral spring return ensures level of return torque.
- Fifteen-second spring return timing.
- No special cycling 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.

Contents

Application	1
Features	1
Specifications	2
Ordering Information	2
Installation	4
Operation	6
Checkout	6



63-2740-05

SPECIFICATIONS

Models: See Table 1.

Table 1. Models.

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

^a 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).

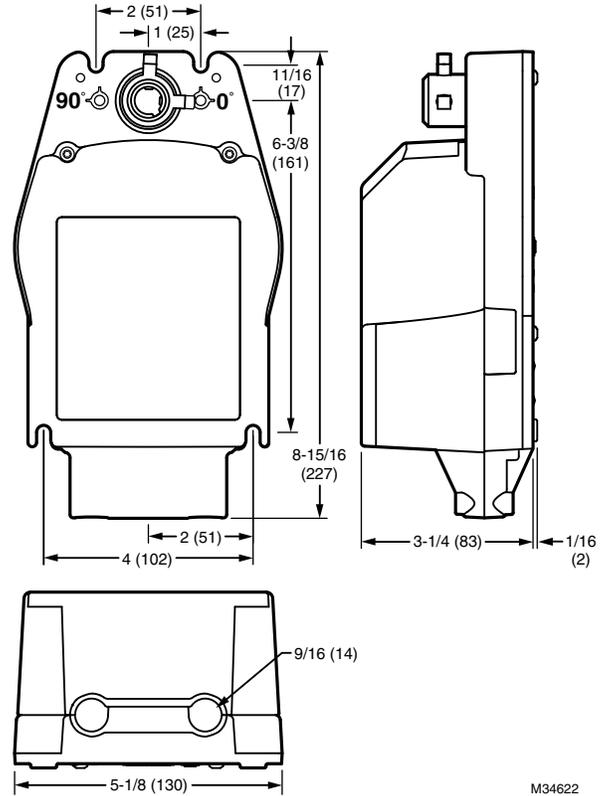


Fig. 1. MS4104, MS4109, MS4604, MS4609, MS8104 and MS8109 dimensional drawing in in. (mm).

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

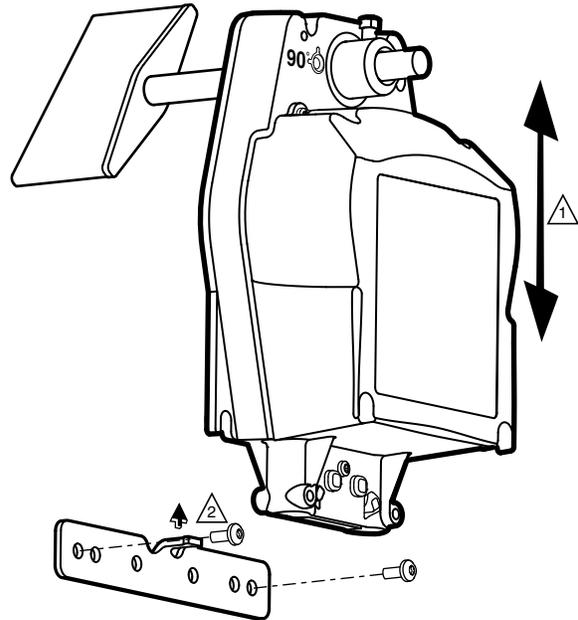
All wiring must agree with applicable codes, ordinances and regulations.

! 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.



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.

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.

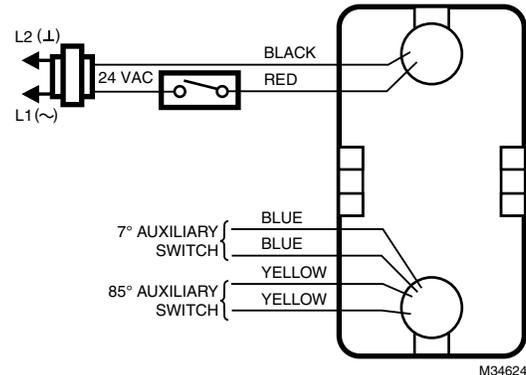


Fig. 3. Typical 24 Vac wiring.

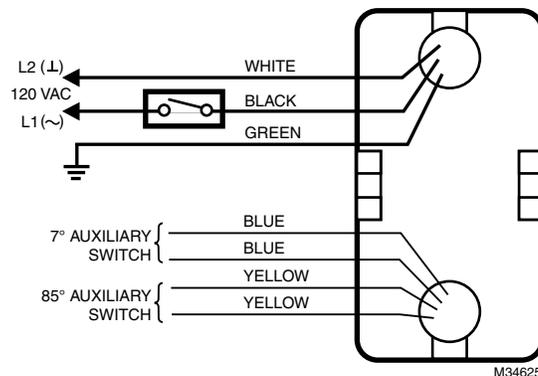


Fig. 4. Typical 120 Vac wiring.

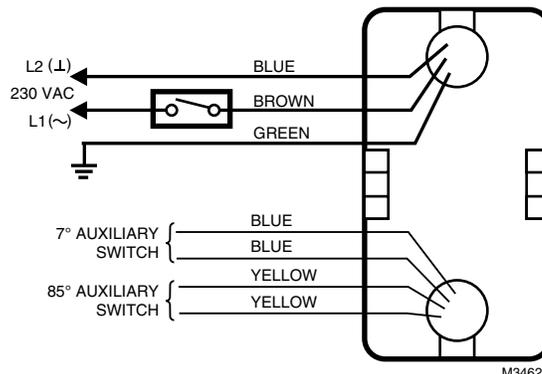


Fig. 5. Typical 230 Vac wiring.

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.

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Automation and Control Solutions

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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.

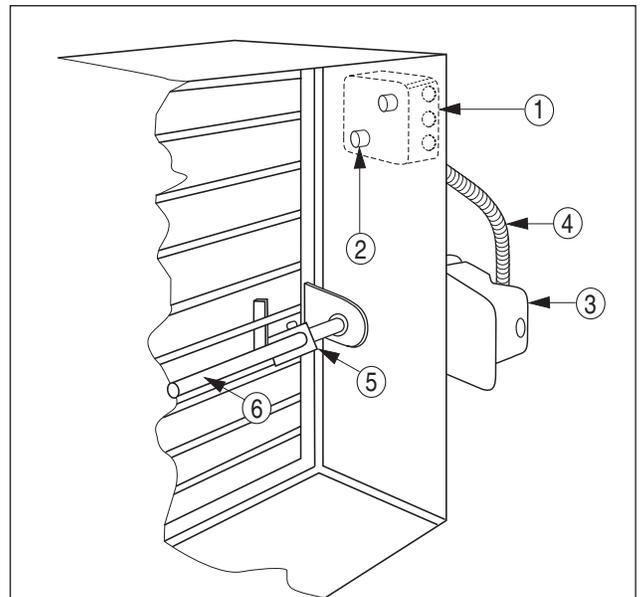
For installation and operation instructions, see dwg. IOM-DTO.

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.

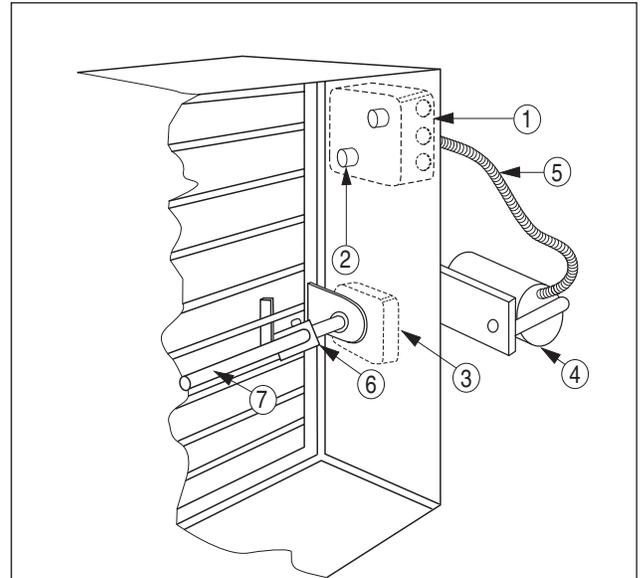
Previous building codes used to require 165°F (74°C) for all fire dampers. This is no longer the case for Smoke Management Systems.



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

SCHEDULE TYPE:	Page 1 of 2			
PROJECT:	Dimensions are in inches (mm)			
ENGINEER:	DATE	B SERIES	SUPERSEDES	DRAWING NO.
CONTRACTOR:	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

SCHEDULE TYPE:
PROJECT:
ENGINEER:
CONTRACTOR:

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

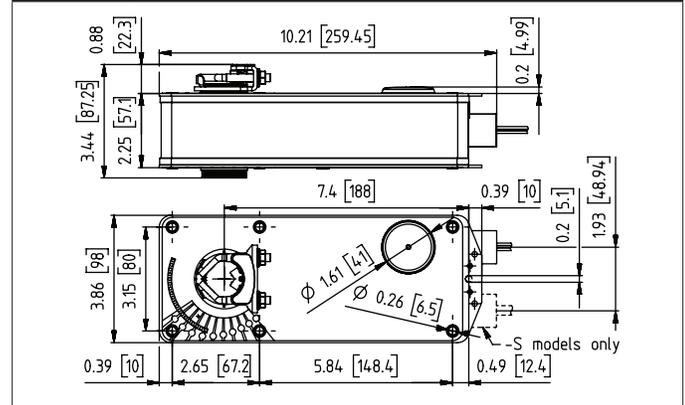
The FSAF_A actuators provide true spring return operation for reliable fail-safe application and positive close-off on UL555S dampers. The spring return system provides constant torque to the damper with and without power applied to the actuator. The FSAF_A series provides 95° of rotation and is provided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

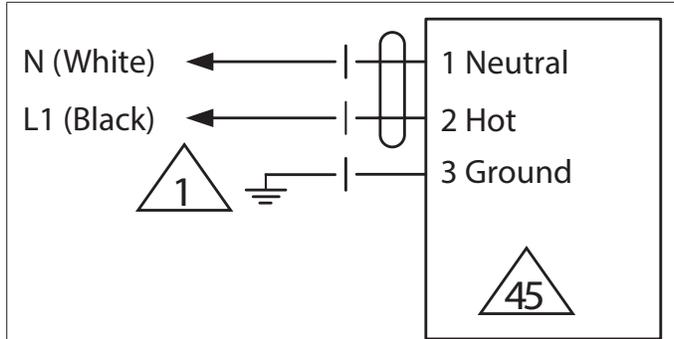
Accessories	
---AF-P	Anti-rotation bracket AF/NF.
---SH8	Push rod for KG6 & KG8 ball joints (36" L, 5/16" diameter).
---TOOL-06	8 mm and 10 mm wrench.
---ZG-100	Univ. right angle bracket 17"x11-1/8"x6" (HxWxbase).
---ZG-101	Univ. right angle bracket (13" H x 11" W x 7-7/16" base).
---ZG-102	Dual actuator 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

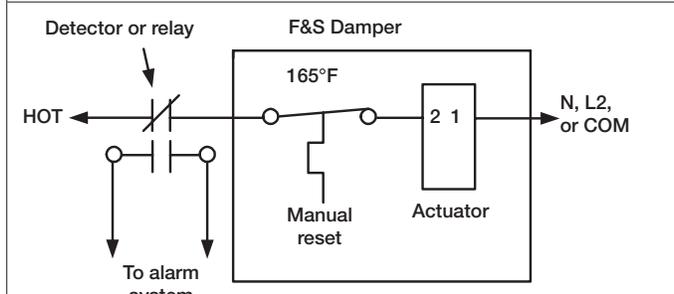
All smoke and combination fire and smoke dampers shall be provided with Belimo FSTF, FSLF, FSNF, or FSAF actuators. All substitutions must be approved before submission of bid. Damper and actuator shall have UL 555S Listing for 250°F &/or 350°F. Actuator shall have been tested to UL 2043 per requirements 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

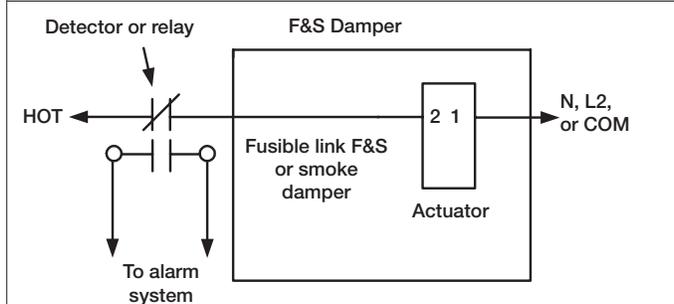
- Provide overload protection and disconnect as required.
- Actuators may be powered in parallel. Power consumption must be observed.
- Ground present on some models.



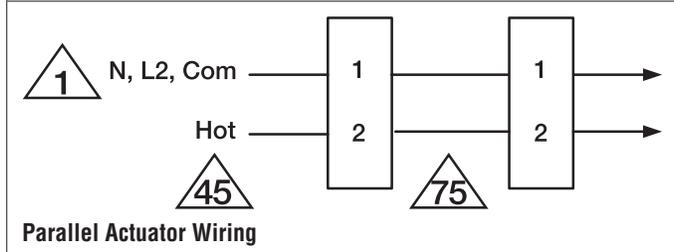
120 VAC



Typical containment damper control wiring



Typical smoke or fusible link damper wiring



Parallel Actuator Wiring

Date created, 03/08/2019 - Subject to change. © Belimo Aircontrols (USA), Inc.

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

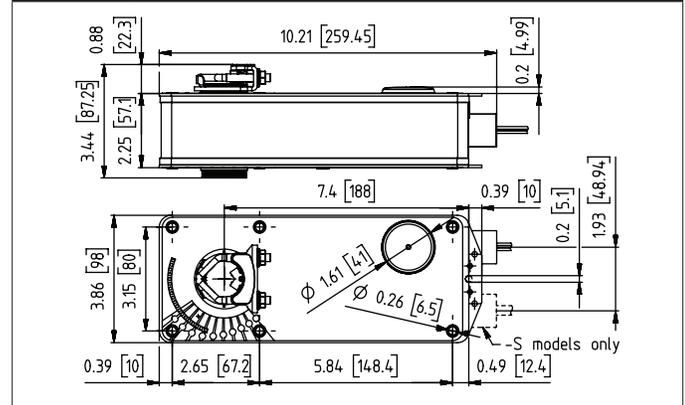
The FSAF_A actuators provide true spring return operation for reliable fail-safe application and positive close-off on UL555S dampers. The spring return system provides constant torque to the damper with and without power applied to the actuator. The FSAF_A series provides 95° of rotation and is provided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

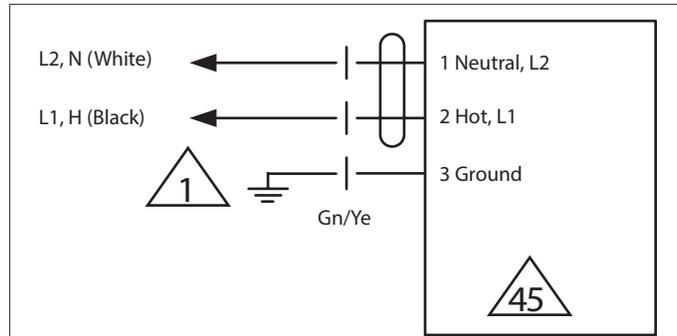
Accessories	
---AF-P	Anti-rotation bracket AF/NF.
---SH8	Push rod for KG6 & KG8 ball joints (36" L, 5/16" diameter).
---TOOL-06	8 mm and 10 mm wrench.
---ZG-100	Univ. right angle bracket 17"x11-1/8"x6" (HxWxbase).
---ZG-101	Univ. right angle bracket (13" H x 11" W x 7-7/16" base).
---ZG-102	Dual actuator 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

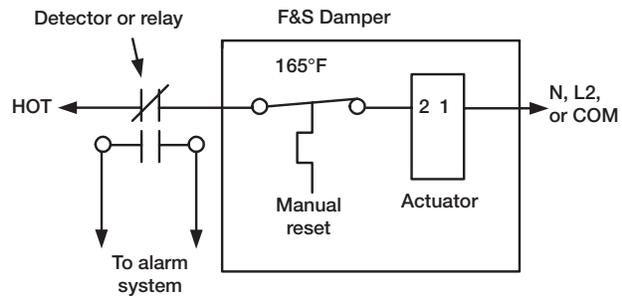
All smoke and combination fire and smoke dampers shall be provided with Belimo FSTF, FSLF, FSNF, or FSAF actuators. All substitutions must be approved before submission of bid. Damper and actuator shall have UL 555S Listing for 250°F &/or 350°F. Actuator shall have been tested to UL 2043 per requirements 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

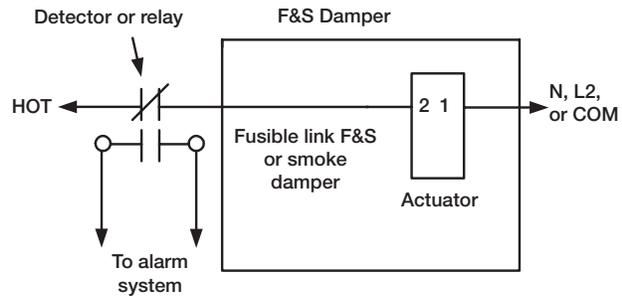
- Provide overload protection and disconnect as required.
- Actuators may be powered in parallel. Power consumption must be observed.
- Ground present on some models.



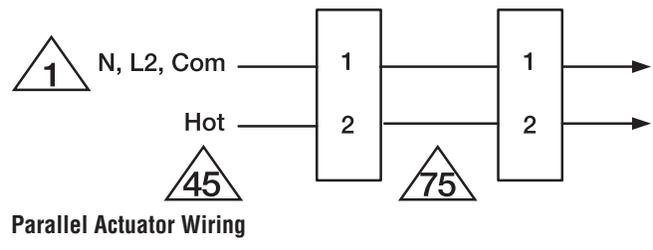
230 VAC



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

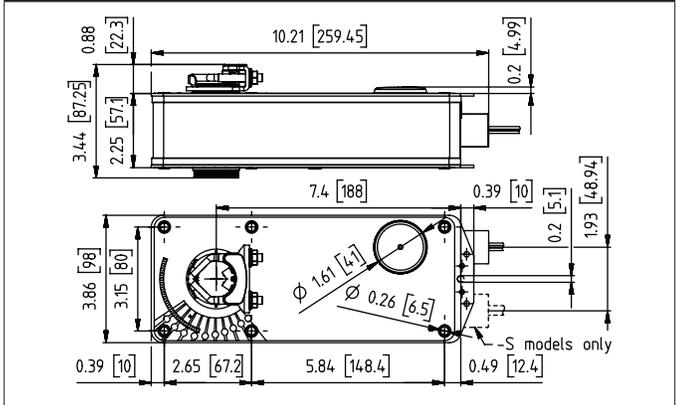
The FSAF_A actuators provide true spring return operation for reliable fail-safe application and positive close-off on UL555S dampers. The spring return system provides constant torque to the damper with and without power applied to the actuator. The FSAF_A series provides 95° of rotation and is provided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

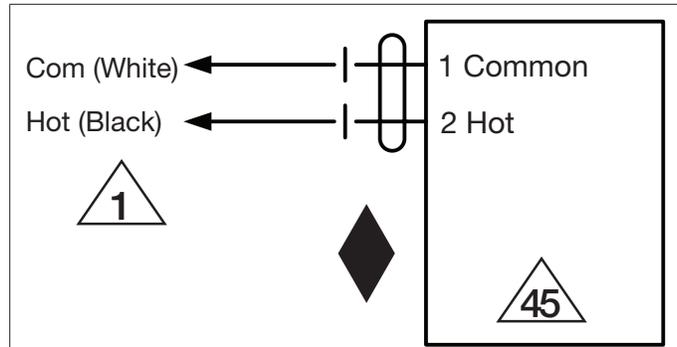
Accessories	
---AF-P	Anti-rotation bracket AF/NF.
---SH8	Push rod for KG6 & KG8 ball joints (36" L, 5/16" diameter).
---TOOL-06	8 mm and 10 mm wrench.
---ZG-100	Univ. right angle bracket 17"x11-1/8"x6" (HxWxbase).
---ZG-101	Univ. right angle bracket (13" H x 11" W x 7-7/16" base).
---ZG-102	Dual actuator 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

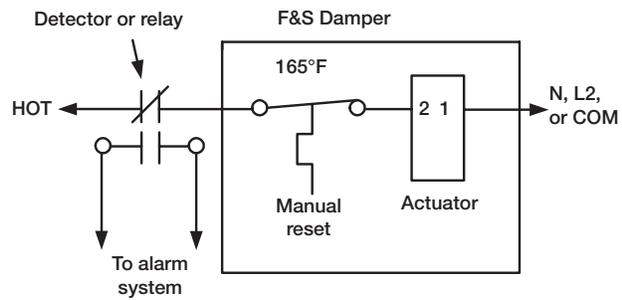
All smoke and combination fire and smoke dampers shall be provided with Belimo FSTF, FSLF, FSNF, or FSAF actuators. All substitutions must be approved before submission of bid. Damper and actuator shall have UL 555S Listing for 250°F &/or 350°F. Actuator shall have been tested to UL 2043 per requirements 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

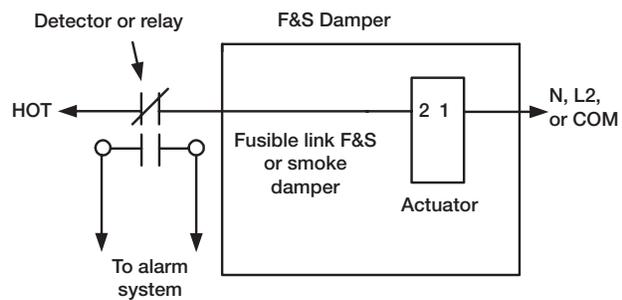
- Provide overload protection and disconnect as required.
- Actuators may be powered in parallel. Power consumption must be observed.
- Ground present on some models.
- Meets cULus requirements without the need of an electrical ground connection.



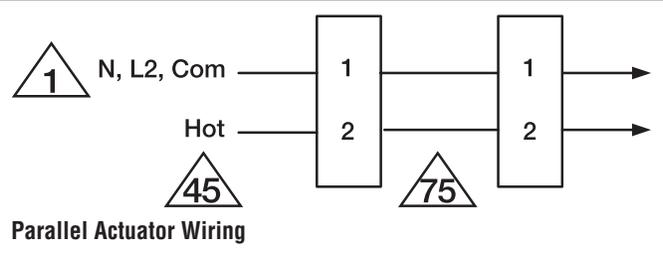
24 VAC/DC



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.

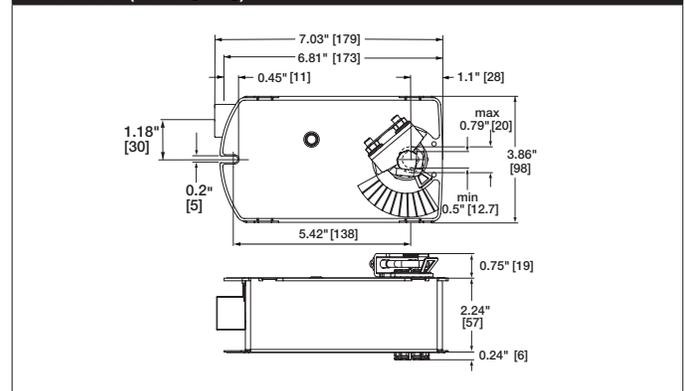
IMPORTANT 24VDC NOTE: The FSLF24 & -S models will not operate below 24VDC. A filtered and regulated power supply must be used.

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.

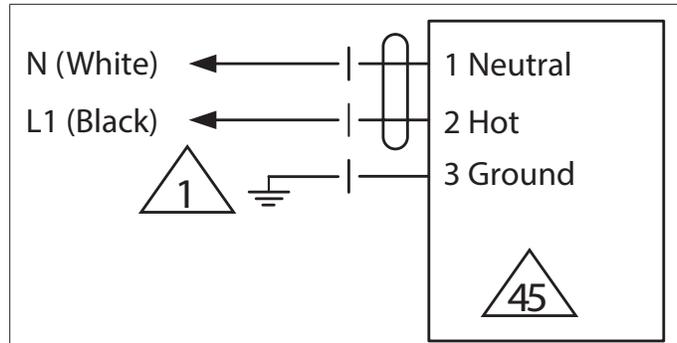
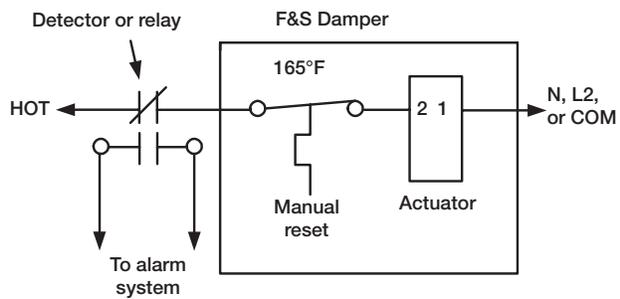
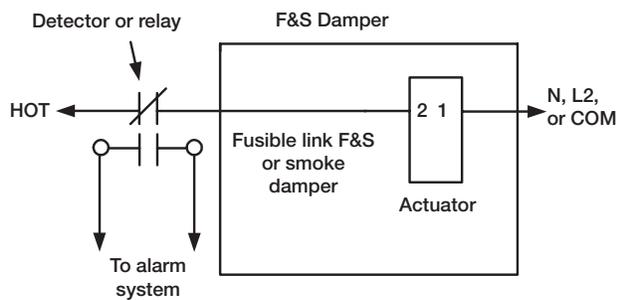
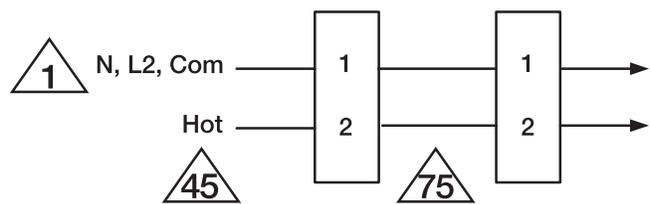
Accessories	
---BAE165 US	165° F electric thermal sensor, SPST, normally closed.
---S2A-F US	Auxiliary switch, 2x SPDT, 3A (0.5A inductive) @250 VAC max.

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.

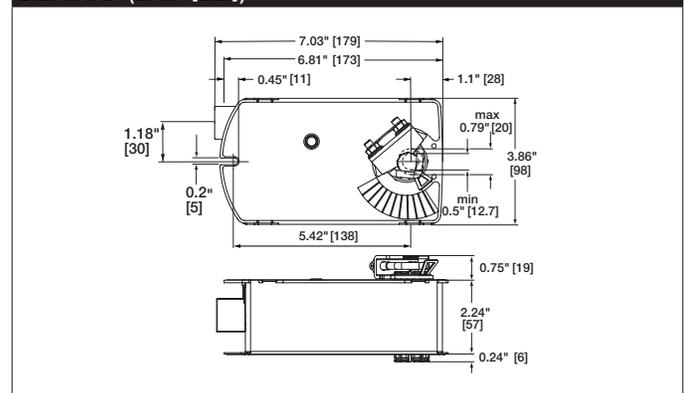
IMPORTANT 24VDC NOTE: The FSLF24 & -S models will not operate below 24VDC. A filtered and regulated power supply must be used.

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.

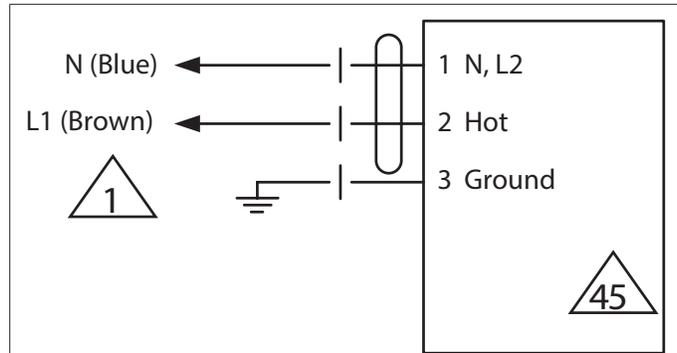
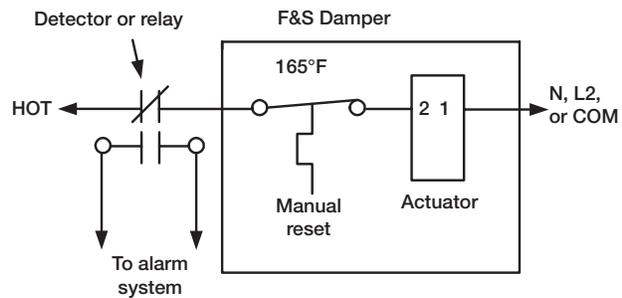
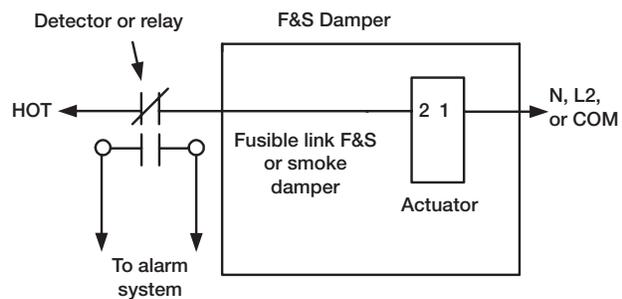
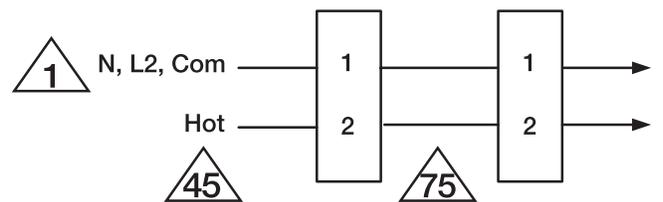
Accessories	
---BAE165 US	165° F electric thermal sensor, SPST, normally closed.
---S2A-F US	Auxiliary switch, 2x SPDT, 3A (0.5A inductive) @250 VAC max.

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.

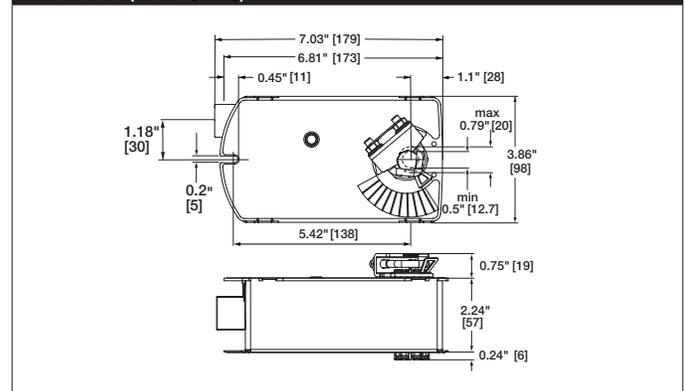
IMPORTANT 24VDC NOTE: The FSLF24 & -S models will not operate below 24VDC. A filtered and regulated power supply must be used.

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 1.125 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.

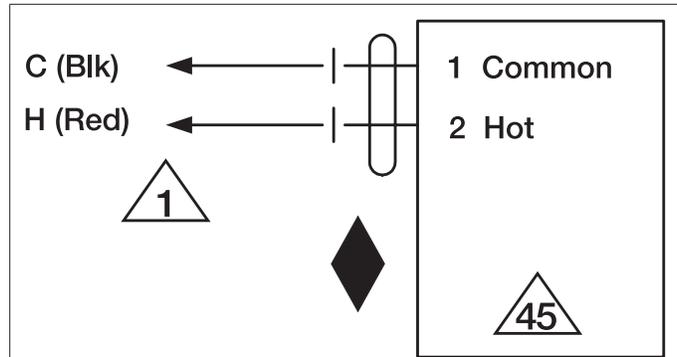
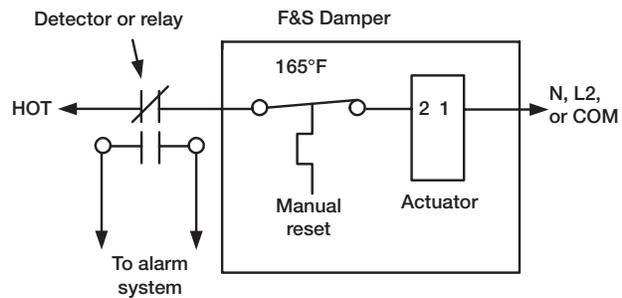
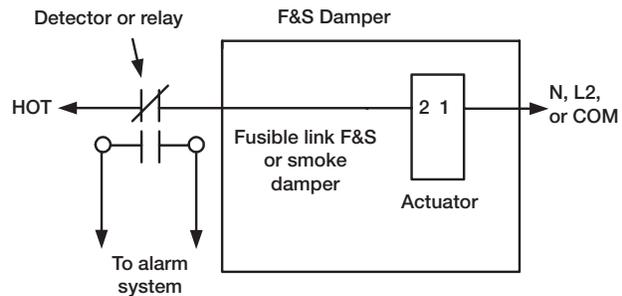
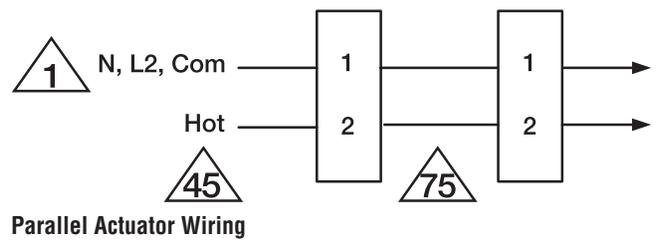
Accessories	
---BAE165 US	165° F electric thermal sensor, SPST, normally closed.
---S2A-F US	Auxiliary switch, 2x SPDT, 3A (0.5A inductive) @250 VAC max.

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.

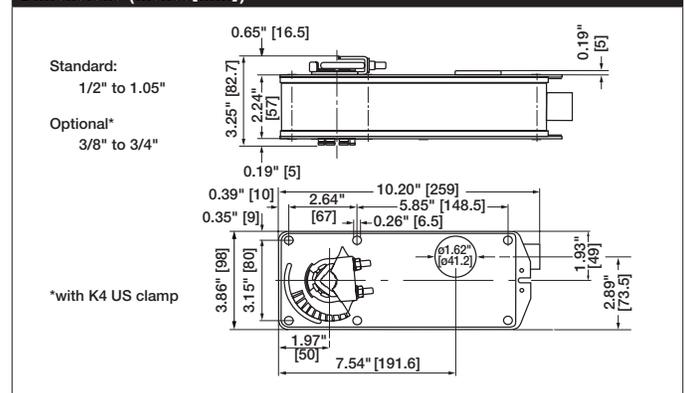
IMPORTANT 24VDC NOTE: The FSNF24 & -S models will not operate below 24VDC. A filtered and regulated power supply must be used.

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.

⚠ **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.

Accessories

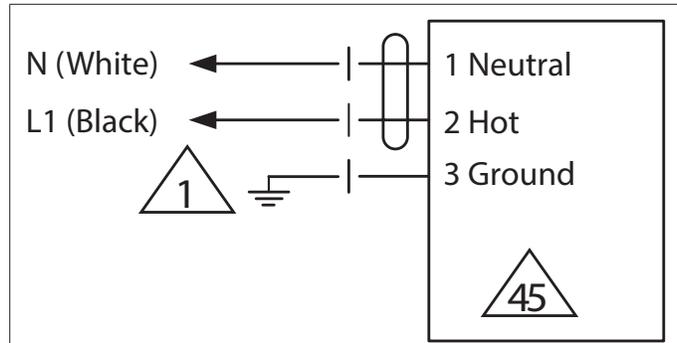
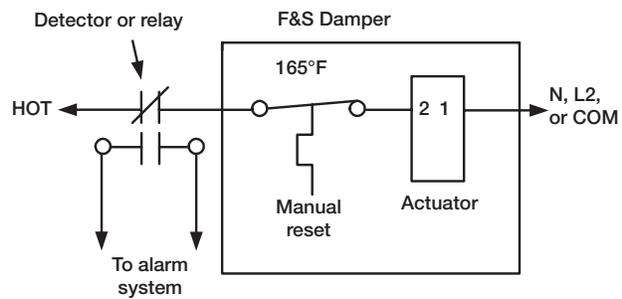
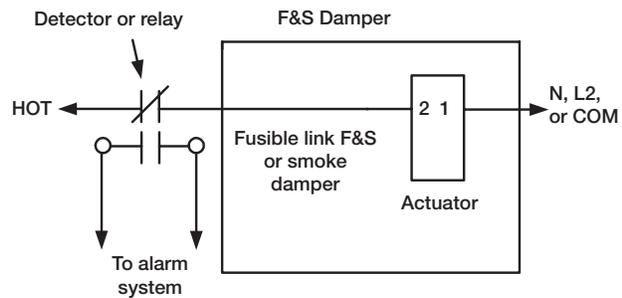
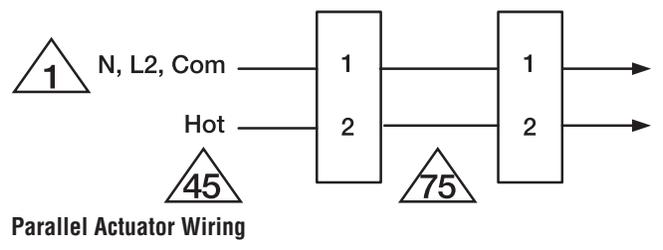
AF-P	Anti-rotation bracket AF/NF.
IND-AF2	End stop indicator
K4-1 US	Classic AF/NF jackshaft clamp (up to 1.05").
KH-AF-1 US	Classic AF/NF crankarm for Jackshaft to 1.05".
SH8	Push rod for KG6 & KG8 ball joints (36" L, 5/16" diameter).
ZDB-AF2 US	Angle of rotation limiter for Classic AF/NF.
ZG-100	Univ. 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.


120 VAC

Typical containment damper control wiring

Typical smoke or fusible link damper wiring

Parallel Actuator Wiring

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

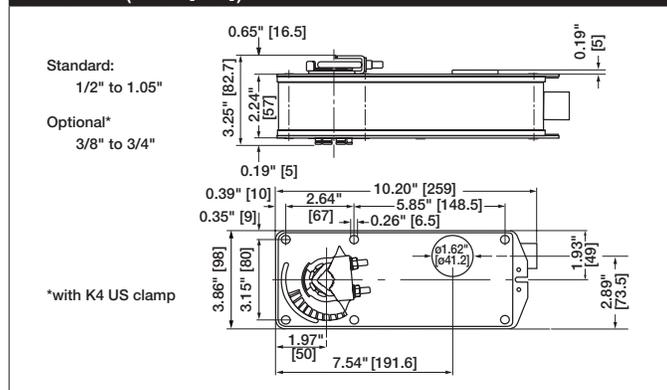
The type FSNF spring-return actuator is intended for the operation of smoke and combination fire and smoke dampers in ventilation and air-conditioning systems. The actuator will meet requirements of UL555 and UL555S when tested as an assembly with the damper and will meet requirements of UBC for 15 second 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. **⚠ 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.

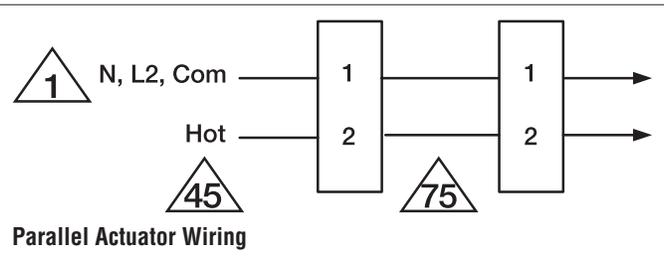
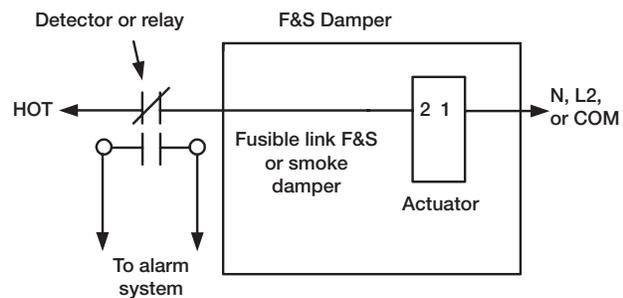
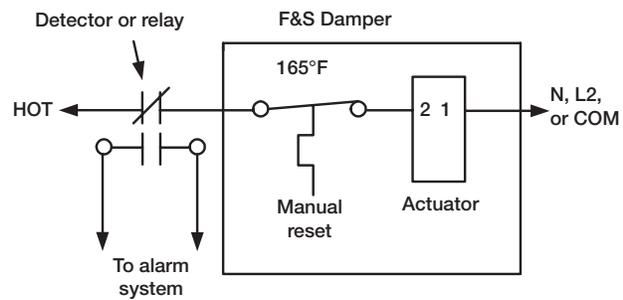
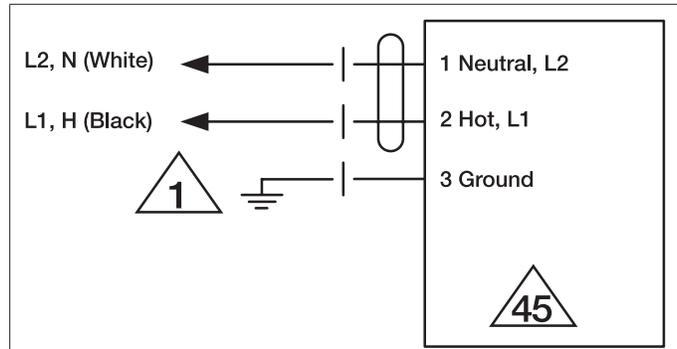
Accessories	
AF-P	Anti-rotation bracket AF/NF.
IND-AF2	End stop indicator
K4-1 US	Classic AF/NF jackshaft clamp (up to 1.05").
KH-AF-1 US	Classic AF/NF crankarm for Jackshaft to 1.05".
SH8	Push rod for KG6 & KG8 ball joints (36" L, 5/16" diameter).
ZDB-AF2 US	Angle of rotation limiter for Classic AF/NF.
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.

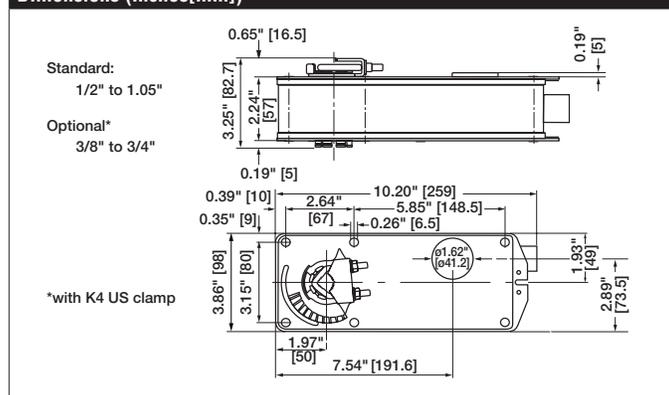
IMPORTANT 24VDC NOTE: The FSNF24 & -S models will not operate below 24VDC. A filtered and regulated power supply must be used.

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.

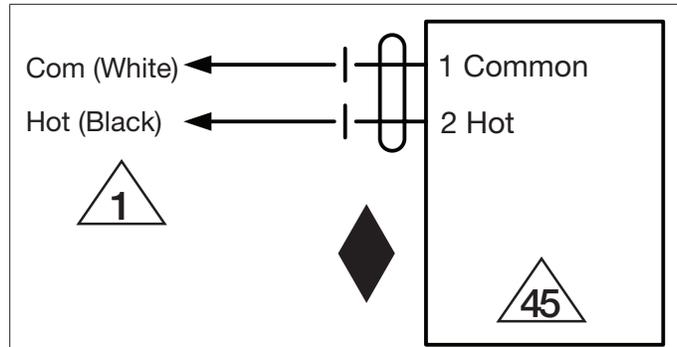
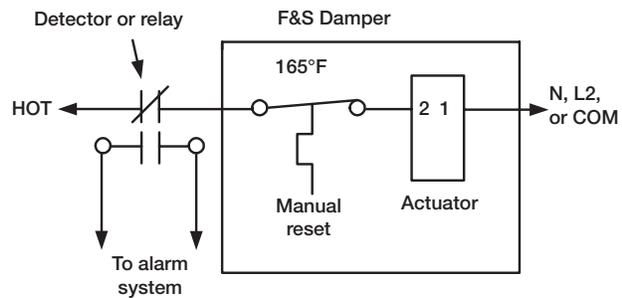
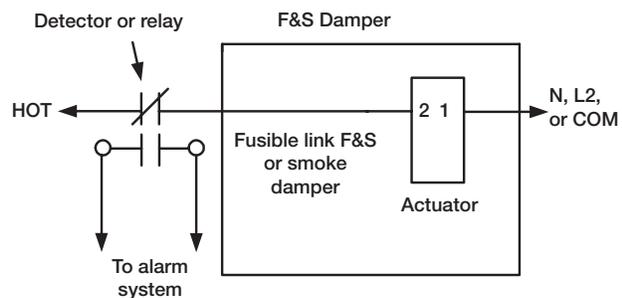
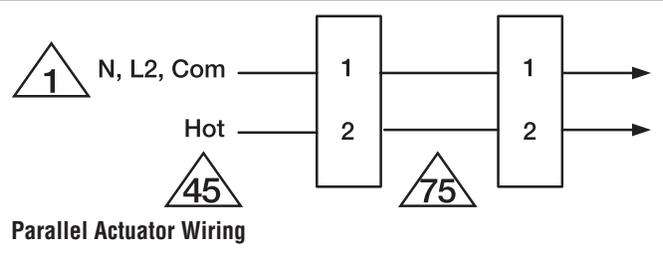
Accessories	
AF-P	Anti-rotation bracket AF/NF.
IND-AF2	End stop indicator
K4-1 US	Classic AF/NF jackshaft clamp (up to 1.05").
KH-AF-1 US	Classic AF/NF crankarm for Jackshaft to 1.05".
SH8	Push rod for KG6 & KG8 ball joints (36" L, 5/16" diameter).
ZDB-AF2 US	Angle of rotation limiter for Classic AF/NF.
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

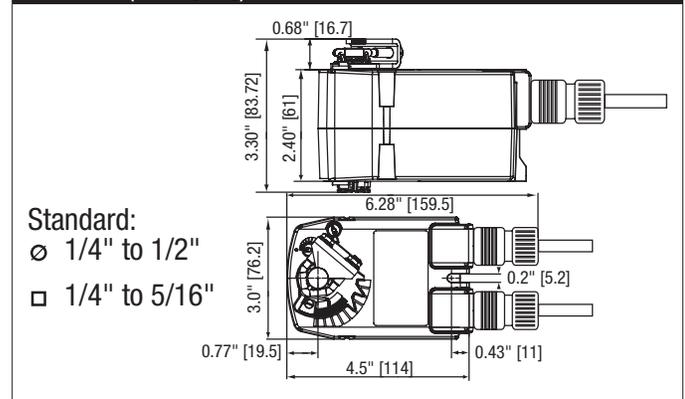
Application

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.

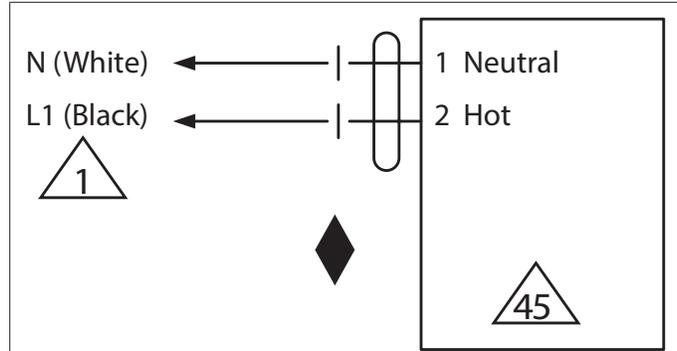
Accessories	
---KH-TF US	TFB(X) crankarm with 5/16" slot.
---KH-TF-1 US	TFB(X) crankarm with 1/4" slot.
KH-TF-1.1 US	TFB(X) crankarm for Shafts with 1/4" slot.
---TF-P	Anti-rotation bracket TF/NKQ/AM/NM/LM.
---TOOL-06	8 mm and 10 mm wrench.
---ZG-TF2	TFB(X) crankarm adaptor kit (T bracket included).
---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

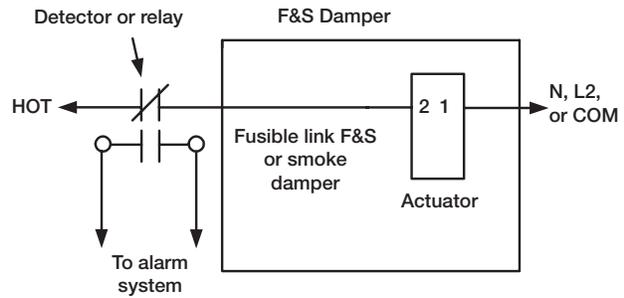
All smoke and combination fire and smoke dampers shall be provided with Belimo FSTF, FSLF, FSNF, or FSAF actuators. All substitutions must be approved before submission of bid. Damper and actuator shall have UL 555S Listing for 250°F &/or 350°F. Actuator shall have been tested to UL 2043 per requirements 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

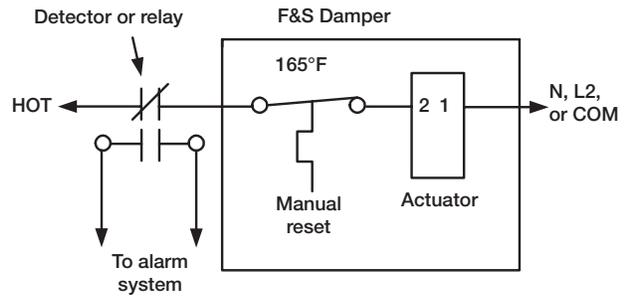
- Provide overload protection and disconnect as required.
- Actuators may be powered in parallel. Power consumption must be observed.
- Ground present on some models.
- Meets cULus requirements without the need of an electrical ground connection.



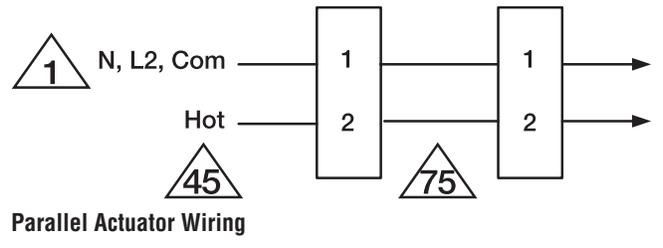
120 VAC



Typical smoke or fusible link damper wiring



Typical containment damper control wiring



Parallel Actuator 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

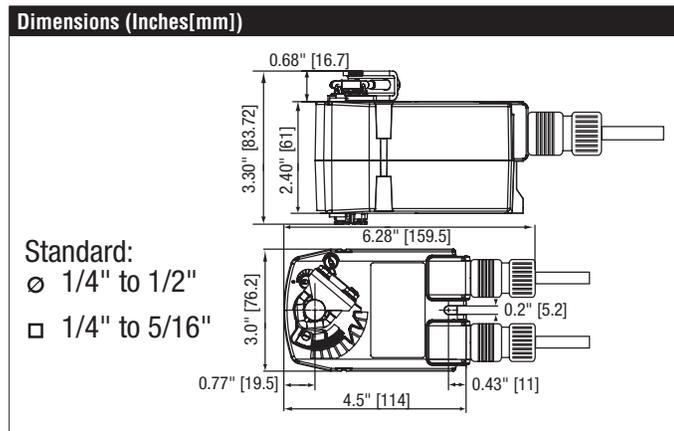
Torque 18 in-lb, 250°F for 30 min, for fire and smoke dampers

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.



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.

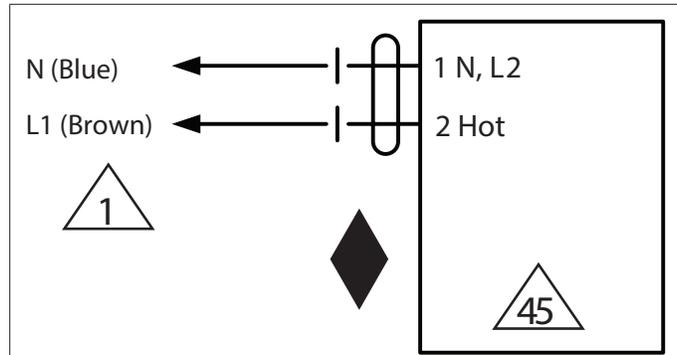
Accessories	
---KH-TF US	TFB(X) crankarm with 5/16" slot.
---KH-TF-1 US	TFB(X) crankarm with 1/4" slot.
KH-TF-1.1 US	TFB(X) crankarm for Shafts with 1/4" slot.
---TF-P	Anti-rotation bracket TF/NKQ/AM/NM/LM.
---TOOL-06	8 mm and 10 mm wrench.
---ZG-TF2	TFB(X) crankarm adaptor kit (T bracket included).
---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

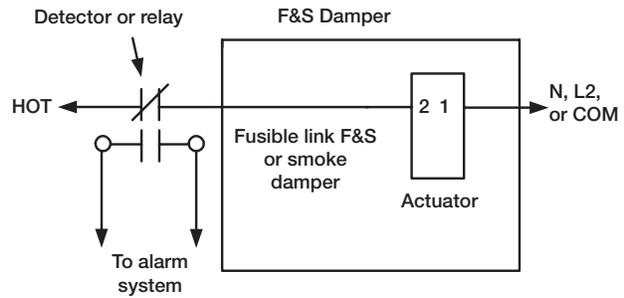
All smoke and combination fire and smoke dampers shall be provided with Belimo FSTF, FSLF, FSNF, or FSAF actuators. All substitutions must be approved before submission of bid. Damper and actuator shall have UL 555S Listing for 250°F &/or 350°F. Actuator shall have been tested to UL 2043 per requirements 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

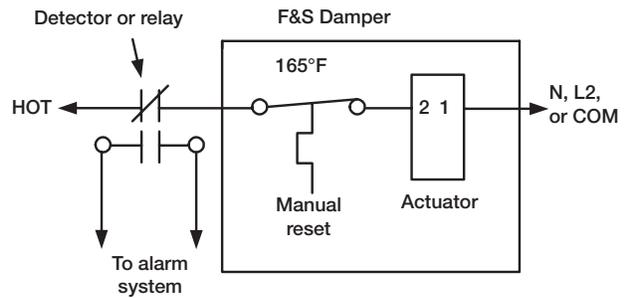
- Provide overload protection and disconnect as required.
- Actuators may be powered in parallel. Power consumption must be observed.
- Ground present on some models.
- Meets cULus requirements without the need of an electrical ground connection.



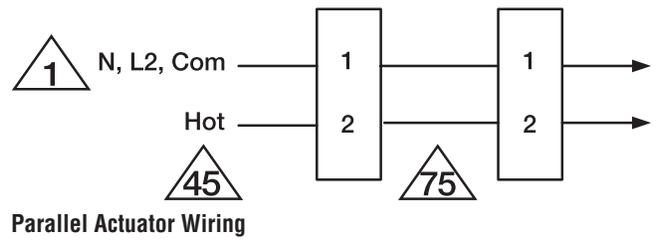
230 VAC



Typical smoke or fusible link damper wiring



Typical containment damper control wiring



Parallel Actuator 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

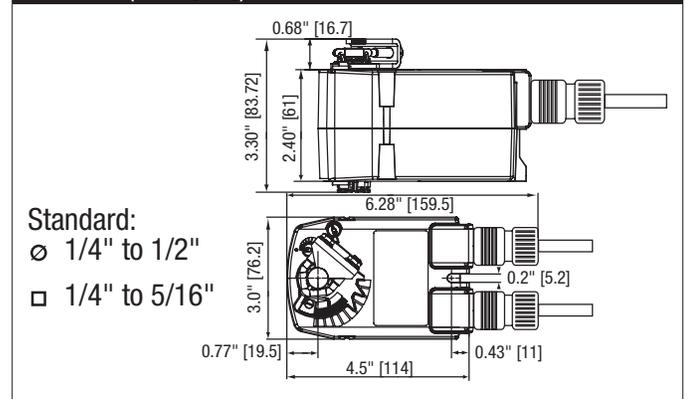
Application

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.

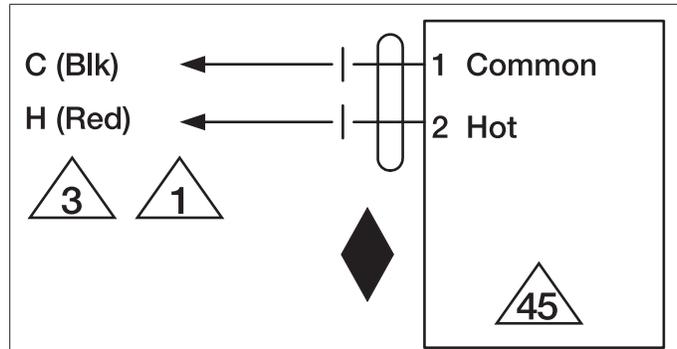
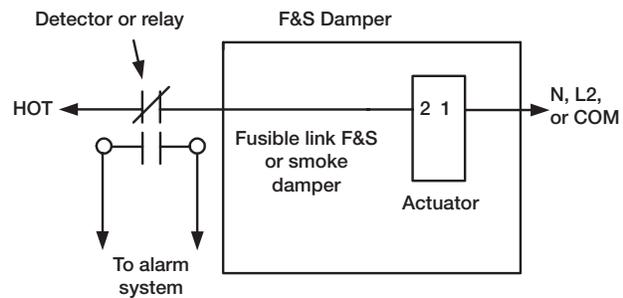
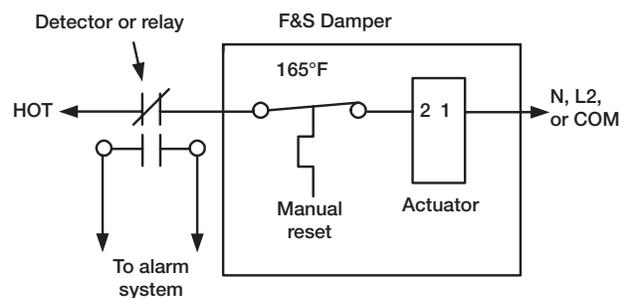
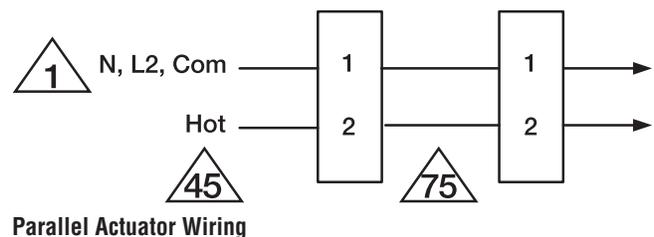
Accessories	
---KH-TF US	TFB(X) crankarm with 5/16" slot.
---KH-TF-1 US	TFB(X) crankarm with 1/4" slot.
KH-TF-1.1 US	TFB(X) crankarm for Shafts with 1/4" slot.
---TF-P	Anti-rotation bracket TF/NKQ/AM/NM/LM.
---TOOL-06	8 mm and 10 mm wrench.
---ZG-TF2	TFB(X) crankarm adaptor kit (T bracket included).
---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



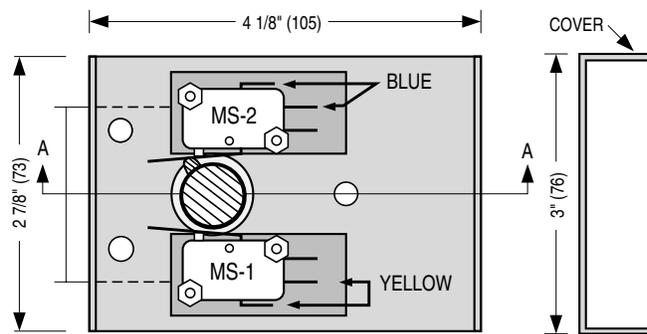
POSITION INDICATOR PACKAGE

FOR COMBINATION FIRE / SMOKE, SMOKE AND CONTROL DAMPERS

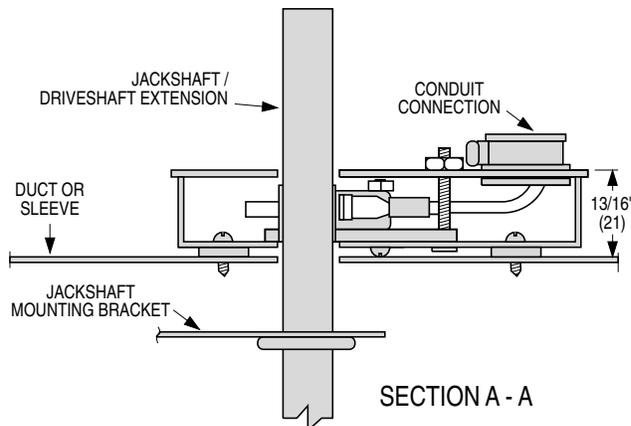
MODEL: MLS-300. For use with GGD221/121 (electric) and 331-2961 / 3060 (pneumatic) actuators

APPLICATION:

- The MLS-300 Position Indicator Package operates as a function of the damper blade position and provides the ability to remotely indicate damper blade position.
- The MLS-300 incorporates two SPDT switches and provides a positive open or closed signal when used in conjunction with remote indicator lights. MLS-300's are used in active smoke control management systems to positively indicate the status of all combination fire/smoke and smoke dampers in the building.
- The MLS-300 is available only as a factory installed option on combination fire/smoke and smoke dampers.
- The MLS-300 may also be used to provide a stop/start circuit for remote fans or to signal alarms.



EXTERNAL RIGHT HAND MOUNTING: FRONT VIEW (LESS COVER)



Position Indicator Microswitch Data:

Switch Type: Single Pole double throw (2)
 15 Amps, 1/3 HP, 125, 250 Vac or 24 Vdc.
 1/2 Amp, 125 Vdc. 1/4 Amp, 250 Vdc.

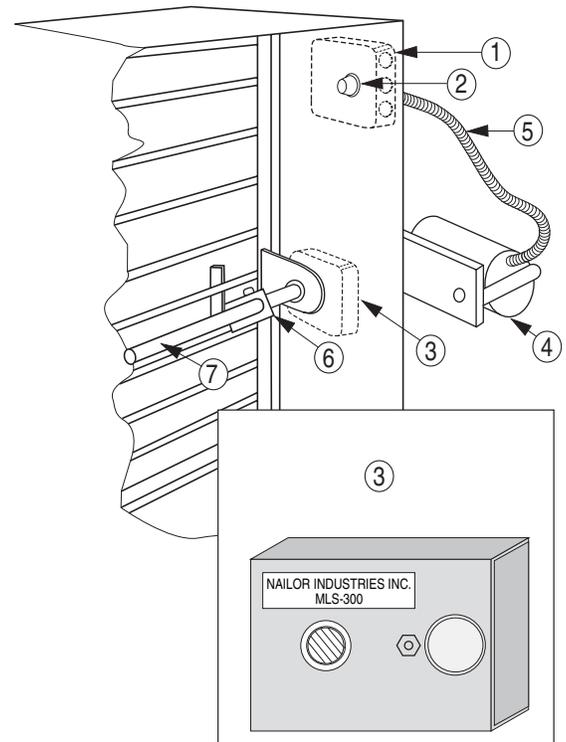
Standard Mounting:

MS1 is damper open signal.

MS2 is damper closed signal.

Non-Standard Mounting:

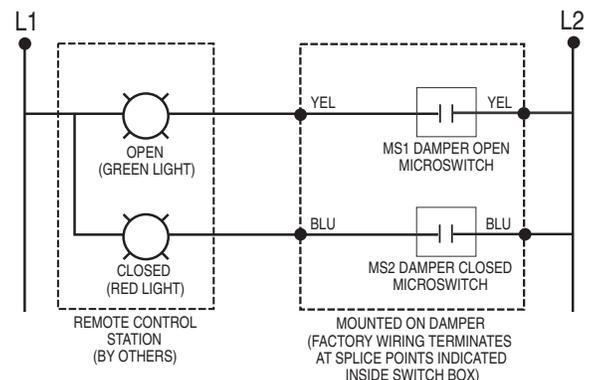
Important: Installer must double check continuity of MS1 and MS2 before wiring to determine which switch signals the damper's open or closed position.



Typical Combination Fire / Smoke Damper Installation With UL Listed Actuator

Description:

1. Electrical Junction Box (and EP switch with pneumatic actuator[s])
2. ERL 165, 212, 250, 350°F Electric Resettable Link (Heat Sensor)
3. Position indicator package
4. Actuator (pneumatic illustrated).
5. Silicone Tubing or Flexible Conduit
6. Over-Center Knee Lock
7. Jackshaft



Dimensions are in inches (mm).

SCHEDULE TYPE:				
PROJECT:				
ENGINEER:	DATE	B SERIES	SUPERSEDES	DRAWING NO.
CONTRACTOR:	7 - 20 - 07	FD - ACC	12 - 4 - 02	MLS-300-2



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.

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

Application and Operation

The Nailor PRL Pneumatic Replaceable Link is a UL Classified heat responsive device used in conjunction with Nailor combination fire/smoke dampers.

The PRL is supplied as standard on all combination fire/smoke dampers ordered with a pneumatic actuator. An alternative to the PRL would be the Nailor ERL (Electric Resettable Link) with an EP (Electric/Pneumatic) Switch.

The PRL is a factory mounted pneumatic release valve/replaceable fusible link assembly. The PRL's function is to sense an abnormally high temperature, as caused by a fire, and allow the damper to close in order to prevent the spread of fire and smoke.

Fire Control Mode: The PRL activates when fire temperatures in excess of 165, 212 or 280°F (74, 100 or 138°C) are detected. When the fusible link melts, air from the pneumatic actuator(s) is exhausted and the actuator spring return mechanism causes the damper to close and lock.

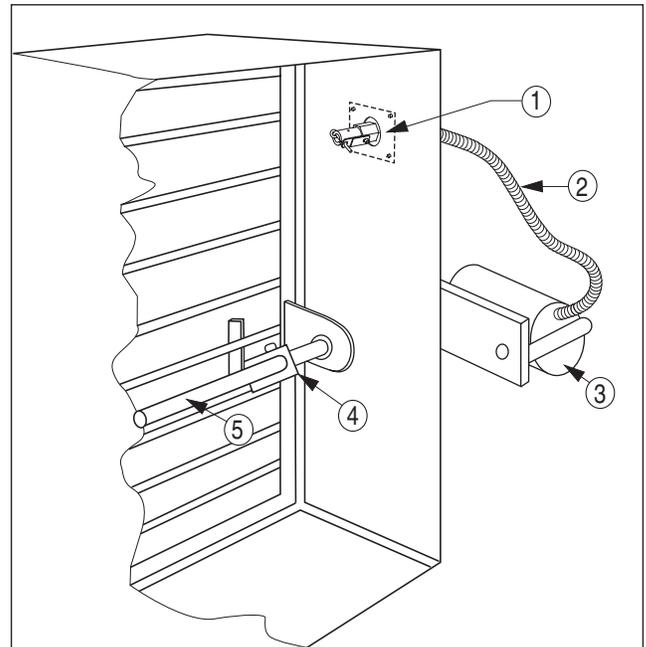
Smoke Control Mode: When a signal is detected via a normally closed smoke detector connection, during system testing or if power failure occurs, the damper will close and remain closed. When the smoke signal ceases (smoke detector reset), the test is completed or power is restored, the damper will automatically reset to the open position.

An EP (Electric/Pneumatic) Switch, by others, must be present in the system.

All pneumatic actuators are factory mounted with a fail close (Normally Closed) damper connection.

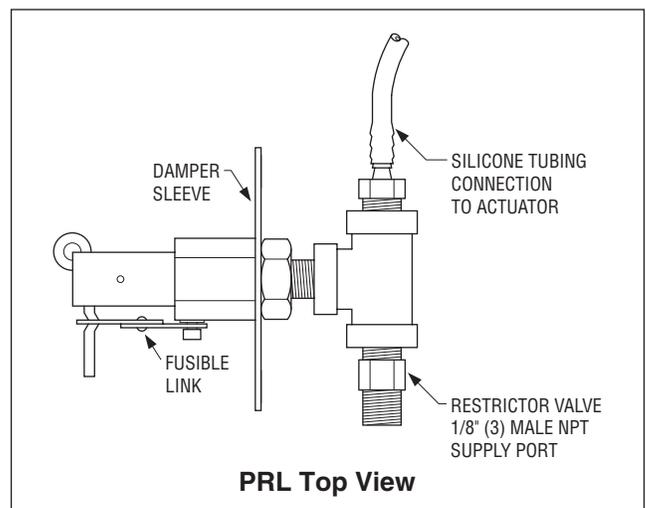
Notes:

1. The PRL must be installed at the factory and cannot be added in the field, in accordance with UL requirements.
2. A single PRL may be used to control up to a maximum of four pneumatic actuators.
3. Pneumatic actuators are to be field piped per local codes.



Typical Combination Fire/Smoke Damper Detail with UL Listed Pneumatic Actuator Description:

1. PRL 165, 212 or 280°F Pneumatic Replaceable Link
2. Silicone Tubing
3. Pneumatic Actuator
4. Over-center Knee Lock
5. Jackshaft



SCHEDULE TYPE
PROJECT
ENGINEER
CONTRACTOR

Dimensions are in inches (mm).

DATE	B SERIES	SUPERSEDES	DRAWING NO.
9 - 9 - 08	FD-ACC	4 - 15 - 03	PRL

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%
Power Consumption:	Running Holding
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

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

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

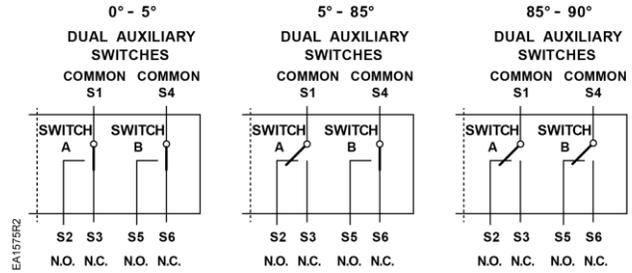
- Optional built-in auxiliary switches with fixed switch points at 5° and 85° rotation.
- Built-in Electronic Fusible Link (EFL) capability with three temperature ratings; 165°F, 212°F, and 250°F
- Reversible, fail-safe spring return
- Plenum-rated
- Pre-cabled
- 30-second operation at rated torque, 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.

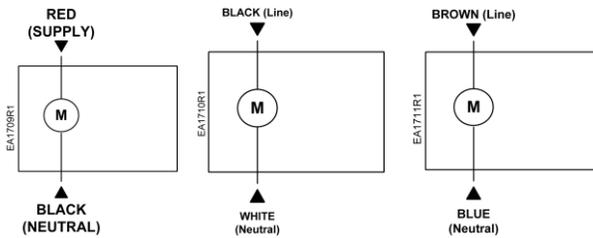


Figure 1.
24 Vac/dc.

Figure 2
120 Vac.

Figure 3.
230 Vac.

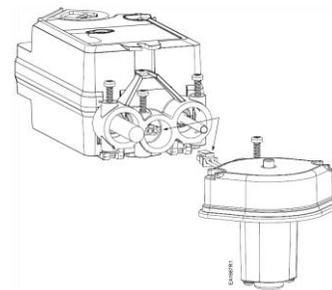


Figure 4. GJD Actuator and EFL.

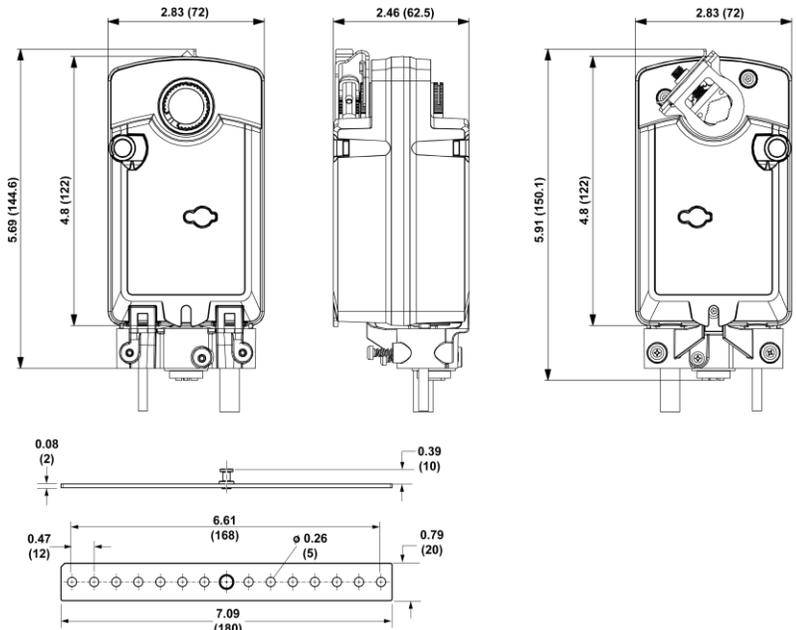


Figure 5. GJD Series Damper Actuator and Mounting Bracket Dimensions in Inches (Millimeters).

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