

FSAF24(-S) US, FSAF120(-S) US

On/Off, Spring Return, Meets 250°F [121°C] for Half Hour, 75 Seconds



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Torque min. 133 in-lb, for control of air dampers

Application

For two position control of UL555S rated dampers in HVAC. Actuator sizing should be done in accordance with the damper manufacturer's specifications.

The actuator is mounted directly to a damper shaft or jackshaft 3/8" to 1.05" in diameter by means of its universal clamp. A crank arm and mounting brackets are available if the actuator cannot be direct coupled to the jackshaft or damper shaft.

Square footage of damper operated will depend on make and model of damper. Typically 12 sq.ft. minimum up to 24 sq.ft maximum will be operated for UL555S applications.

Operation

The FSAF series 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 series provides 95° of rotation and is provided with a graduated position indicator showing 0 to 95°. The FSAF has a manual positioning mechanism which allows the setting of any damper position within its 95° of rotation.

The actuator is shipped in the zero fail-safe position to provide automatic compression against damper gaskets for tight shut-off. When power is applied, the manual mechanism is released and the actuator drives toward the open position where it stops rotating.

The manual override can also be released physically by the use of a crank supplied with the actuator.

Technical Data		FSAF24(-S) US, FSAF120(-S) US
Power supply		
	FSAF24(-S) US	24 VAC ± 20%, 24 VDC -10% +20%
	FSAF120(-S) US	120 VAC ± 10%, 50/60 Hz
Power consumption		
	FSAF24(-S) US	running 7.5 W, 10 VA, .4 A
		holding 2 W, 4 VA, .15 A
	FSAF120(-S) US	running 50/60Hz: 9.5 W, 11 VA, .1 A
		holding 3.5 W, 6 VA, .05 A
Transformer sizing		10 VA (Class 2 power source 24V only)
Electrical connection	motor	3 ft, 18 ga, 2 color coded leads
		1/2" conduit connectors
	-S models	3 ft, 18 ga, 4 leads appliance cable
		1/2" conduit connectors
Overload protection		electronic throughout 0 to 95° rotation
Angle of rotation		mechanically limited to 95°
Torque		133 in-lb [15 Nm] constant
Direction of rotation	spring	reversible with cw/ccw mounting
Position indication		visual indicator, 0° to 95° (0° is spring return position)
Manual override		3mm hex crank (shipped w/actuator)
Running time		<75 sec. constant, independent of load
	spring	<20 seconds nominal
Humidity		5 to 95% RH non-condensing
Ambient temperature		
	normal duty	-22°F to 122°F [-30°C to 50°C]
	safety duty	3 on/off cycles after 30 minutes at ambient temperature of 250°F [121°C]
Storage temperature		-40°F to 176°F [-40°C to 80°C]
Housing		NEMA type 1 / IP40
Housing material		zinc coated metal
Gears		permanently lubricated
Agency listings		cULus listed to UL873 and CAN/CSA C22.2 No.24
Noise level (max)		45 dB (A)
	spring return	62 dB
Servicing		Maintenance free
Quality standard		ISO 9001, 5 year Belimo warranty
Weight		(standard / -S model)
	FSAF24(-S) US	5.7 / 6.2 lbs (2.6 / 2.8 kg)
	FSAF120(-S) US	6.1 / 6.6 lbs (2.8 / 3 kg)

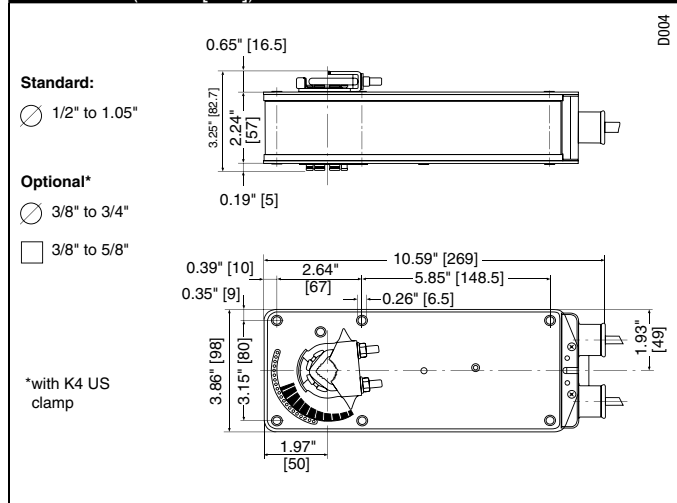
FSAF24-S US, FSAF120-S US

Auxiliary Switch	2xSPST 7A resistive, 2.5A inductive at 120V or 250V, UL Approved, double-insulated, one switch at 10°, one adjustable from 30° to 90°
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SAFETY NOTE

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.

Dimensions (Inches [mm])



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Accessories (AF series accessories may be employed)

IND-AF2	Damper position indicator
K4 US	Universal clamp for 3/8" to 3/4" shafts
K4-1 US	Universal clamp for up to 1.05" dia. jackshafts
K4-H	Universal clamp for hexshafts 3/8" to 5/8"
KH-AF	Crank arm for up to 3/4" round shaft (Series 2)
KH-AF-1	Crank arm for up to 1.05" jackshaft (Series 2)
KH-AFV	V-bolt kit for KH-AF and KH-AF-1
Tool-01	10 mm wrench
ZDB-AF2 US	Angle of rotation limiter
ZG-100	Universal mounting bracket
ZG-101	Universal mounting bracket
ZG-102	Multiple actuator mounting bracket
ZG-103	Universal mounting bracket
ZG-104	Universal mounting bracket
ZG-106	Mounting bracket for Honeywell® Mod IV replacement or new crank arm type installations
ZG-107	Mounting bracket for Honeywell® Mod III or Johnson® Series 100 replacement or new crank arm type installations
ZG-108	Mounting bracket for Barber Colman® MA 3./4., Honeywell® Mod III or IV or Johnson® Series 100 replacement or new crank arm type installations
ZG-AF	Crank arm adaptor kit for AF/NF
ZG-AF108	Crank arm adaptor kit for AF/NF
ZS-100	Weather shield (metal)
ZS-150	Weather shield (polycarbonate)
ZS-300	NEMA 4X housing
22965-00001	12mm form fit square shaft adaptor

For an overview of how to apply the accessories, see Belimo Mechanical Accessories and refer to the Belimo Mounting Methods Guide.

NOTE: When using FSAFxx (-S) US actuators, only use accessories listed on this page.

Typical Specification

Large combination fire and smoke dampers are to be operated by Belimo FSAF series actuators. Manufacturer shall provide 5 year warranty.

Actuators shall draw no more than 11VA at 120V or 24V.

Where auxiliary switches are required for signaling, starting fans, or position indication, -S model actuators, damper blade, or proximity switches shall be provided.

Smaller dampers shall employ Belimo FSLF or FSNF actuators per damper manufacturer recommendations.

Wiring Diagrams

INSTALLATION NOTES

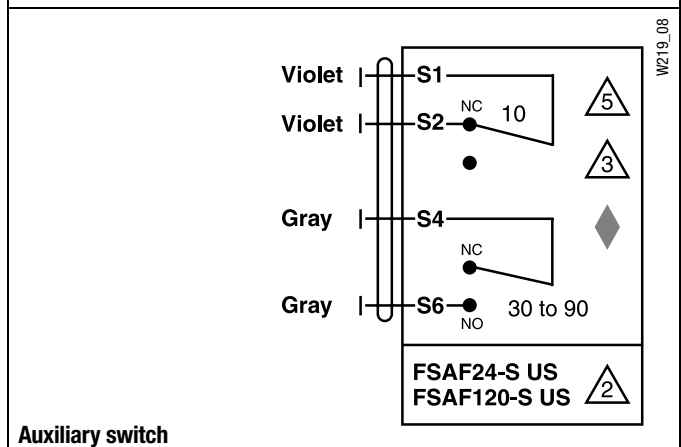
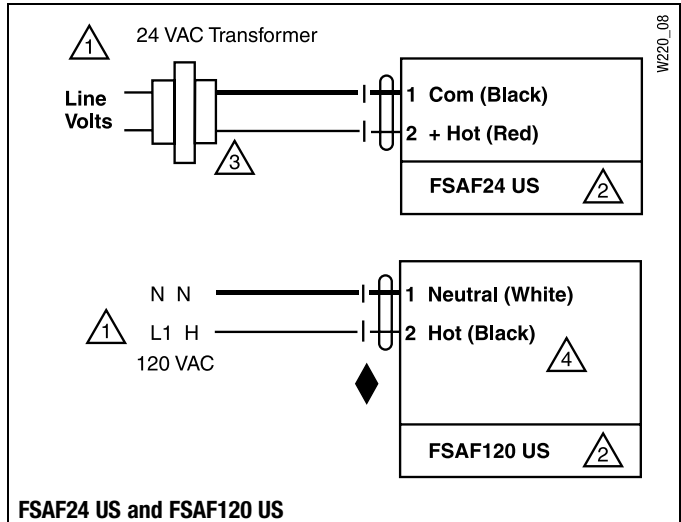
- 1 Provide overload protection and disconnect as required.
- 2 **CAUTION Equipment Damage!**
Actuators may be connected in parallel. Power consumption and input impedance must be observed.
- 3 Actuator may also be powered by 24 VDC.
- 4 No ground connection required. Double insulated.
- 5 For end position indication, interlock control, fan startup, etc., the FSAF24-S US and FSAF120-S US incorporates two built-in auxiliary switches: 2 x SPST, 7A resistive, 2.5 inductive @120/250 VAC, UL Approved, one switch is fixed at 10, one is adjustable from 30 to 90.

APPLICATION NOTES

- ◆ Meets UL requirements without the need of an electrical ground connection.
- ◆ Meets cULus or UL and CSA Standard requirements without the need of an electrical ground connection.

WARNING Live Electrical Components!

During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.



FSAF230(-S) US

On/Off, Spring Return, 250°F [121°C] for Half Hour, 75 Seconds



Technical Data		FSAF230(-S) US
Power supply		230 VAC ± 14%, 50/60 Hz
Power consumption	running	50/60Hz: 11 W, 12 VA, .07 A
	holding	3.5 W, 6 VA, .03 A
Transformer sizing		10 VA (Class 2 power source 24V only)
Electrical connection	motor	3 ft, 18 ga, 2 color coded leads 1/2" conduit connectors
	-S models	3 ft, 18 ga, 4 leads appliance cable 1/2" conduit connectors
Overload protection		electronic throughout 0 to 95° rotation
Angle of rotation		mechanically limited to 95°
Torque		133 in-lb [15 Nm] constant
Direction of rotation	spring	reversible with cw/ccw mounting
Position indication		visual indicator, 0° to 95° (0° is spring return position)
Manual override		3mm hex crank (shipped w/actuator)
Running time		<75 sec. constant, independent of load
	spring	<20 seconds nominal
Humidity		5 to 95% RH non-condensing
Ambient temperature	normal duty	-22°F to 122°F [-30°C to 50°C]
	safety duty	3 on/off cycles after 30 minutes at ambient temperature of 250°F [121°C]
Storage temperature		-40°F to 176°F [-40°C to 80°C]
Housing		NEMA type 1 / IP40 with flexible conduit
Housing material		zinc coated metal
Gears		permanently lubricated
Agency listings		cULus listed to UL873 and CAN/CSA C22.2 No.24
Noise level (max)		45 dB (A)
	spring return	62 dB
Servicing		Maintenance free
Quality standard		ISO 9001, 5 year Belimo warranty
Weight		6.9 lbs (3.1 kg)

FSAF230-S US	
Auxiliary Switch	2xSPST 7A resistive, 2.5A inductive at 120V or 250V, UL Approved, double-insulated, one switch at <10°, one adjustable from >30° to 90°

Torque min. 133 in-lb, for control of air dampers

Application

For two position control of UL555S rated dampers in HVAC. Actuator sizing should be done in accordance with the damper manufacturer's specifications.

The actuator is mounted directly to a damper shaft or jackshaft 3/8" to 1.05" in diameter by means of its universal clamp. A crank arm and mounting brackets are available if the actuator cannot be direct coupled to the jackshaft or damper shaft.

Square footage of damper operated will depend on make and model of damper. Typically 12 sq.ft. minimum up to 24 sq.ft maximum will be operated for UL555S applications.

Operation

The FSAF series 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 series provides 95° of rotation and is provided with a graduated position indicator showing 0 to 95°. The FSAF has a manual positioning mechanism which allows the setting of any damper position within its 95° of rotation.

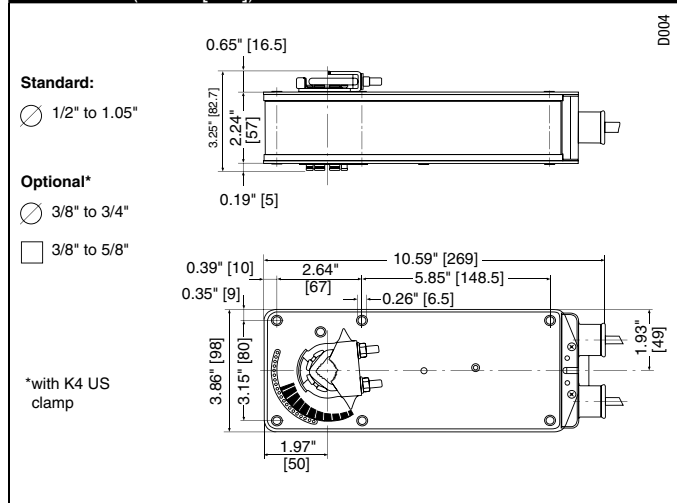
The actuator is shipped in the zero fail-safe position to provide automatic compression against damper gaskets for tight shut-off. When power is applied, the manual mechanism is released and the actuator drives toward the open position where it stops rotating.

The manual override can also be released physically by the use of a crank supplied with the actuator.

SAFETY NOTE

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.

Dimensions (Inches [mm])



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Accessories (AF series accessories may be employed)

IND-AF2	Damper position indicator
K4 US	Universal clamp for 3/8" to 3/4" shafts
K4-1 US	Universal clamp for up to 1.05" dia. jackshafts
K4-H	Universal clamp for hexshafts 3/8" to 5/8"
KH-AF	Crank arm for up to 3/4" round shaft (Series 2)
KH-AF-1	Crank arm for up to 1.05" jackshaft (Series 2)
KH-AFV	V-bolt kit for KH-AF and KH-AF-1
Tool-01	10 mm wrench
ZDB-AF2 US	Angle of rotation limiter
ZG-100	Universal mounting bracket
ZG-101	Universal mounting bracket
ZG-102	Multiple actuator mounting bracket
ZG-103	Universal mounting bracket
ZG-104	Universal mounting bracket
ZG-106	Mounting bracket for Honeywell® Mod IV replacement or new crank arm type installations
ZG-107	Mounting bracket for Honeywell® Mod III or Johnson® Series 100 replacement or new crank arm type installations
ZG-108	Mounting bracket for Barber Colman® MA 3./4., Honeywell® Mod III or IV or Johnson® Series 100 replacement or new crank arm type installations
ZG-AF	Crank arm adaptor kit for AF/NF
ZG-AF108	Crank arm adaptor kit for AF/NF
ZS-100	Weather shield (metal)
ZS-150	Weather shield (polycarbonate)
ZS-300	NEMA 4X housing
22965-00001	12mm form fit square shaft adaptor

For an overview of how to apply the accessories, see Belimo Mechanical Accessories and refer to the Belimo Mounting Methods Guide.

NOTE: When using FSAFxx (-S) US actuators, only use accessories listed on this page.

Typical Specification

Large combination fire and smoke dampers are to be operated by Belimo FSAF series actuators. Manufacturer shall provide 5 year warranty.

Actuators shall draw no more than 12VA at 230V or 10 VA at 24V.

Where auxiliary switches are required for signaling, starting fans, or position indication, -S model actuators, damper blade, or proximity switches shall be provided.

Smaller dampers shall employ Belimo FSLF or FSNF actuators per damper manufacturer recommendations.

Wiring Diagrams

INSTALLATION NOTES

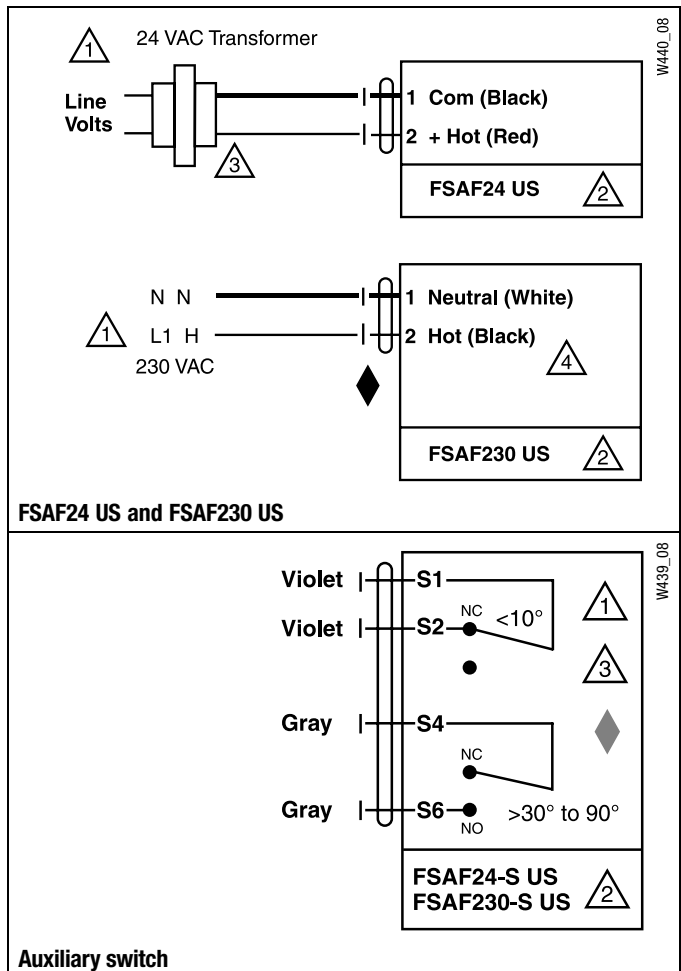
- 1 Provide overload protection and disconnect as required.
- 2 **CAUTION Equipment Damage!**
Actuators may be connected in parallel. Power consumption and input impedance must be observed.
- 3 Actuator may also be powered by 24 VDC.
- 4 No ground connection required. Double insulated.
- 5 For end position indication, interlock control, fan startup, etc., the FSAF230-S US incorporates two built-in auxiliary switches: 2 x SPST, 7A resistive, 2.5 inductive @120/250 VAC, UL Approved, one switch is fixed at 10°, one is adjustable from 30° to 90°.

APPLICATION NOTES

- ◆ Meets UL requirements without the need of an electrical ground connection.
- ◆ Meets cULus or UL and CSA Standard requirements without the need of an electrical ground connection.

WARNING Live Electrical Components!

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FSAF24-SR(-S) US

Proportional, Spring Return, 24 V, 2 to 10 VDC or 4 to 20 mA control signal
Operation at 250°F for limited time per UL555S testing



Technical Data		FSAF24-SR(-S) US
Power supply		24 VAC ± 20% 50/60 Hz 24 VDC ± 10%
Power consumption	running	7 W, 11 VA
	holding	3 W, 5 VA
Transformer sizing		15 VA (class 2 power source)
Electrical connection	FSAF24-SR	3 ft, 18 GA, 4 color coded leads (24V) 1/2" conduit connector
	FSAF24-SR-S	3 ft, 18 GA appliance cable 1/2" conduit connector
Overload protection		electronic throughout 0 to 95° rotation
Operating range		2 to 10 VDC, 4 to 20mA
Input impedance		100 kΩ (0.1 mA), 500 Ω
Feedback output U		2 to 10 VDC (max. 0.5 mA) for 95°
Angle of rotation		mechanically limited to 95°
Torque		133 in-lb [15 Nm] constant
Direction of rotation	spring	reversible with cw/ccw mounting The control direction switch is not present. Direct acting only. 2 VDC=Fail-safe position.
Position indication		visual indicator, 0° to 95° (0° spring return position)
Manual override		3mm hex crank (shipped w/actuator)
Running time	motor	<75 sec. constant, independent of load
	spring	< 20 seconds
Humidity		5 to 95% RH non-condensing
Ambient temperature	normal duty	-22°F to 122°F [-30°C to 50°C]
	safety duty	3 on/off cycles after 30 minutes at ambient temperature of 250°F [121°C]
Storage temperature		-40°F to 176°F [-40°C to 80°C]
Housing		NEMA type 2 / IP40
Housing material		zinc coated metal
Agency listings†		cULus to UL873 and CSA C22.2 No. 24-93
Noise level (max)	running	45 db (A)
Servicing		maintenance free
Quality standard		ISO 9001, 5 year Belimo warranty
Weight		6.0 lbs (2.7 kg.)
FSAF24-SR-S US		
Auxiliary switch		2 x SPDT 7A resistive, 2.5A inductive at 120/250VAC. UL Approved, double-insulated, one set at =+10°, one adjustable 30° to 90°

Torque min. 133 in-lb, for control of air dampers

Application

For proportional modulation of UL555S rated dampers in HVAC. Actuator sizing should be done in accordance with the damper manufacturer's specifications.

The actuator is mounted directly to a damper shaft or jackshaft up to 1.05" in diameter by means of its universal clamp. A crank arm and mounting brackets are available if the actuator cannot be direct coupled to the jackshaft or damper shaft.

The actuator operates in response to a 2 to 10 VDC, or with the addition of a 500 Ω resistor, a 4 to 20 mA control input from an electronic controller or positioner. A 2 to 10 VDC feedback signal is provided for position indication or master-slave applications. See Application Bulletin for details.

Operation

The FSAF series actuators provide spring return operation. There is no reversing switch on the FSAF24-SR. It is direct acting only. A reverse acting signal is required if it must spring open while 2V signal drives it closed. The torque is asymmetrical giving 180 in-lb drive and 133 in-lb spring.

The FSAF resets after being driven or springing closed to the 0 position. There is a possible hysteresis of 1° every 1000 changes in signal. This can cause a position shift. It is recommended that power or signal be reset once a week.

A manual override winder and locking mechanism is provided. If the manual winder is used when the actuator is powered, the actuator will release and drive closed to reset the 0 degree position.

The actuator may not be mechanically paralleled or "piggybacked." Each damper section should be controlled by a separate actuator.

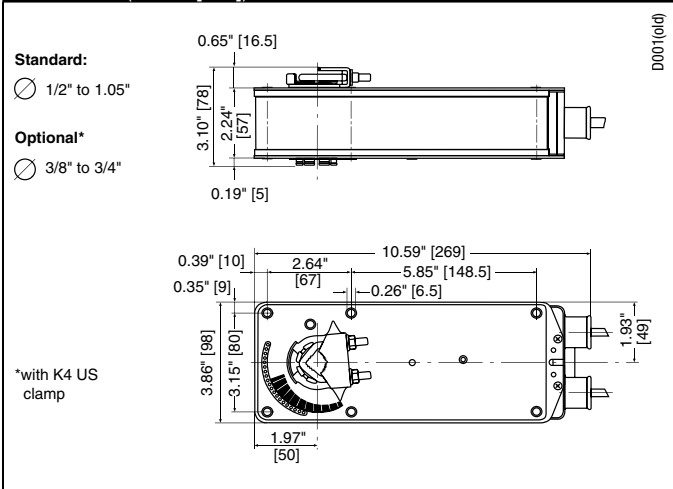
The wire 5 feedback can be used to parallel up to five additional actuators. If less than 2.1 V or greater than 9.9V is given wire 3, actuator drives all the way to the respective end stop.

The FSAF uses a DC motor which is controlled by a microchip. The actuator may be stalled anywhere during its rotation without damage. If power is removed, the damper will spring closed. Interlocks must be provided as necessary for life safety functions and to shut down fan if required.

SAFETY NOTE

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.

Dimensions (Inches [mm])



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Accessories (AF series accessories may be employed)

IND-AF2	Damper position indicator
K4 US	Universal clamp for 3/8" to 3/4" shafts
K4-1 US	Universal clamp for up to 1.05" dia. jackshafts
K4-H	Universal clamp for hexshafts 3/8" to 5/8"
KH-AF	Crank arm for up to 3/4" round shaft (Series 2)
KH-AF-1	Crank arm for up to 1.05" jackshaft (Series 2)
KH-AFV	V-bolt kit for KH-AF and KH-AF-1
Tool-01	10 mm wrench
SGA24	Min. and/or max. positioner in NEMA 4 housing
SGF24	Min. and/or max. positioner for flush panel mounting
ZG-R01	500 Ω resistor for 0 to 20 mA control signal
ZDB-AF2 US	Angle of rotation limiter
ZG-100	Universal mounting bracket
ZG-101	Universal mounting bracket
ZG-102	Multiple actuator mounting bracket
ZG-103	Universal mounting bracket
ZG-104	Universal mounting bracket
ZG-106	Mounting bracket for Honeywell® Mod IV replacement or new crank arm type installations
ZG-107	Mounting bracket for Honeywell® Mod III or Johnson® Series 100 replacement or new crank arm type installations
ZG-108	Mounting bracket for Barber Colman® MA 3./4., Honeywell® Mod III or IV or Johnson® Series 100 replacement or new crank arm type installations
ZG-AF	Crank arm adaptor kit for AF/NF
ZG-AF108	Crank arm adaptor kit for AF/NF
ZS-100	Weather shield (metal)
ZS-150	Weather shield (polycarbonate)
ZS-260	Explosion-proof housing
ZS-300	NEMA 4X housing

For an overview of how to apply the accessories, see Belimo Mechanical Accessories and refer to the Belimo Mounting Methods Guide.

NOTE: When using FSAF24-SR(-S) US actuators, only use accessories listed on this page.

Typical Specification

Proportional smoke, and combination fire and smoke dampers, shall be controlled by Belimo FSAF24-SR actuators. The control signal shall provide proportional damper control in response to a 2 to 10 VDC or, with the addition of a 500 Ω resistor, a 4 to 20 mA control input from an electronic controller or positioner. The actuators must be designed so that they may be used for either clockwise or counter clockwise fail-safe operation. Actuator shall open damper in <75 seconds per UL555S and shall spring closed in under 20 seconds. Actuators shall be UL Approved, have a 5-year warranty, and be manufactured under ISO 9001 International Quality Control Standards. Actuators shall be as manufactured by Belimo. Actuators with auxiliary switches must be constructed to meet the requirement for double insulation so an electrical ground connection is not required to meet agency listings.

Replacement Application

The number one "equal or better" requirement for use as a replacement for obsolete defective motors is the UL555S listing of the Belimo actuator with the damper for the application. The local authority having jurisdiction sets the requirements since UL has stated that they do not regulate replacements.

Wiring Diagrams

INSTALLATION NOTES

- 1 Provide overload protection and disconnect as required.
- 2 **CAUTION Equipment Damage!**
Actuators may be connected in parallel.
Power consumption and input impedance must be observed.
- 3 Actuator may also be powered by 24 VDC.

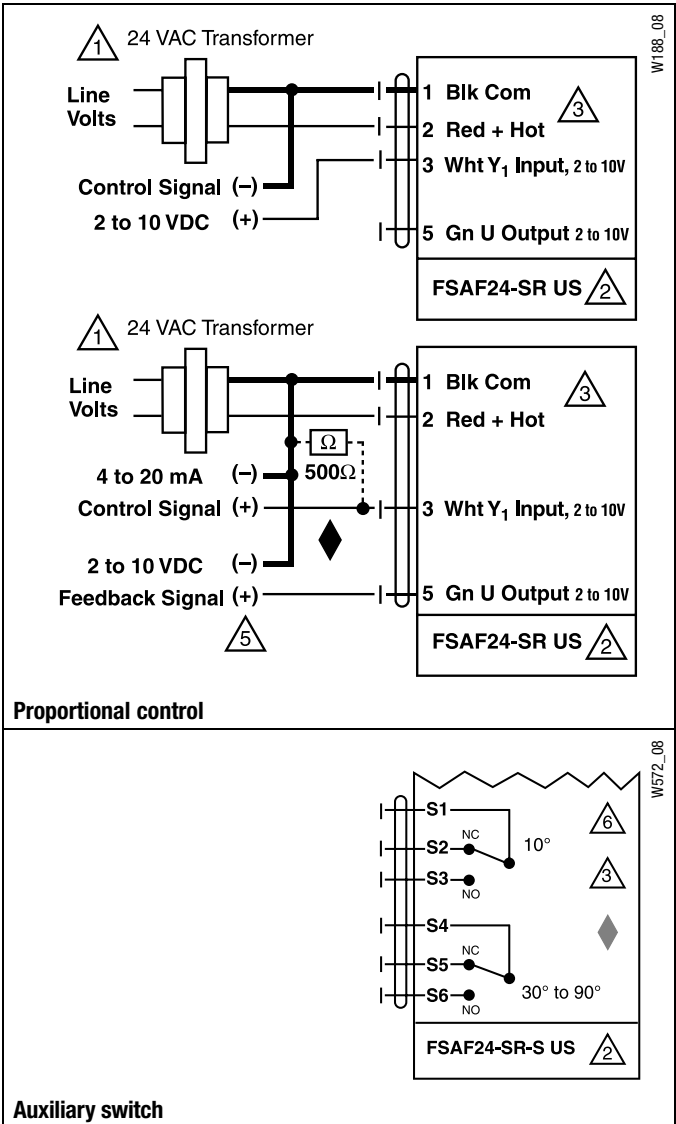
- 4 No ground connection required. Double insulated.
- 5 Only connect common to neg. (-) leg of control circuits.
- 6 For end position indication, interlock control, fan startup, etc., FSAF24-SR-S US incorporates two built-in auxiliary switches:
2 x SPDT, 7A resistive, 2.5A inductive 120/250 VAC, UL Approved, one switch is fixed at 10°, one is adjustable 30° to 90°.

APPLICATION NOTES

- Meets UL requirements without the need of an electrical ground connection.
- The ZG-R01 500 Ω resistor converts the 4 to 20 mA control signal to 2 to 10 VDC.

WARNING Live Electrical Components!

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FSAF24-BAL(-S) US

Spring Return, 24 V, 3-Position, 100% Open Override
Operation at 250°F for limited time per UL555S testing



Technical Data		FSAF24-BAL(-S) US
Power supply		24 VAC ± 20% 50/60 Hz 24 VDC ± 10%
Power consumption	running	AC 9.5 VA 6.5W DC 6W
	holding	AC 5 VA 3W DC 3W
Transformer sizing		10 VA (class 2 power source 24V only)
Electrical connection		3 ft, 18 GA, 1/2" conduit connector
Overload protection		electronic throughout 0 to 95° rotation
Control signal		24 VAC/DC 3-position
Angle of rotation		20° to 95°, pot adjustable
Torque		133 in-lb [15 Nm]
Direction of rotation	spring	reversible with cw/ccw mounting
Position indication		visual indicator, 0° to 95° (0° spring return position)
Manual override		3mm hex crank (shipped w/actuator)
Running time	motor	<75 seconds @ 250°F [121°C]
	spring	< 20 seconds
Humidity		5 to 95% RH non-condensing
Ambient temperature		-22°F to 122°F [-30°C to 50°C]
Storage temperature		-40°F to 176°F [-40°C to 80°C]
Housing		NEMA type 1/IP40 (with flex conduit)
Housing material		zinc coated metal
Agency listings†		cULus to UL873 and CSA C22.2 No. 24-93
Noise level (max)	running	<45 dB(A)
	spring	<62dB(A)
Servicing		maintenance free
Quality standard		ISO 9001, 5 year Belimo warranty
Weight		5.3 lbs (2.4 kg)
		5.7 lbs (2.6 kg) for -S model

FSAF24-BAL-S US	
Auxiliary switch	2 x SPDT 7A resistive, 2.5A inductive at 120/250VAC. UL listed, double-insulated, one switch is set at 10°, one is adjustable 30° to 90°

Application

For 3-position control of UL555S rated dampers in HVAC. Actuator sizing should be done in accordance with the damper manufacturer's tests. In the absence of other information, use 10 in-lb of torque per square foot of area for opposed blade and 14 in-lb for parallel blade fire and smoke dampers at 1000 fpm air velocity.

The FSAF24-BAL is specifically designed to balance the air flow in ducts and simultaneously provide control of fire and smoke dampers. 0V = spring closed. 24V on wire 2, not 3 = drive to the potentiometer position (balanced flow). 24V on wire 3, regardless of the status of wire 2 = drive full open (smoke control extraction or pressurization). See Application Bulletin for details.

Operation

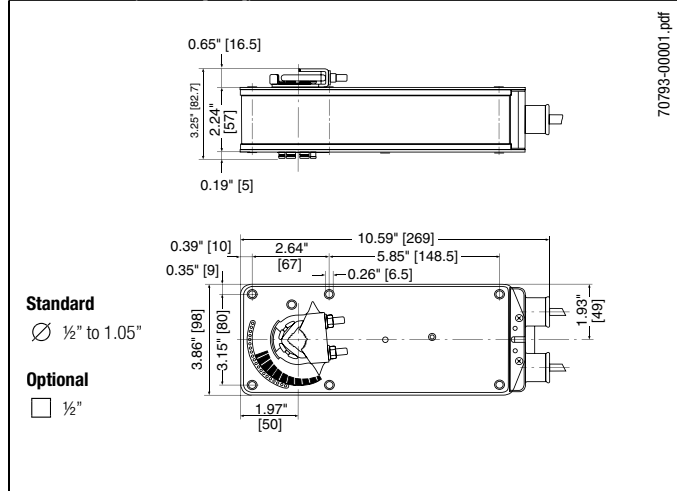
For 3-position control of UL555S rated dampers in HVAC. Actuator sizing should be done in accordance with the damper manufacturer's tests. In the absence of other information, use 10 in-lb of torque per square foot of area for opposed blade and 14 in-lb for parallel blade fire and smoke dampers at 1000 fpm air velocity.

The FSAF24-BAL is specifically designed to balance the air flow in ducts and simultaneously provide control of fire and smoke dampers. 0V = spring closed. 24V on wire 2, not 3 = drive to the potentiometer position (balanced flow). 24V on wire 3, regardless of the status of wire 2 = drive full open (smoke control extraction or pressurization).

SAFETY NOTE

The actuator contains no components which the user can replace or repair.

Dimensions (Inches [mm])



M40024 - 05/10 - Subject to change. © Belimo Aircontrols (USA), Inc.

Accessories (AF series accessories may be employed)

IND-AF2	Damper position indicator
K4-1 US	Universal clamp for up to 1.05" dia. jackshafts
KH-AF	Crank arm for up to 3/4" round shaft (Series 2)
KH-AF-1	Crank arm for up to 1.05" jackshaft (Series 2)
KH-AFV	V-bolt kit for KH-AF and KH-AF-1
Tool-01	10 mm wrench
ZDB-AF2	Angle of rotation limiter
ZG-100	Universal mounting bracket
ZG-101	Universal mounting bracket
ZG-103	Universal mounting bracket
ZG-104	Universal mounting bracket
ZG-106	Mounting bracket for Honeywell® Mod IV replacement or new crank arm type installations
ZG-107	Mounting bracket for Honeywell® Mod III or Johnson® Series 100 replacement or new crank arm type installations
ZG-108	Mounting bracket for Barber Colman® MA 3../4..., Honeywell® Mod III or IV or Johnson® Series 100 replacement or new crank arm type installations
ZG-AF	Crank arm adaptor kit for AF/NF
ZG-AF108	Crank arm adaptor kit for AF/NF
ZS-100	Weather shield (metal)
ZS-150	Weather shield (polycarbonate)
ZS-300	NEMA 4X housing
22965-00001	12 mm form fit square shaft adaptor

For an overview of how to apply the accessories, see Belimo Mechanical Accessories and refer to the Belimo Mounting Methods Guide.

NOTE: When using FSAF24-BAL(-S) US actuators, only use accessories listed on this page.

Typical Specification

Where indicated on drawings, combination fire and smoke and balancing dampers shall be controlled by Belimo FSAF24-BAL or equal actuators. The actuators must be designed so that they may be used for either clockwise or counter clockwise failsafe operation. Actuator shall open damper in <75 seconds per UL555S and shall spring closed in under 20 seconds. Actuators shall have a 5-year warranty and be manufactured under ISO9001 International Quality Control Standards.

Actuator shall have an adjustable Maximum Opening Potentiometer which shall be used by the TAB contractor to adjust flow to that portion of the system fed by the damper.

The actuator shall spring closed if either the smoke detector or alarm system removes power from it. Actuator shall spring closed if the primary temperature thermdisc opens due to high ambient of >165°F or as otherwise indicated on drawings.

The actuator shall drive full open if either the smoke control system 100% open override or Fire Fighters Smoke Control Station override is activated. Damper shall spring closed again if the thermdisc of a combination fire and smoke damper opens due to high temperature (typically 250°F).

Wiring Diagrams

INSTALLATION NOTES

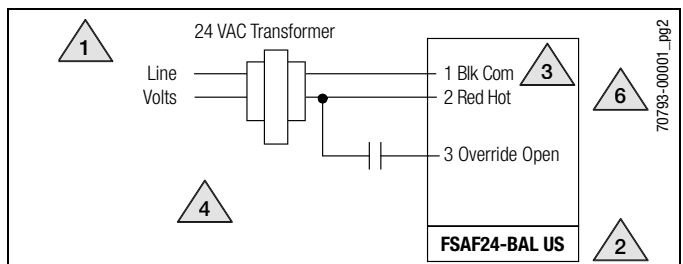
- 1 Provide overload protection and disconnect as required.
- 2 **CAUTION Equipment Damage!**
Actuators may be connected in parallel. Power consumption and input impedance must be observed.
- 3 Actuator may also be powered by 24 VDC.
- 4 Only connect Hot, Wire 2 to Wire 3 override control
- 5 For end position, interlock control, fan start-up, etc., FSAF24-BAL-S incorporates two built-in auxiliary switches: 2 x SPDT, 7A resistive, 2.5A inductive 120/250 VAC, UL listed, one switch is fixed at 10°, one adjustable 30° to 90°
- 6 For end position indication, interlock control, fan startup, etc., FSAF24-SR-S US incorporates two built-in auxiliary switches: 2 x SPDT, 7A resistive, 2.5A inductive 120/250 VAC, UL Approved, one switch is fixed at 10°, one is adjustable 30° to 90°.

APPLICATION NOTES

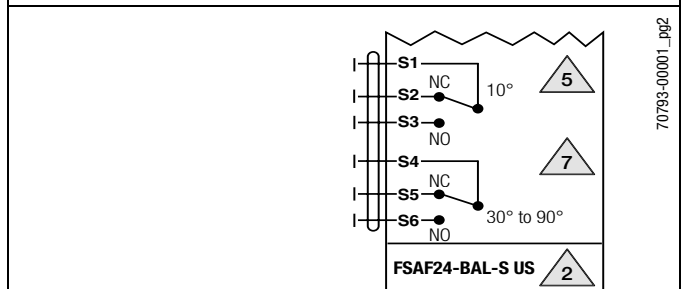
- 6 Meets UL requirements without the need of an electrical ground connection.
- 7 Double insulated

WARNING Live Electrical Components!

During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.



Override control



Auxiliary switch

M40024 - 05/10 - Subject to change. © Belimo Aircontrols (USA), Inc.

70793-0001_pg2

70793-0001_pg2



Technical Data FSNF24(-S)(-FC) US, FSNF120(-S)(-FC) US

Power supply	FSNF24(-S)(-FC) US	24 VAC ± 20%, 50/60 Hz
	FSNF120(-S)(-FC) US	120 VAC ± 10%, 50/60 Hz
Power consumption	running	17 W, 24 VA
	24 VAC holding	4 W, 6.5 VA
	120 VAC running	19 W, 23 VA, 0.19 A
	120 VAC holding	6 W, 8.5 VA, 0.07 A
Fusing*	FSNF24	2.5 amp slow blow
	FSNF120	0.5 amp slow blow
Transformer sizing		40 VA per 24 VAC actuator
Electrical connection	FSNF24 US	3 ft, 18 ga, 2 color coded leads
	FSNF120 US	3 ft, 18 ga, 3 color coded leads
	FSNF...-S US	3 ft, 18 ga, appliance cable
Overload protection		electronic throughout 0 to 95° rotation grounded enclosure, 120V
Control		microprocessor
Angle of rotation		95°
Torque		70 in-lb [7.9 Nm] minimum from 32°F to 350°F [0°C to 177°C]
Direction of rotation	spring	can be selected by CCW/CW mounting
Position indication		visual indicator, 0° to 95°
Running time		between 32°F and 350°F [0°C to 177°C] <15 seconds at rated voltage and torque
Humidity		5 to 95% RH non-condensing
Ambient temperature		32°F to 122°F [0°C to 50°C]
Storage temperature		-40°F to 176°F [-40°C to 80°C]
Housing		NEMA type 1
Housing material		zinc coated steel
Gears		steel, permanently lubricated
Agency listings		cULus listed to UL873 and CAN/CSA C22.2 No. 24 NYC Department of Buildings Materials and Equipment Acceptance Division MEA 197-07-M California State Fire Marshal Listing 3210-1593:101
Servicing		maintenance free
Quality standard		ISO 9001
Weight	FSNF24(-S) US	6.0 lbs [2.75 kg], (+ 0.5 lbs [+ .23 kg])
	FSNF120(-S) US	6.7 lbs [3.0 kg], (+ 0.5 lbs [+ .23 kg])

FSNF24-S US, FSNF120-S US, FSNF24-S-FC, FSNF120-S-FC

Auxiliary switch		2xSPST 7A resistive, 2.5A inductive at 120V or 250V, UL Approved, double-insulated, one switch at 10°, one at 85°
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FSNF24(-S)(-FC) US, FSNF120(-S)(-FC) US
On/Off, Spring Return, 350°F for Half Hour, 15 Seconds Cycle Time

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 open and close in 15 seconds at 350°F. Square footage of damper operated will depend on make and model of damper and the temperature 250°F or 350°F.

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.

-FC Models have the same electrical and mechanical characteristics except instead of a 1/2" conduit connector a 3/8" screw flex connector is supplied.

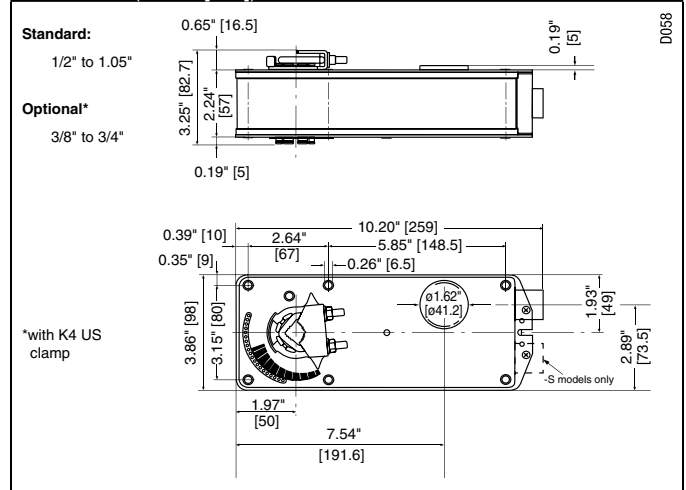
SAFETY NOTES

The actuator contains no components which the user can replace or repair.

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" Flexible Connector Models (-FC Screw Connector) – Mount the flexible conduit into the actuator's metal bushing by means of the provided screw with a torque of 0.9 ft-lb. Jacket the actuator's input wiring with suitable flexible conduit. Properly terminate the conduit in a suitable junction box.

Dimensions (Inches [mm])



Accessories

All AF/NF linkages and parts except ZG-102 may be employed.

*** Individual Fusing or Breakers are not required by Belimo.**

The FSNF24 draws higher peak current when driving against any 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 2.5 amp slow blow should be used for 24VAC. A 0.5 amp slow blow should be used for 120VAC.

Transformers

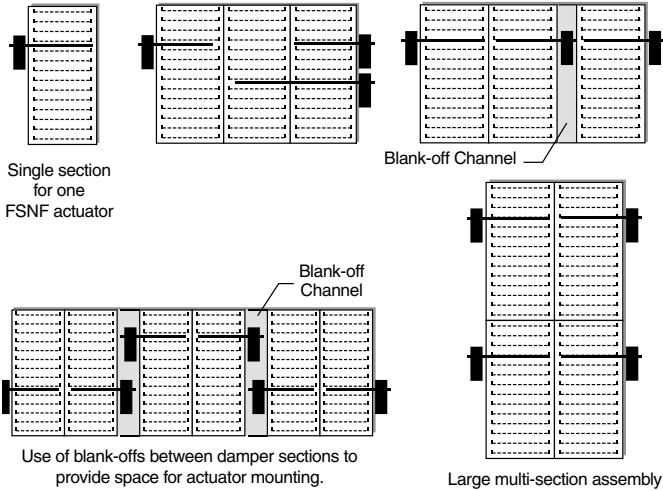
Note that while a 100VA transformer would handle 2 actuators, a 4A breaker is insufficient.

Typical Applications

Multi-section Damper Assemblies

The typical fire and smoke damper requires from 5-15 in-lb of torque per square foot at 250°F – 350°F under dynamic load (2400 fpm velocity). The FSNF will operate multi-section dampers using multiple actuators for multiple sections. Some of the methods used are shown below.

This is a direct coupled actuator. If linkages are needed use those for the FSAF series. Do not use the ZG-102 as close coupled actuators have a shortened life due to the high speed of the FSNF. Mounting at opposite ends of a jackshaft is OK.



Typical Specification

Smoke Control and Combination Fire and Smoke Control Damper Actuators

All smoke and combination fire and smoke dampers shall be provided with Belimo FSTF, FSLF, FSNF, or FSAF actuators. No substitutions allowed.

Damper and actuator shall have UL555S Listing for 250°F (350°F) and shall comply with UBC if required by local codes.

Where proof of closure switches are required, blade switches, actuator auxiliary switches, or proximity switches are allowed if permitted by local codes.

Replacement Applications

The number one "equal or better" requirement for use as a replacement for obsolete defective motors is the UL555S listing of the Belimo actuator with the damper for the application. The local authority having jurisdiction sets the requirements. In some cases a permit and inspection may be required.

Go to www.belimo.us/firesmoke for a Cross Reference from old damper actuators to Belimo. Extensive retrofit installation instructions are available, along with technical training information.

CAUTION

Caution must be used when replacing failed motors with new Belimo actuators. Many old motors did not have internal springs and depended on external springs on the side of the damper or wrapped around the damper shaft to close the damper. Old motor springs must be removed or disabled. Do not remove fusible link springs if they had only fire and no smoke functions

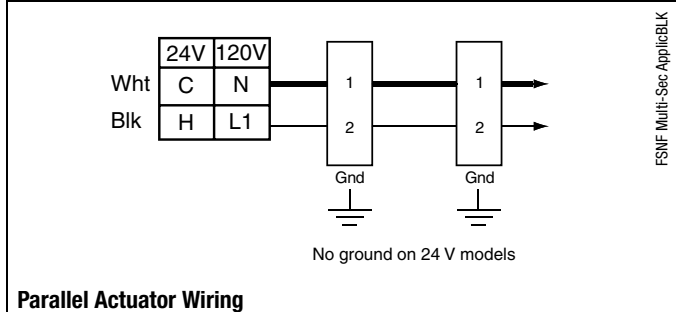
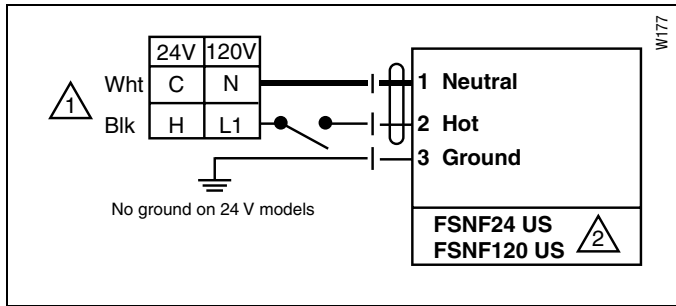
In some cases, a BAE 165 or equal thermal sensor must be installed.

Wiring Diagrams

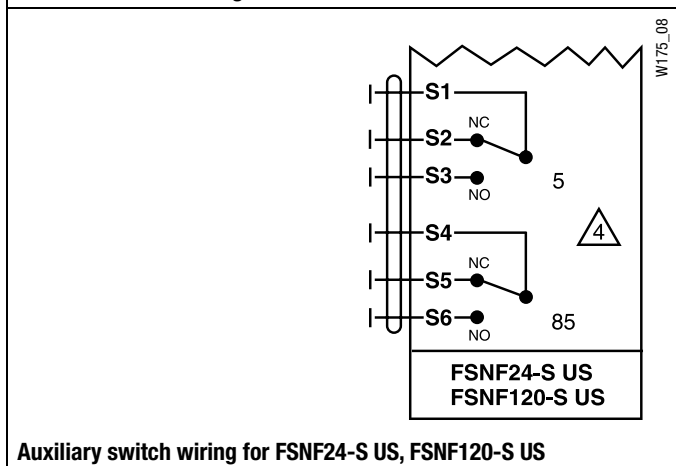
INSTALLATION NOTES

- 1 Provide overload protection and disconnect as required.
- 2 **CAUTION Equipment Damage!**
Actuators may be connected in parallel. Power consumption and input impedance must be observed.
- 4 For end position indication, interlock control, fan startup, etc., FSNF24-S US and FSNF120-S US incorporate two built-in auxiliary switches:
2 x SPDT, 7A (2.5A inductive)@125/250 VAC, UL Approved, 10° and 85°.
Switch rating is for 250°F 1/2 hour only.

WARNING Live Electrical Components!
 During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.



Parallel Actuator Wiring



Subject to change. © Belimo Aircontrols (USA), Inc.



Technical Data		FSNF24(-S)(-FC) US, FSNF230(-S) US
Power supply		
	FSNF24(-S)(-FC) US	24 VAC \pm 20%, 50/60 Hz
	FSNF230(-S) US	230 VAC \pm 10%, 50/60 Hz
Power consumption		
	running	17 W, 24 VA
	24 VAC holding	4 W, 6.5 VA
	230 VAC running	20 W, 23 VA, 0.1 A
	holding	6 W, 8 VA, 0.04 A
Fusing*		
	FSNF24	2.5 amp slow blow
	FSNF230	0.25 amp slow blow
Transformer sizing		40 VA per 24 VAC actuator
Electrical connection		
	FSNF24 US	3 ft, 18 ga, 2 color coded leads
	FSNF230 US	3 ft, 18 ga, 3 color coded leads
	FSNF...-S US	3 ft, 18 ga, appliance cable
Overload protection		electronic throughout 0 to 95° rotation grounded enclosure, 230V
Control		microprocessor
Angle of rotation		95°
Torque		70 in-lb [7.9 Nm] minimum from 32°F to 350°F [0°C to 177°C]
Direction of rotation		spring
Position indication		can be selected by CCW/CW mounting
Running time		visual indicator, 0° to 95°
Humidity		between 32°F and 350°F [0°C to 177°C]
Ambient temperature		<15 seconds at rated voltage and torque
Storage temperature		5 to 95% RH non-condensing
Housing		32°F to 122°F [0°C to 50°C]
Housing material		-40°F to 176°F [-40°C to 80°C]
Gears		NEMA type 1
Agency listings		zinc coated steel
Servicing		steel, permanently lubricated
Quality standard		cULus listed to UL873 and CAN/CSA C22.2 No. 24
Weight		NYC Department of Buildings Materials and Equipment Acceptance Division MEA 197-07-M
		California State Fire Marshal Listing 3210-1593:101
Auxiliary switch		2xSPST 7A resistive, 2.5A inductive at 120V or 250V, UL Approved, double-insulated, one switch at 10°, one at 85°

FSNF24(-S)(-FC) US, FSNF230(-S) US	
Auxiliary switch	2xSPST 7A resistive, 2.5A inductive at 120V or 250V, UL Approved, double-insulated, one switch at 10°, one at 85°

FSNF24(-S)(-FC) US, FSNF230(-S) US

On/Off, Spring Return, 350°F for Half Hour, 15 Seconds Cycle Time

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 open and close in 15 seconds at 350°F. Square footage of damper operated will depend on make and model of damper and the temperature 250°F or 350°F.

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.

-FC Models have the same electrical and mechanical characteristics except instead of a 1/2" conduit connector a 3/8" screw flex connector is supplied.

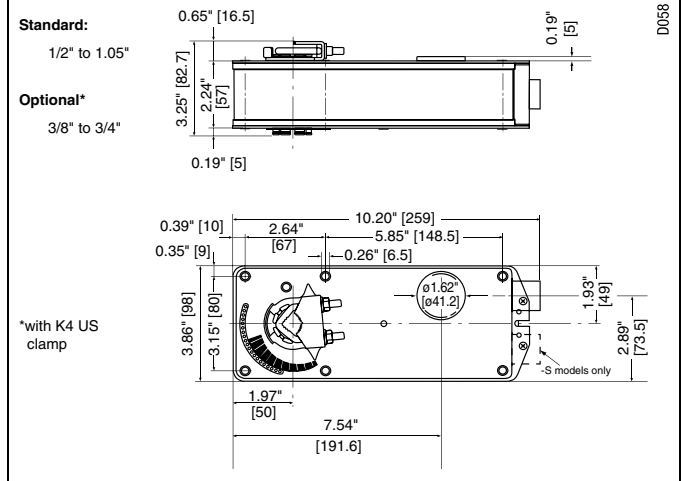
SAFETY NOTES

The actuator contains no components which the user can replace or repair.

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" Flexible Connector Models (-FC Screw Connector) – Mount the flexible conduit into the actuator's metal bushing by means of the provided screw with a torque of 0.9 ft-lb. Jacket the actuator's input wiring with suitable flexible conduit. Properly terminate the conduit in a suitable junction box.

Dimensions (Inches [mm])



Accessories

All AF/NF linkages and parts except ZG-102 may be employed.

* Individual Fusing or Breakers are not required by Belimo.

The FSNF24 draws higher peak current when driving against any 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 2.5 amp slow blow should be used for 24VAC. A 0.25 amp slow blow should be used for 230VAC.

Transformers

Note that while a 100VA transformer would handle 2 actuators, a 4A breaker is insufficient.

FSNF24(-S)(-FC) US, FSNF230(-S) US

On/Off, Spring Return, 350°F for Half Hour, 15 Seconds Cycle Time

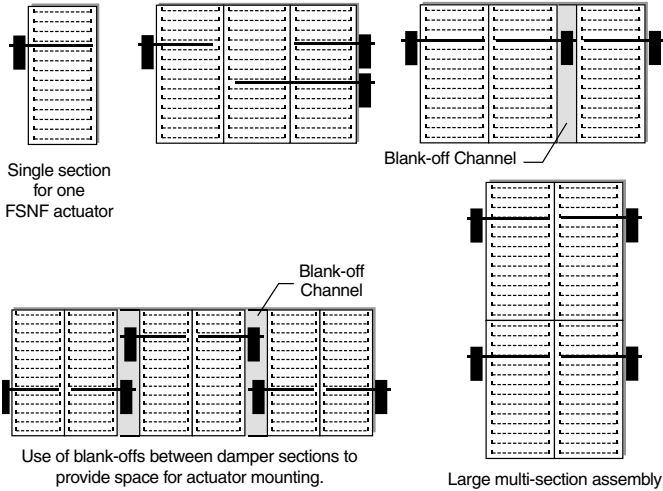


Typical Applications

Multi-section Damper Assemblies

The typical fire and smoke damper requires from 5-15 in-lb of torque per square foot at 250°F – 350°F under dynamic load (2400 fpm velocity). The FSNF will operate multi-section dampers using multiple actuators for multiple sections. Some of the methods used are shown below.

This is a direct coupled actuator. If linkages are needed use those for the FSAF series. Do not use the ZG-102 as close coupled actuators have a shortened life due to the high speed of the FSNF. Mounting at opposite ends of a jackshaft is OK.



Typical Specification

Smoke Control and Combination Fire and Smoke Control Damper Actuators

All smoke and combination fire and smoke dampers shall be provided with Belimo FSTF, FSLF, FSNF, or FSAF actuators. No substitutions allowed.

Damper and actuator shall have UL555S Listing for 250°F (350°F) and shall comply with UBC if required by local codes.

Where proof of closure switches are required, blade switches, actuator auxiliary switches, or proximity switches are allowed if permitted by local codes.

Replacement Applications

The number one "equal or better" requirement for use as a replacement for obsolete defective motors is the UL555S listing of the Belimo actuator with the damper for the application. The local authority having jurisdiction sets the requirements. In some cases a permit and inspection may be required.

Go to www.belimo.us/firesmoke for a Cross Reference from old damper actuators to Belimo. Extensive retrofit installation instructions are available, along with technical training information.

CAUTION

Caution must be used when replacing failed motors with new Belimo actuators. Many old motors did not have internal springs and depended on external springs on the side of the damper or wrapped around the damper shaft to close the damper. Old motor springs must be removed or disabled. Do not remove fusible link springs if they had only fire and no smoke functions

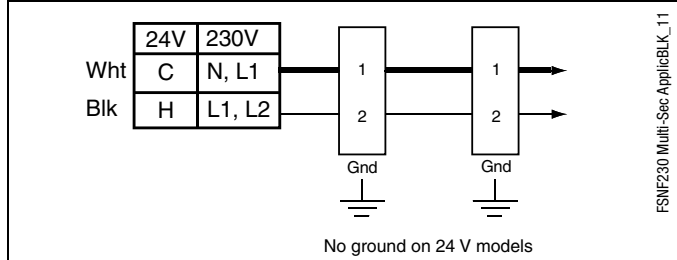
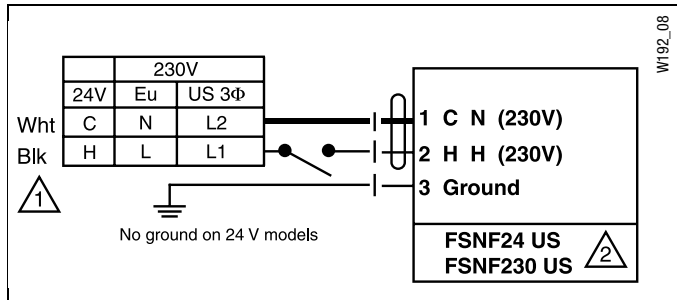
In some cases, a BAE 165 or equal thermal sensor must be installed.

Wiring Diagrams

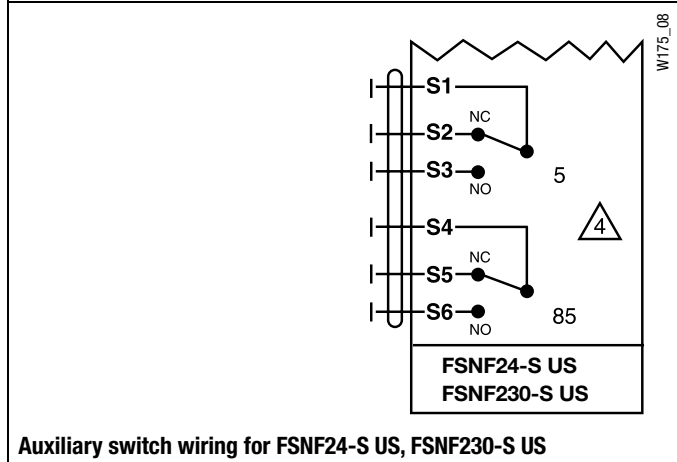
INSTALLATION NOTES

- 1 Provide overload protection and disconnect as required.
- 2 **CAUTION Equipment Damage!**
Actuators may be connected in parallel. Power consumption and input impedance must be observed.
- 4 For end position indication, interlock control, fan startup, etc., FSNF24-S US and FSNF230-S US incorporate two built-in auxiliary switches:
2 x SPDT, 7A (2.5A inductive)@125/250 VAC, UL Approved, 10° and 85°.
Switch rating is for 250°F 1/2 hour only.

WARNING Live Electrical Components!
During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.



Parallel Actuator Wiring




Technical Data FSLF24(-S)(-FC) US, FSLF120(-S)(-FC) US

Power supply		
	FSLF24(-S)(-FC) US	24 VAC \pm 20%, 50/60 Hz
	FSLF120(-S)(-FC) US	120 VAC \pm 10%, 50/60 Hz
Power consumption	running	50/60 Hz, 15 VA
	24 VAC holding	50/60 Hz, 3.5 VA
	end stop	50/60 Hz 25 VA
120 VAC	running	50/60 Hz 18 VA
	holding	50/60 Hz 6.5 VA
	end stop	50/60 Hz 27 VA
Fusing*		
	FSLF24	1 amp slow blow
	FSLF120	0.25 amp slow blow
Transformer sizing		25 VA per 24 VAC actuator
Electrical connection		
	FSLF24 US	3 ft, 18 ga, 2 color coded leads
	FSLF120 US	3 ft, 18 ga, 3 color coded leads
	FSLF...-S US	3 ft, 18 ga, appliance cable
Overload protection		electronic throughout 0 to 95° rotation auto-restart after temporary overload (FSLF120 US grounded enclosure)
Control		microprocessor
Angle of rotation		95°
Torque		30 in-lb [3.5 Nm] minimum from 32°F to 350°F [0°C to 177°C]
Direction of rotation		spring can be selected by CCW/CW mounting
Position indication		visual indicator, 0° to 95°
Running time	motor	< 15 sec at rated voltage and torque 32°F to +122°F [0°C to +50°C]
	spring	<15 seconds at rated voltage and torque
Humidity		5 to 95% RH non-condensing
Ambient temperature		32°F to 122°F [0°C to 50°C]
Storage temperature		-40°F to 176°F [-40°C to 80°C]
Housing		NEMA type 1
Housing material		zinc coated steel
Gears		permanently lubricated
Agency listings		cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1, CSA C22.2 No.24-93
Servicing		maintenance free
Quality standard		ISO 9001
Weight		
	FSLF24(-S) US	3.4 lbs [1.7 kg], (+ 0.3 lbs [+0.14 kg])
	FSLF120(-S) US	4.0 lbs [1.8 kg], (+ 0.3 lbs [+0.14 kg])

FSLF24(-S)(-FC) US, FSLF120(-S)(-FC) US

Auxiliary switch	2 x SPST 0.5 A inductive, 3A resistive @ 120/250VAC, minimum 1 mA @ 5 VDC, .3 A ind, .5A res @ 24VDC, UL listed, 10° and 85°. Double insulated <input type="checkbox"/>
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FSLF24(-S)(-FC) US, FSLF120(-S)(-FC) US

On/Off, Spring Return, 350°F for Half Hour, 15 Seconds Cycle Time

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.

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.

SAFETY NOTES

The actuator contains no components which the user can replace or repair. 24 VAC Connect via safety isolating transformer, Class 2 supply.

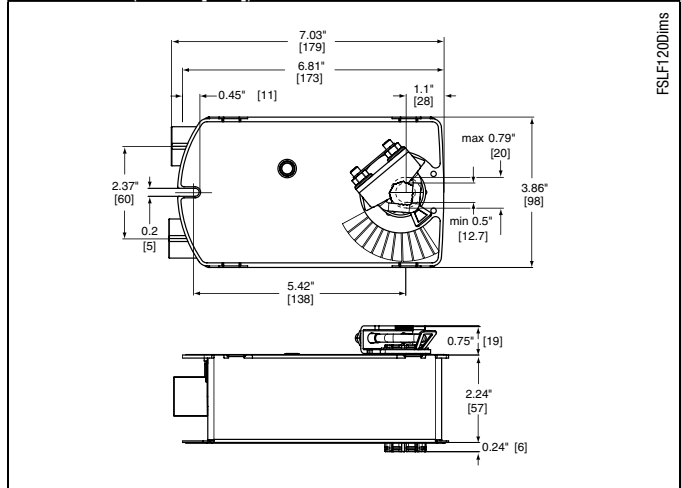
1/2" Threaded Connector

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.

Dimensions (Inches [mm])



*Individual Fusing or Breakers are not required by Belimo.

The FSLF24 draws higher peak current when driving against any 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.

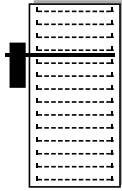
FSLF24(-S)(-FC) US, FSLF120(-S)(-FC) US

On/Off, Spring Return, 350°F for Half Hour, 15 Seconds Cycle Time

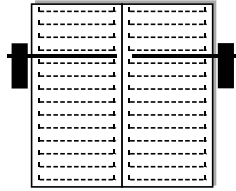


Typical Applications

The typical fire and smoke damper requires from 5-15 in-lb of torque per square foot at 250°F - 350°F under dynamic load (2000 fpm velocity). The FSLF is a single section damper actuator. For the multi section dampers, use the FSNF series. This is a direct coupled actuator. If linkages are needed use the FSNF series.



Single section for one FSLF actuator



Two section for two FSLF actuators

Typical Specification

Smoke Control and Combination Fire and Smoke Control Damper Actuators

All smoke and combination fire and smoke dampers shall be provided with Belimo FSLF, FSNF, or FSAF actuators. No substitutions allowed. Damper and actuator shall have UL555S Listing for 250°F (350°F) and shall comply with UBC if required by local codes. Where proof of closure switches are required, blade switches, actuator auxiliary switches, or proximity switches are allowed.

Replacement Applications

The number one "equal or better" requirement for use as a replacement for obsolete defective motors is the UL555S listing of the Belimo actuator with the damper for the application. The local authority having jurisdiction sets the requirements. In some cases a permit and inspection may be required.

Go to www.belimo.us/firesmoke for a Cross Reference from old damper actuators to Belimo. Extensive retrofit installation instructions are available, along with technical training information.

CAUTION

Caution must be used when replacing failed motors with new Belimo actuators. Many old motors did not have internal springs and depended on external springs on the side of the damper or wrapped around the damper shaft to close the damper. Old motor springs must be removed or disabled. Do not remove fusible link springs if they had only fire and no smoke functions

In some cases, a BAE 165 or equal thermal sensor must be installed.

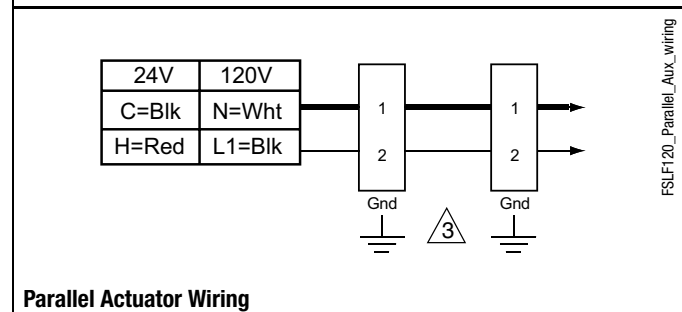
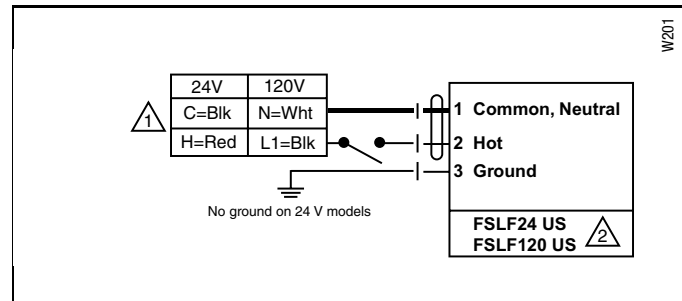
Wiring Diagrams

INSTALLATION NOTES

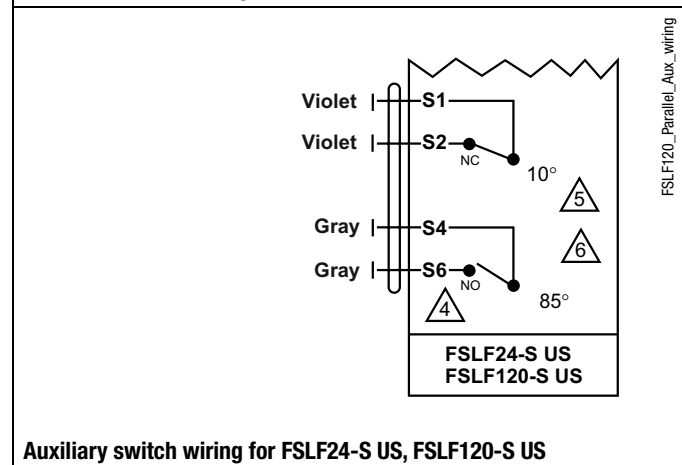
- 1 Provide overload protection and disconnect as required.
- 2 **CAUTION Equipment Damage!**
Actuators may be connected in parallel. Power consumption and input impedance must be observed.
- 3 No ground on 24 V models
- 4 S4 makes to S6 when the actuator is powered open.
- 5 For end position indication, interlock control, fan startup, etc., FSLF24-S US and FSLF120-S US incorporate two built-in auxiliary switches.
- 6 Double insulated

WARNING Live Electrical Components!

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Parallel Actuator Wiring



Auxiliary switch wiring for FSLF24-S US, FSLF120-S US

Subject to change. © Belimo Aircontrols (USA), Inc.


Technical Data FSLF24(-S)(-FC) US, FSLF230(-S) US

Power supply		
	FSLF24(-S)(-FC) US	24 VAC \pm 20%, 50/60 Hz
	FSLF230(-S) US	230 VAC \pm 10%, 50/60 Hz
Power consumption	running	50/60 Hz, 15 VA
	24 VAC holding	50/60 Hz, 3.5 VA
	end stop	50/60 Hz 25 VA
230 VAC	running	50/60 Hz 17 VA
	holding	50/60 Hz 6.5 VA
	end stop	50/60 Hz 27 VA
Fusing*		
	FSLF24	1 amp slow blow
	FSLF230	0.125 amp slow blow
Transformer sizing		25 VA per 24 VAC actuator
Electrical connection		
	FSLF24 US	3 ft, 18 ga, 2 color coded leads
	FSLF230 US	3 ft, 18 ga, 3 color coded leads
	FSLF...-S US	3 ft, 18 ga, appliance cable
Overload protection		electronic throughout 0 to 95° rotation auto-restart after temporary overload (FSLF230 US grounded enclosure)
Control		microprocessor
Angle of rotation		95°
Torque		30 in-lb [3.5 Nm] minimum from 32°F to 350°F [0°C to 177°C]
Direction of rotation		spring can be selected by CCW/CW mounting
Position indication		visual indicator, 0° to 95°
Running time	motor	< 15 sec at rated voltage and torque 32°F to +122°F [0°C to +50°C]
	spring	<15 seconds at rated voltage and torque
Humidity		5 to 95% RH non-condensing
Ambient temperature		32°F to 122°F [0°C to 50°C]
Storage temperature		-40°F to 176°F [-40°C to 80°C]
Housing		NEMA type 1
Housing material		zinc coated steel
Gears		permanently lubricated
Agency listings		cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1, CSA C22.2 No.24-93
Servicing		maintenance free
Quality standard		ISO 9001
Weight		
	FSLF24(-S) US	3.4 lbs [1.7 kg], (+ 0.3 lbs [+0.14 kg])
	FSLF230(-S) US	4.0 lbs [1.8 kg], (+ 0.3 lbs [+0.14 kg])

FSLF24(-S)(-FC) US, FSLF230(-S) US

Auxiliary switch	2 x SPST 0.5 A inductive, 3A resistive @ 120/250VAC, minimum 1 mA @ 5 VDC, .3 A ind, .5A res @ 24VDC, UL listed, 10° and 85°. Double insulated <input type="checkbox"/>
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FSLF24(-S)(-FC) US, FSLF230(-S) US

On/Off, Spring Return, 350°F for Half Hour, 15 Seconds Cycle Time

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.

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.

SAFETY NOTES

The actuator contains no components which the user can replace or repair. 24 VAC Connect via safety isolating transformer, Class 2 supply.

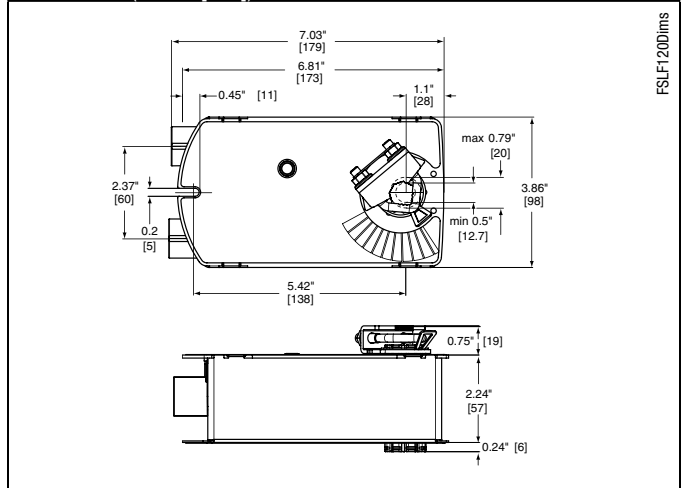
1/2" Threaded Connector

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.

Dimensions (Inches [mm])



*Individual Fusing or Breakers are not required by Belimo.

The FSLF24 draws higher peak current when driving against any 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 0.125 amp slow blow should be used for 230VAC.

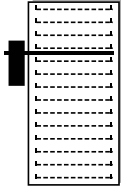
FSLF24(-S)(-FC) US, FSLF230(-S) US

On/Off, Spring Return, 350°F for Half Hour, 15 Seconds Cycle Time

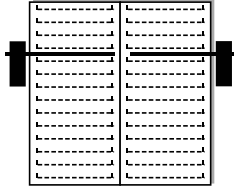


Typical Applications

The typical fire and smoke damper requires from 5-15 in-lb of torque per square foot at 250°F - 350°F under dynamic load (2000 fpm velocity). The FSLF is a single section damper actuator. For the multi section dampers, use the FSNF series. This is a direct coupled actuator. If linkages are needed use the FSNF series.



Single section for one FSLF actuator



Two section for two FSLF actuators

Typical Specification

Smoke Control and Combination Fire and Smoke Control Damper Actuators

All smoke and combination fire and smoke dampers shall be provided with Belimo FSLF, FSNF, or FSAF actuators. No substitutions allowed. Damper and actuator shall have UL555S Listing for 250°F (350°F) and shall comply with UBC if required by local codes. Where proof of closure switches are required, blade switches, actuator auxiliary switches, or proximity switches are allowed.

Replacement Applications

The number one "equal or better" requirement for use as a replacement for obsolete defective motors is the UL555S listing of the Belimo actuator with the damper for the application. The local authority having jurisdiction sets the requirements. In some cases a permit and inspection may be required.

Go to www.belimo.us/firesmoke for a Cross Reference from old damper actuators to Belimo. Extensive retrofit installation instructions are available, along with technical training information.

CAUTION

Caution must be used when replacing failed motors with new Belimo actuators. Many old motors did not have internal springs and depended on external springs on the side of the damper or wrapped around the damper shaft to close the damper. Old motor springs must be removed or disabled. Do not remove fusible link springs if they had only fire and no smoke functions

In some cases, a BAE 165 or equal thermal sensor must be installed.

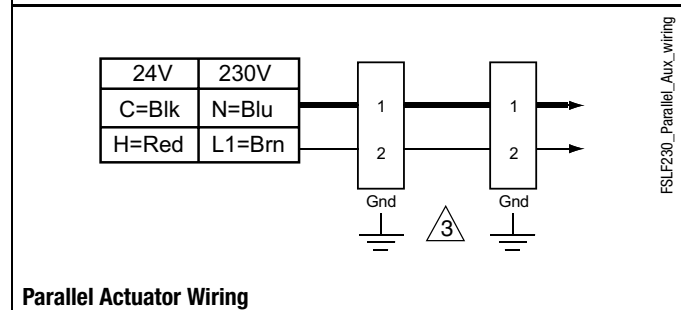
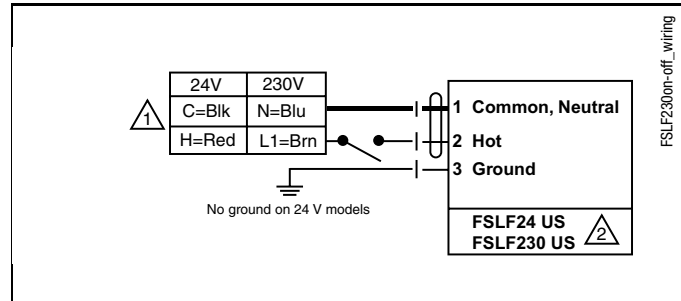
Wiring Diagrams

INSTALLATION NOTES

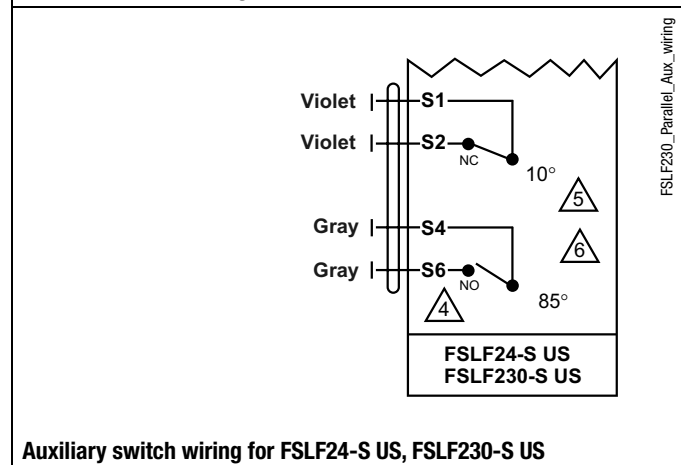
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- 3 No ground on 24 V models
- 4 S4 makes to S6 when the actuator is powered open.
- 5 For end position indication, interlock control, fan startup, etc., FSLF24-S US and FSLF230-S US incorporate two built-in auxiliary switches.
- 6 Double insulated

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Parallel Actuator Wiring



Auxiliary switch wiring for FSLF24-S US, FSLF230-S US

Subject to change. © Belimo Aircontrols (USA), Inc.



Technical Data		FSTF120(-S) US
Power supply	nominal	120 VAC, 60 Hz
	tolerance	108 to 132 VAC, 60 Hz
Power consumption	running	2 W, 3.5 VA
	holding	1.5 W, 2.5 VA
	max. inrush current	2.1 A
Transformer sizing		5 VA (class 2 power source)
Electrical connection (-S models have 2 cables)		3 ft, 18 GA appliance cable
		1/2" conduit connector
Overload protection		electronic throughout 0 to 95° rotation
Electrical protection		actuators are double insulated
Angle of rotation		max 95°, adjust. with mechanical stop
Torque		min. 18 in-lb [2 Nm]
Direction of rotation		reversible with cw/ccw mounting
Position indication		visual indicator, 0° to 95°
		(0° spring return position)
Running time	motor	< 75 sec (0 to 18 in-lb)
	spring	< 25 sec @32°F to 122°F [0°C to 50°C]
Humidity		5 to 95% RH non-condensing
Ambient temperature		32°F to 122°F [0°C to 50°C]
Operating temperature		Up to 250°F for 1/2 hour per UL555S test
Housing		NEMA type 2 / IP42, UL enclosure type 2
Housing material		UL94-5VA. UL2043 Listed for plenum use
Agency listings†		cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2004/108/EC (and 2006/95/EC for -S versions). UL2043 smoke rated
Noise level (max)	running	< 50 db (A)
	spring return	62 db (A)
	holding	inaudible
Servicing		maintenance free
Quality standard		ISO 9001
Weight	FSTF120 US	1.26 lbs (0.57 kg)
	FSTF120-S US	1.5 lbs (0.68 kg)

† Rated Impulse Voltage 4kV, Type of action 1.AA (1.AA.B for -S version), Control Pollution Degree 3.

FSTF120-S US

Auxiliary switch	2 x SPST 3A (0.5A) @ 120 VAC, UL approved One fixed at 10° and one fixed at 80°
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Torque min. 18 in-lb, for control of 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 and the temperature required.

Operation

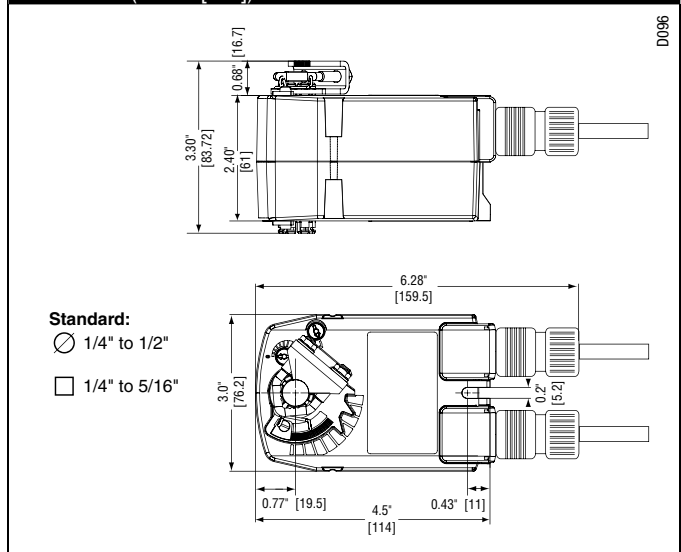
Mounting of the actuator to the damper axle shaft or jackshaft is via a cold-weld clamp. Teeth in the clamp and V-bolt dig into the metal of both solid and hollow shafts maintaining a perfect connection. The specially designed clamp will not crush hollow shafts. The bottom end of the actuator is held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

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.

Dimensions (Inches [mm])



FSTF120(-S) US

On/Off, Spring Return, 120 VAC



Accessories

Tool-06	8mm and 10 mm wrench
KH-TF	Crank arm for up to 1/2" round shaft
ZG-TF2	Crank arm adaptor kit for FSTF
ZG-TF112	Mounting bracket, kit for FSTF
ZS-100	Weather shield (metal)
ZS-150	Weather shield (polycarbonate)

NOTE: When using FSTF120 US and FSTF120-S US actuators, only use accessories listed on this page or those provided by damper manufacturers.

For actuator wiring information and diagrams, refer to Belimo Wiring Guide.

Typical Specification

On/Off fire and smoke spring return damper actuators shall be direct coupled type which require no crank arm and linkage and be capable of direct mounting to a shaft up to a 1/2" diameter and center a 1/2" shaft. The actuators must be designed so that they may be used for either clockwise or counterclockwise fail-safe operation. Actuators shall be protected from overload at all angles of rotation. If required, two SPDT auxiliary switches shall be provided. Actuators shall be cULus listed and have a 5 year warranty, and be manufactured under ISO 9001 International Quality Control Standards. Actuators shall be as manufactured by Belimo.

Wiring Diagrams

✂ INSTALLATION NOTES

1 Provide overload protection and disconnect as required.

2 **CAUTION Equipment Damage!**
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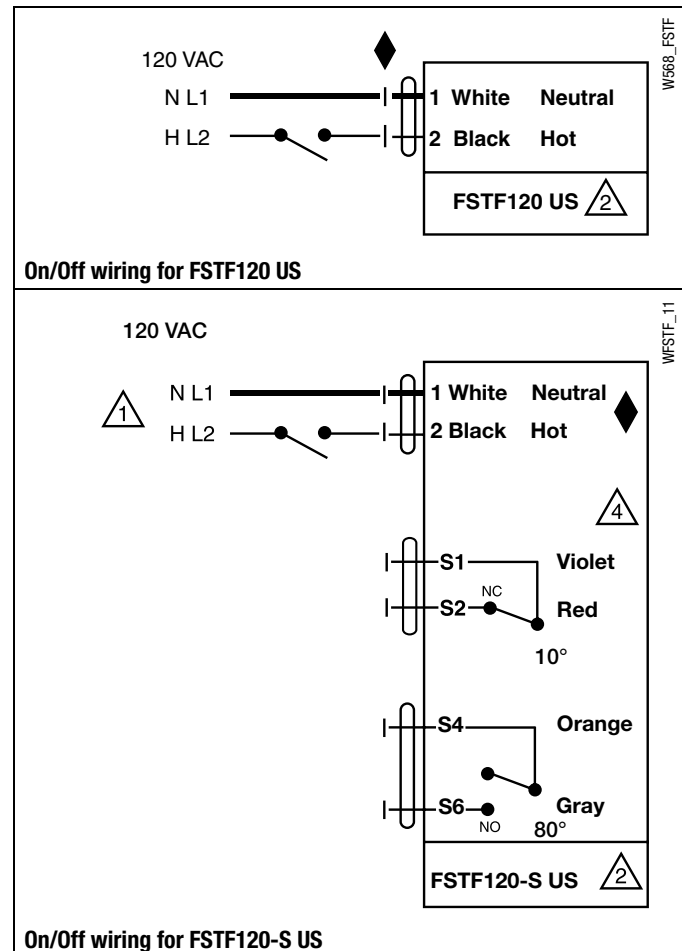
4 Two SPST auxiliary switches for position indication. NC switch opens at 10° and NO switch closes at 80°

📄 APPLICATION NOTES

◆ Meets cULus requirements without the need of an electrical ground connection.

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