

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

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



Technical Data		FSAF24(-S) US, FSAF120(-S) US
Power supply		
FSAF24(-S) US		24 VAC \pm 20%, 24 VDC -10% +20%
FSAF120(-S) US		120 VAC \pm 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
	-S models	1/2" conduit connectors 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
Position indication		reversible with cw/ccw mounting
Manual override		visual indicator, 0° to 95° (0° is spring return position)
Running time		3mm hex crank (shipped w/actuator)
Humidity	spring	<75 sec. constant, independent of load
		<20 seconds nominal
Ambient temperature		5 to 95% RH non-condensing
	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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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.

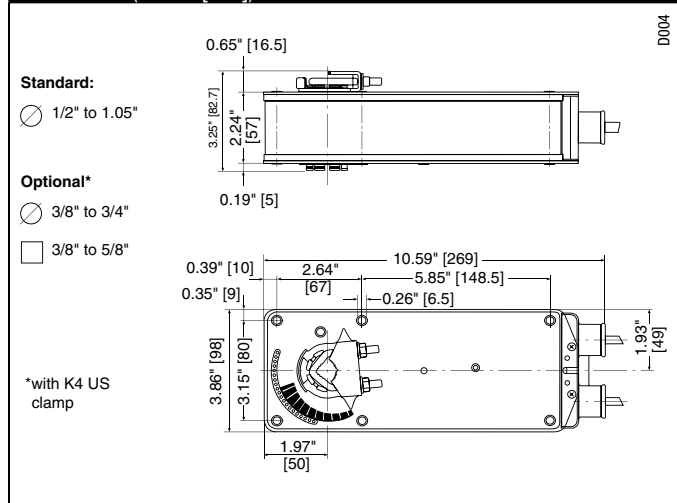
The actuator is shipped in the zero fail-safe position to provide automatic compression against damper gaskets for tight shut-off. When power is applied, the manual mechanism is released and the actuator drives toward the open position where it stops rotating.

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])



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

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

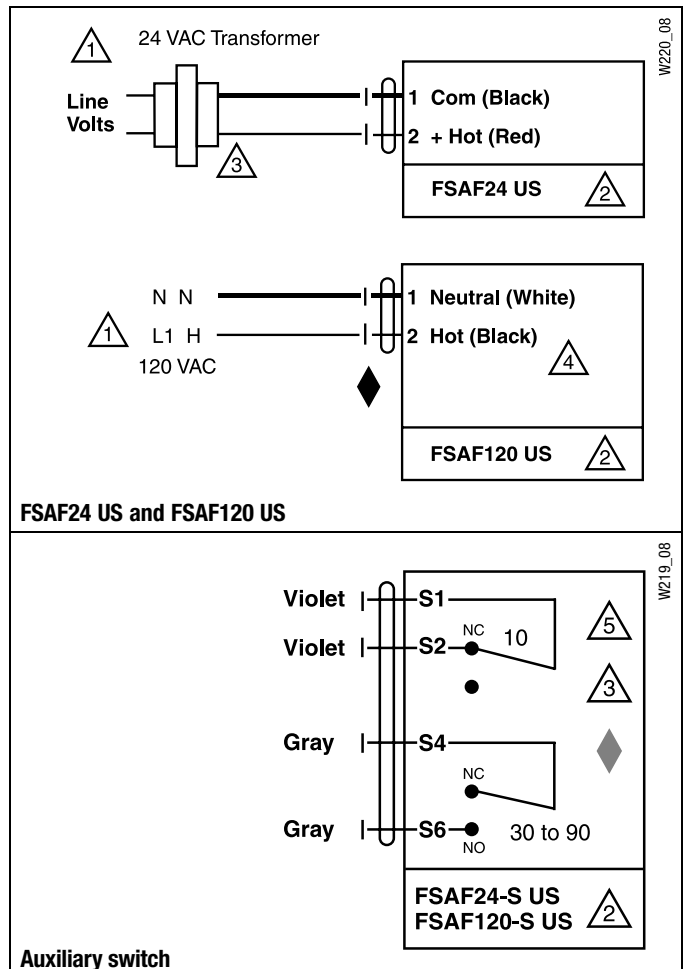
- 1 Provide overload protection and disconnect as required.
- 2 **CAUTION Equipment Damage!**
Actuators may be connected in parallel.
Power consumption and input impedance must be observed.
- 3 Actuator may also be powered by 24 VDC.
- 4 No ground connection required. Double insulated.
- 5 For end position 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.

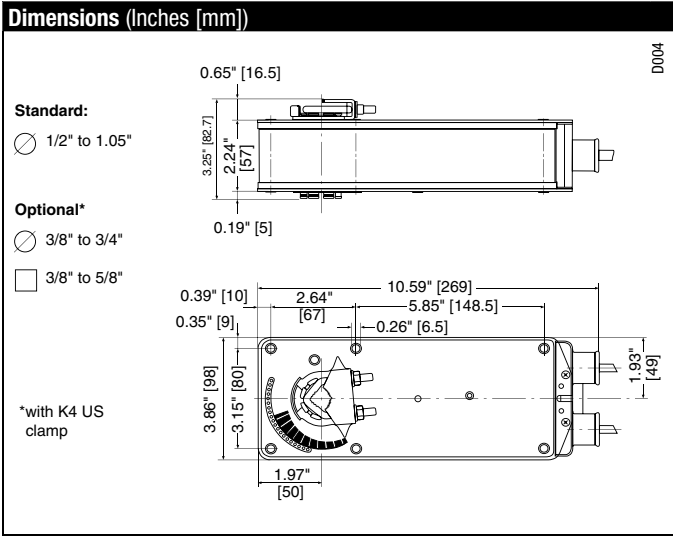
The FSAF series provides 95° of rotation and is provided with a graduated position indicator showing 0 to 95°. The FSAF has a manual positioning mechanism which allows the setting of any damper position within its 95° of rotation.

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.



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

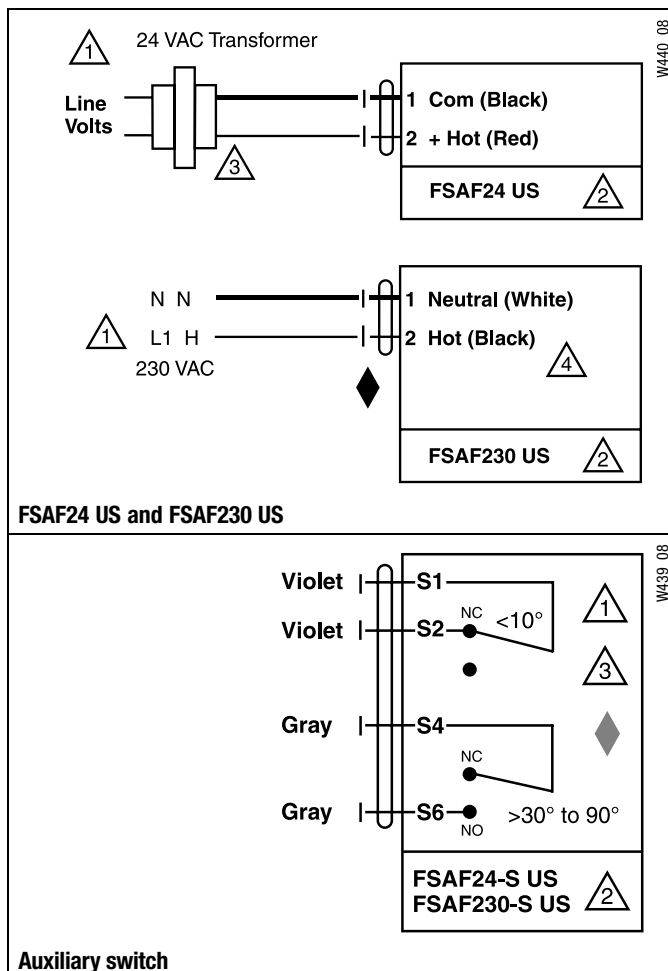
- 1 Provide overload protection and disconnect as required.
- 2 **CAUTION Equipment Damage!**
Actuators may be connected in parallel.
Power consumption and input impedance must be observed.
- 3 Actuator may also be powered by 24 VDC.
- 4 No ground connection required. Double insulated.
- 5 For end position 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 \pm 20% 50/60 Hz 24 VDC \pm 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 k Ω (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 \pm 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.

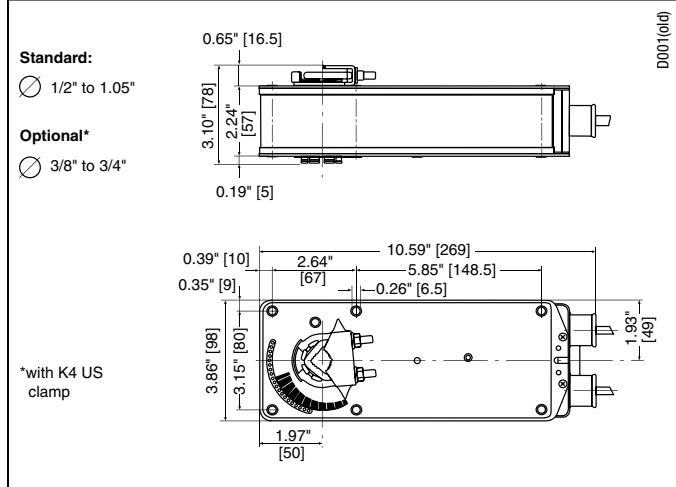
The wire 5 feedback can be used to parallel up to five additional actuators. If less than 2.1 V or greater than 9.9V is given wire 3, actuator drives all the way to the respective end stop.

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])



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

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.

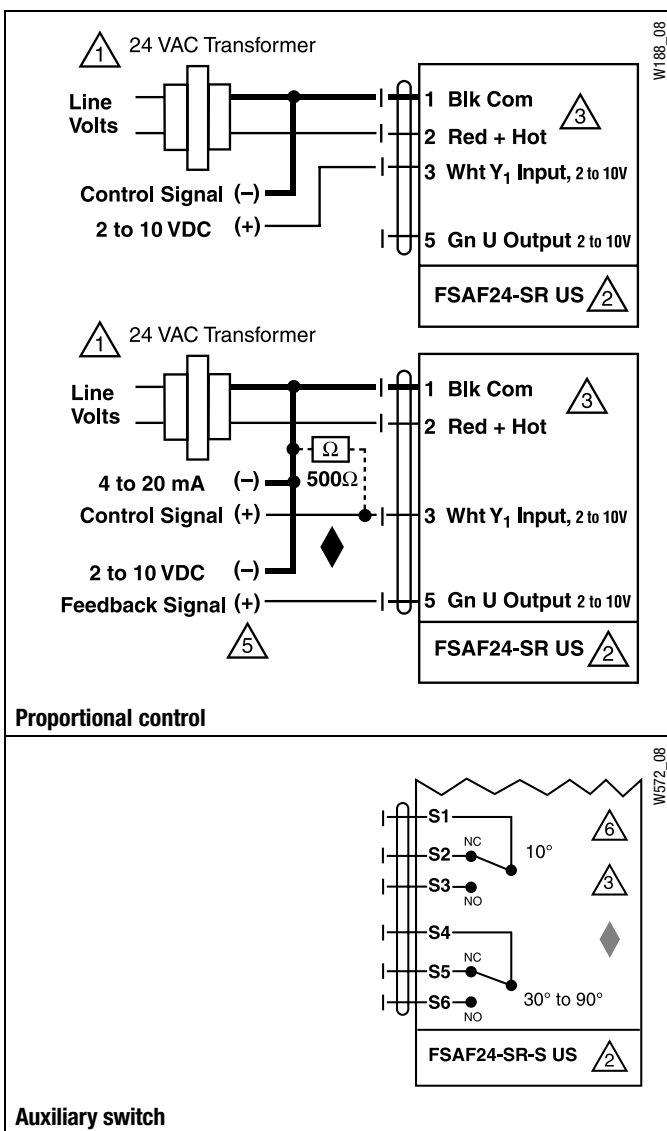
- 4 No ground connection required. Double insulated.
- 5 Only connect common to neg. (-) leg of control circuits.
- 6 For end position indication, interlock control, fan startup, etc., FSAF24-SR-S US incorporates two built-in auxiliary switches:
2 x SPDT, 7A resistive, 2.5A inductive 120/250 VAC, UL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

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.



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 \pm 20% 50/60 Hz 24 VDC \pm 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

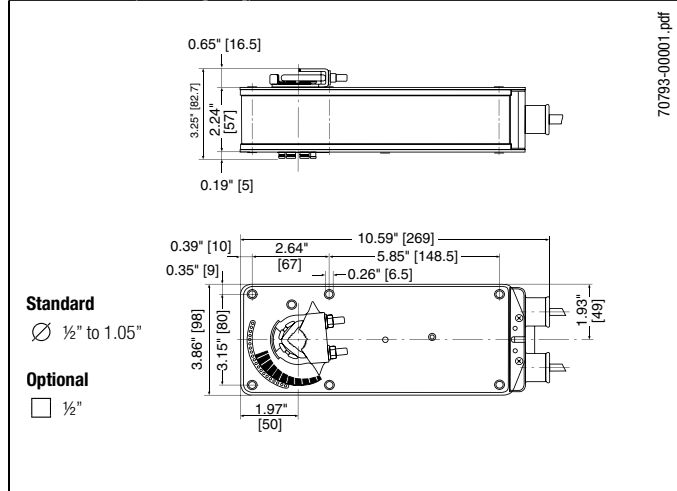
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The FSAF24-BAL is specifically designed to balance the air flow in ducts and simultaneously provide control of fire and smoke dampers. 0V = spring closed. 24V on wire 2, not 3 = drive to the potentiometer position (balanced flow). 24V on wire 3, regardless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



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 indicted 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°.

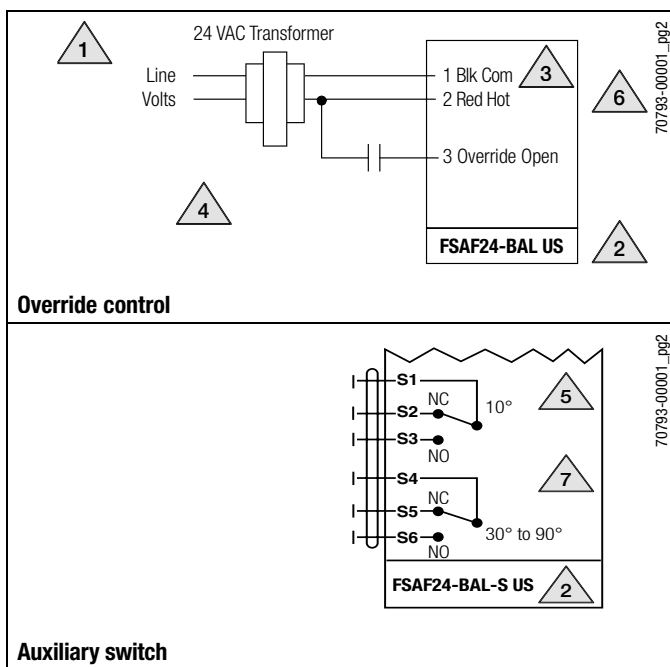
APPLICATION NOTES

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.





Technical Data		FSAFB24-SR(-SC), FSAFB24-SR-S(-SC)
Power supply		24 VAC $\pm 20\%$, 50/60 Hz 24 VDC $+20\%$ / -10%
Power consumption	running	6 W, 8.5 VA
	holding	3 W, 5 VA
Transformer sizing		10 VA (class 2 power source)
Electrical connection		3 ft, 18 GA appliance cable, 1/2" conduit connector
		-S models: two 3 ft, 18 gauge appliance cables with 1/2" conduit connectors -SC models: 8 in, 18 gauge appliance cable, with 1/2" conduit connectors
Overload protection		electronic throughout 0 to 95° rotation
Operating range Y		2 to 10 VDC, 4 to 20mA
Input impedance		100 k Ω for 2 to 10 VDC (draws 0.1 mA)
		500 Ω for 4 to 20 mA
Feedback output U		2 to 10 VDC (max. 0.5 mA)
Torque		180 in-lb [10 Nm] minimum
Direction of rotation	spring	reversible with CW/CCW mounting
	motor	reversible with built-in switch
Mechanical angle of rotation		95° (adjustable with mechanical end stop, 35° to 95°)
Running time	spring	< 20 seconds @ -4°F to 122°F [-20°C to 50°C]; < 60 seconds @ -22°F [-30°C]
	motor	<75 seconds at 250°F, <75 seconds at 70°F
Override control		Short 3 to Hot (2) to override 100% open
Position indication		visual indicator, 0° to 95° (0° is full spring return position)
Manual override		5 mm hex crank (3/16" Allen), supplied
Humidity		max. 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 2, IP54, Enclosure Type2
Housing material		zinc coated metal and plastic casing
Agency listings†		cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2004/108/EC & 2006/95/EC
Noise level		≤40dB(A) motor @ 70 seconds, run time dependent ≤62dB(A) spring return inaudible holding
Servicing		maintenance free
Quality standard		ISO 9001
Weight		4.6 lbs (2.1 kg); 4.9 lbs (2.25 kg) with switches
† Rated Impulse Voltage 800V, Type of action 1.AA (1.AA.B for -S version), Control Pollution Degree 3.		
FSAFB24-SR-S(-SC)		
Auxiliary switches		2 x SPDT 3A resistive (0.5A inductive) @ 120 or 250 VAC, UL approved one set at +10°, one adjustable 10° to 90°

FSAFB24-SR(-SC), FSAFB24-SR-S(-SC)

Fire & Smoke, Fail-Safe, Spring Return, Proportional 2-10 VDC Actuators

Torque min. 180 in-lb
Control 2 to 10 VDC
Feedback 2 to 10 VDC

Application

For proportional control of fire and smoke combination and smoke dampers in UL555S applications. In new installations, codes require damper manufacturer mounting per UL555S.

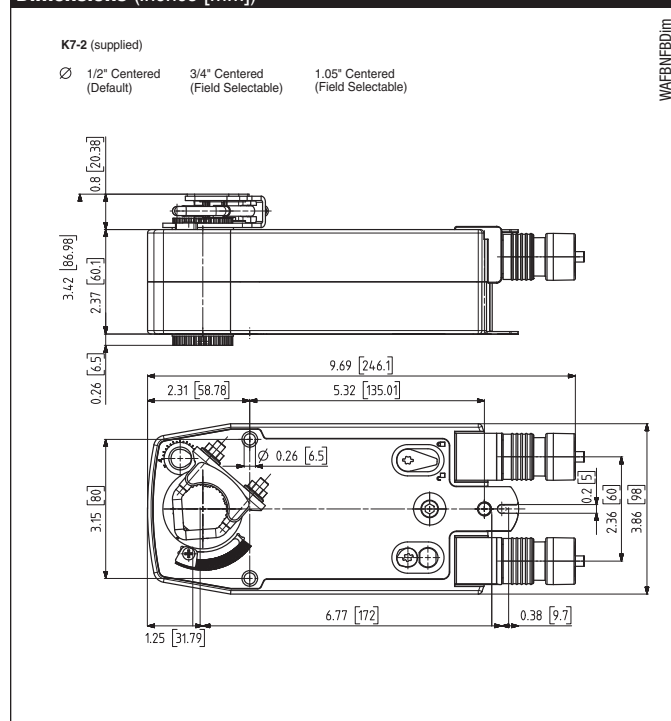
Operation

The FSAFB24-SR(-SC), FSAFB24-SR-S (-SC), actuator provides 95° of rotation and is provided with a graduated position indicator showing 0° to 95°. The actuator will synchronize the 0° mechanical stop or the physical damper and use this point for its zero position during normal control operations. A unique manual override allows the setting of any actuator position within its 95° of rotation with no power applied. This mechanism can be released physically by the use of a crank supplied with the actuator. When power is applied the manual override is released and the actuator drives toward the fail-safe position.

The actuator uses a brushless DC motor which is controlled by an Application Specific Integrated Circuit (ASIC) and a microprocessor. The microprocessor provides the intelligence to the ASIC to provide a constant rotation rate and to know the actuator's exact position. The ASIC monitors and controls the brushless DC motor's rotation and provides a Digital Rotation Sensing (DRS) function to prevent damage to the actuator in a stall condition. The position feedback signal is generated without the need for mechanical feedback potentiometers using DRS. The actuator may be stalled anywhere in its normal rotation without the need of mechanical end switches. The actuator cannot burn out from being stalled before full rotation is achieved.

The FSAFB24-SR (-SC), FSAFB24-SR-S (-SC), is mounted directly to control shafts up to 1.05" diameter by means of its universal clamp and anti-rotation bracket. A crank arm and several mounting brackets are available for damper applications where the actuator cannot be direct coupled to the damper shaft. The spring return system provides the specified torque to the application during a power interruption. The FSAFB24-SR (-SC), FSAFB24-SR-S (-SC), actuator is shipped at +5° (5° from full fail-safe) to provide automatic compression against damper gaskets for tight shut-off.

Dimensions (Inches [mm])



FSAFB24-SR(-SC), FSAFB24-SR-S(-SC)

Fire & Smoke, Fail-Safe, Spring Return, Proportional 2-10 VDC Actuators



Accessories	
AV 8-25	Shaft extension
IND-AFB	Damper position indicator
KH-AFB	Crank arm
K7-2	Universal clamp for up to 1.05" dia jackshafts
TF-CC US	Conduit fitting
Tool-06	8mm and 10 mm wrench
ZG-100	Universal mounting bracket
ZG-101	Universal mounting bracket
ZG-118	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-AFB	Crank arm adaptor kit
ZG-AFB118	Crank arm adaptor kit
ZS-100	Weather shield (metal)
ZS-150	Weather shield (polycarbonate)
ZS-260	Explosion-proof housing
ZS-300	NEMA 4X housing

NOTE: When using FSAFB24-SR and FSAFB24-SR-S actuators, only use accessories listed on this page. For actuator wiring information and diagrams, refer to Belimo Wiring Guide.

Typical Specification

Proportional 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 jackshaft up to a 1.05" diameter. A manual override shall be provided for positioning the damper open before power is available on a new construction project. The actuator must provide proportional damper control in response to a 2 to 10 VDC or, with the addition of a 500Ω resistor, a 4 to 20 mA control input from an electronic controller or positioner. Control wiring shall conform to Belimo Americas wiring schematics. The actuators shall be a flip-over design so that they may be used for either clockwise or counterclockwise fail-safe operation. Actuators shall use a brushless DC motor controlled by a microprocessor and be protected from overload at all angles of rotation. Run time shall be constant, and independent of torque. A 2 to 10 VDC feedback signal shall be provided for position feedback. Actuators shall be cULUS listed, 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

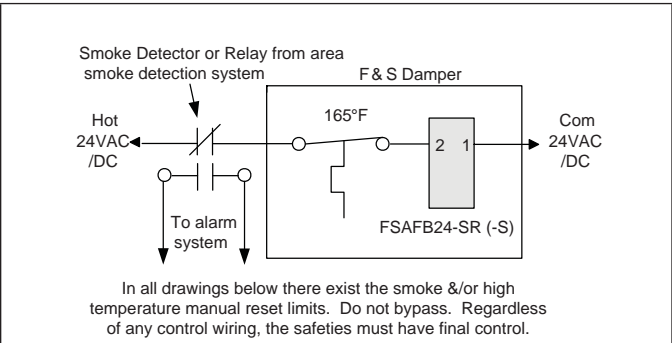
- 1 Provide overload protection and disconnect as required.
- 2 CAUTION Equipment Damage! Actuators may be connected in parallel if not mechanically mounted to the same shaft. Power consumption and input impedance must be observed.
- 3 Actuator may also be powered by 24 VDC.

APPLICATION NOTES

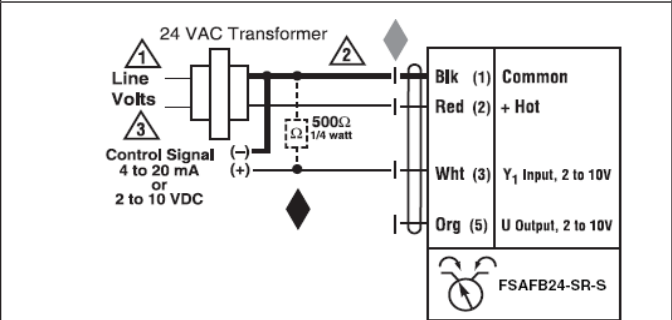
- Meets UL requirements without the need of an electrical ground connection.
- The ZG-R01 500 Ω resistor may be used.

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.

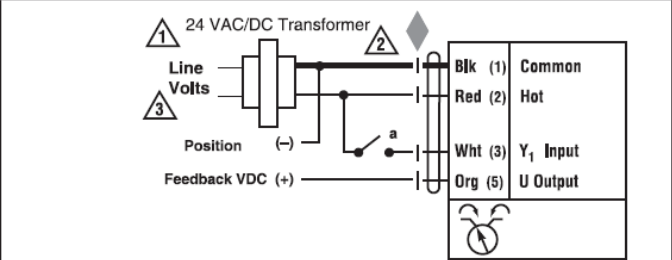
Safety Note:
Screw a conduit fitting into the actuator's metal bushing. Jacket the actuator's input and output wiring with suitable flexible conduit. Properly terminate the conduit in a suitable junction box.



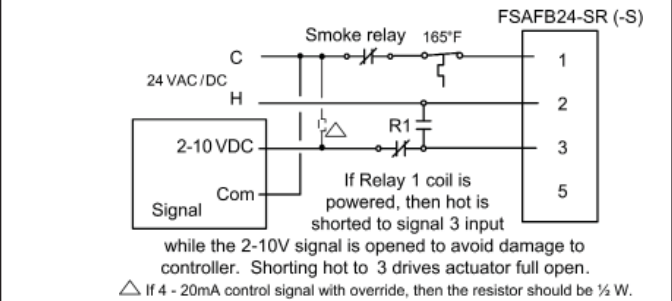
Smoke detection and Primary Sensor



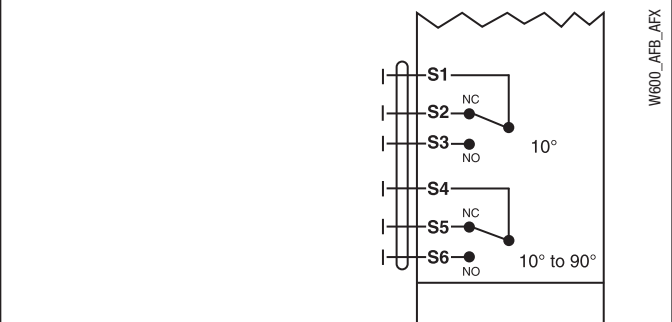
VDC/4-20 mA



On/Off Control



Override Open



Auxiliary Switches for FSAFB24-SR-S(-SC)

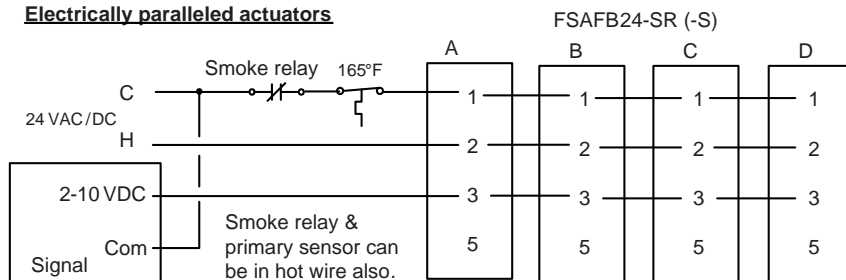
Applications

For mounting instructions visit:

https://www.belimo.us/bellib/Damper_Actuators/AFB_NFB_Installation.pdf

Parallel Wiring

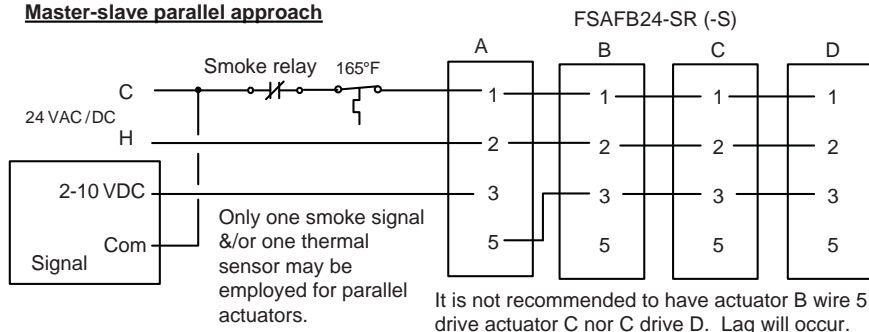
Electrically paralleled actuators



Only one smoke signal &/or one thermal sensor may be employed for parallel actuators.

Any wire 5 FBK could be used to indicate position or to drive other actuators.

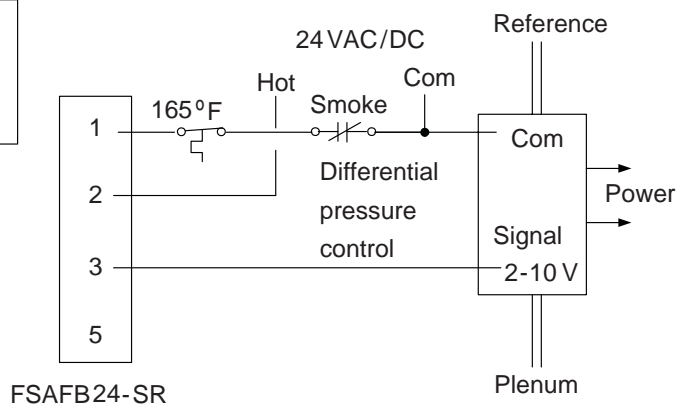
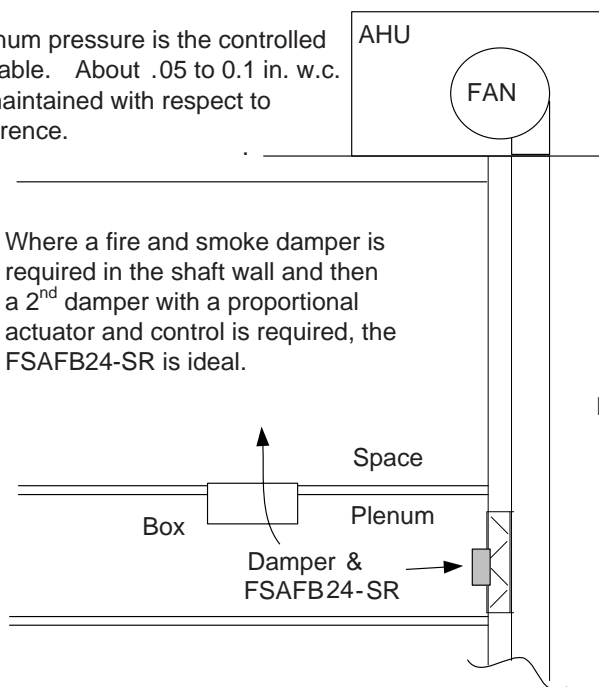
Master-slave parallel approach



Underfloor Air Conditioning

Plenum pressure is the controlled variable. About .05 to 0.1 in. w.c. is maintained with respect to reference.

Where a fire and smoke damper is required in the shaft wall and then a 2nd damper with a proportional actuator and control is required, the FSAFB24-SR is ideal.



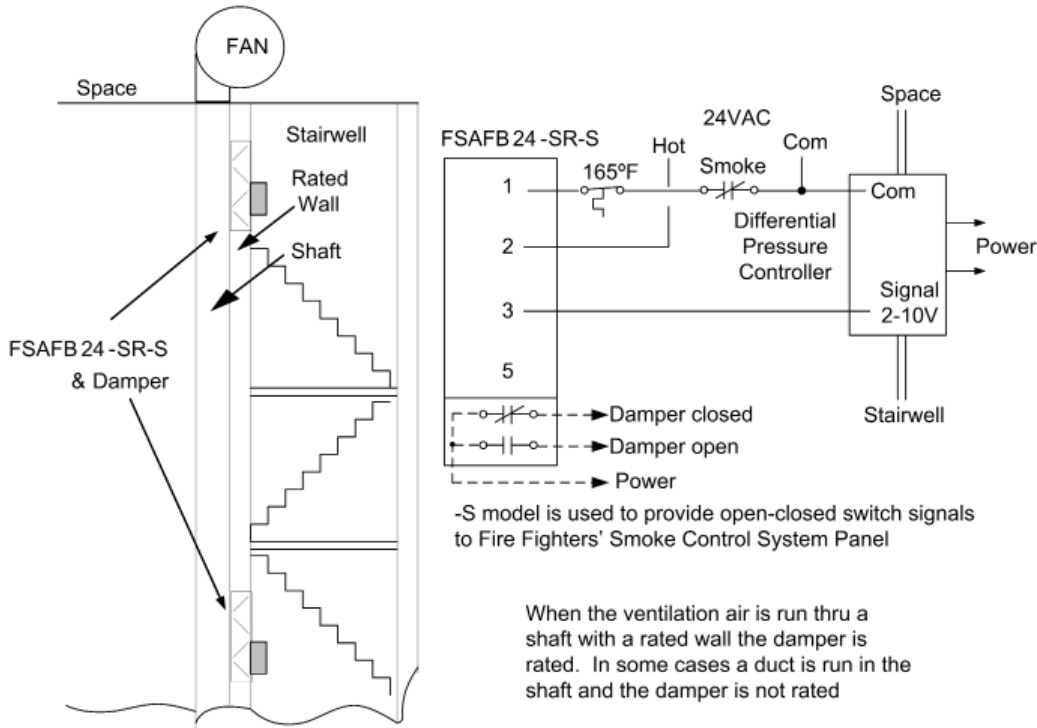
Typically, a duct smoke detector or an area smoke detection system controls the damper – “Smoke” relay contacts above. No auxiliary switches are needed if the damper is not considered part of an engineered smoke control system.

FSAFB24-SR(-SC), FSAFB24-SR-S(-SC)

Fire & Smoke, Fail-Safe, Spring Return, Proportional 2-10 VDC Actuators

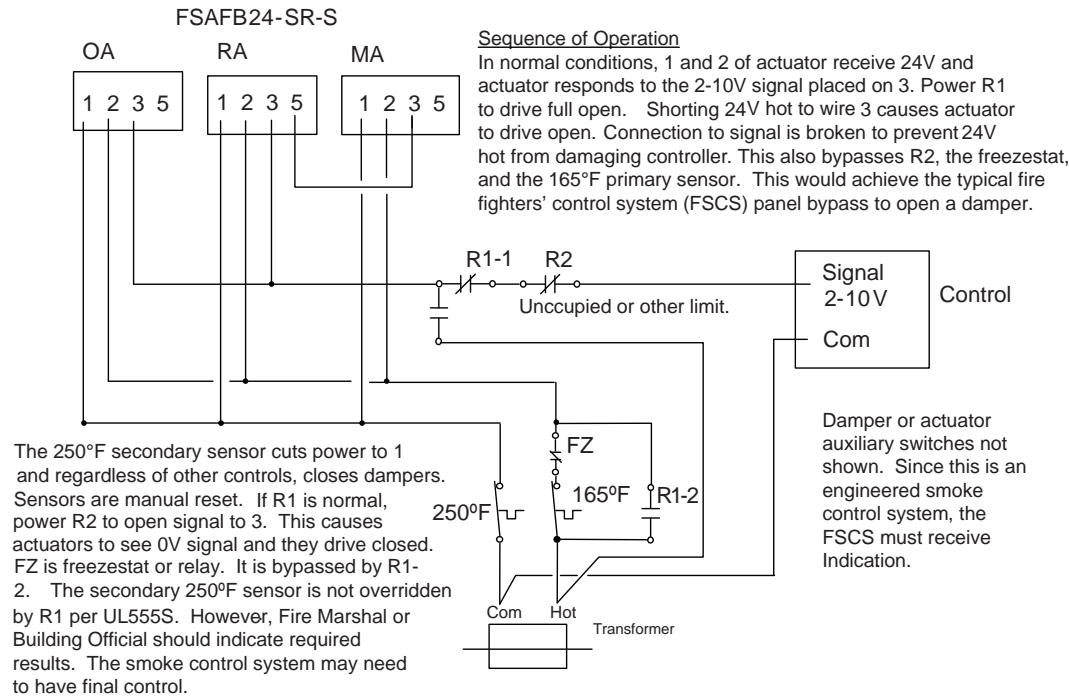


Stairwell Pressurization



Economizer with reopenable dampers

(Typical for many proportional applications.)



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Technical Data		FSAFB24-SR-(SC), FSAFB24-SR-S-(SC)
Power supply		24 VAC $\pm 20\%$, 50/60 Hz 24 VDC $+20\%$ / -10%
Power consumption	running	6 W, 8.5 VA
	holding	3 W, 5 VA
Transformer sizing		10 VA (class 2 power source)
Electrical connection		3 ft, 18 GA appliance cable, 1/2" conduit connector -S models: two 3 ft, 18 gauge appliance cables with 1/2" conduit connectors -SC models: 8 in, 18 gauge appliance cable, with 1/2" conduit connectors
Overload protection		electronic throughout 0 to 95° rotation
Operating range Y		2 to 10 VDC, 4 to 20mA
Input impedance		100 k Ω for 2 to 10 VDC (draws 0.1 mA) 500 Ω for 4 to 20 mA
Feedback output U		2 to 10 VDC (max. 0.5 mA)
Torque		180 in-lb [10 Nm] minimum
Direction of rotation	spring motor	reversible with CW/CCW mounting reversible with built-in switch
Mechanical angle of rotation		95° (adjustable with mechanical end stop, 35° to 95°)
Running time	spring	< 20 seconds @ -4°F to 122°F [-20°C to 50°C]; < 60 seconds @ -22°F [-30°C]
	motor	<75 seconds at 250°F, <75 seconds at 70°F
Override control		Short 3 to Hot (2) to override 100% open
Position indication		visual indicator, 0° to 95° (0° is full spring return position)
Manual override		5 mm hex crank (3/16" Allen), supplied
Humidity		max. 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 2, IP54, Enclosure Type2
Housing material		zinc coated metal and plastic casing
Agency listings†		cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2004/108/EC & 2006/95/EC
Noise level		≤40dB(A) motor @ 70 seconds, run time dependent ≤62dB(A) spring return inaudible holding
Servicing		maintenance free
Quality standard		ISO 9001
Weight		4.6 lbs (2.1 kg); 4.9 lbs (2.25 kg) with switches

† Rated Impulse Voltage 800V, Type of action 1.AA (1.AA.B for -S version), Control Pollution Degree 3.

FSAFB24-SR-S-(SC)	
Auxiliary switches	2 x SPDT 3A resistive (0.5A inductive) @ 120 or 250 VAC, UL approved one set at +10°, one adjustable 10° to 90°

FSAFB24-SR(-SC), FSAFB24-SR-S(-SC)

Fire & Smoke, Fail-Safe, Spring Return, Proportional 2-10 VDC Actuators

Torque min. 180 in-lb

Control 2 to 10 VDC

Feedback 2 to 10 VDC

Application

For proportional control of fire and smoke combination and smoke dampers in UL555S applications. In new installations, codes require damper manufacturer mounting per UL555S.

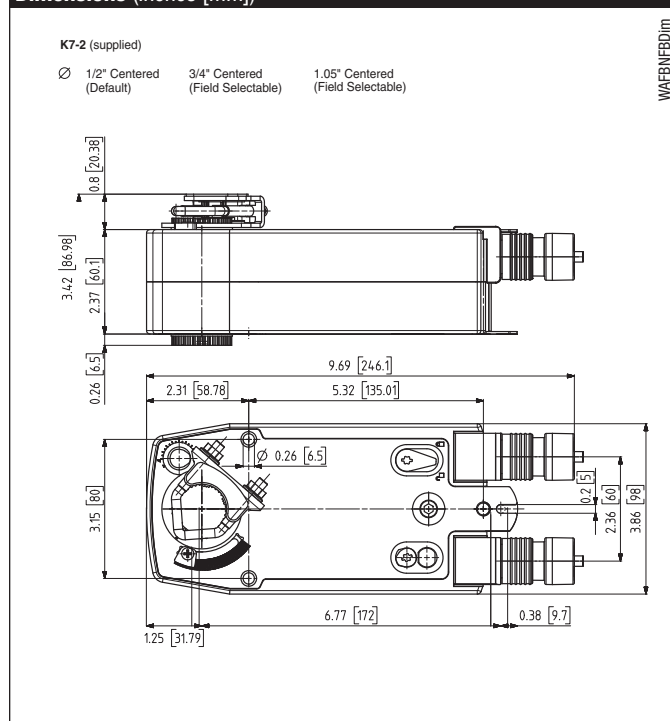
Operation

The FSAFB24-SR-(SC), FSAFB24-SR-S (SC), actuator provides 95° of rotation and is provided with a graduated position indicator showing 0° to 95°. The actuator will synchronize the 0° mechanical stop or the physical damper and use this point for its zero position during normal control operations. A unique manual override allows the setting of any actuator position within its 95° of rotation with no power applied. This mechanism can be released physically by the use of a crank supplied with the actuator. When power is applied the manual override is released and the actuator drives toward the fail-safe position.

The actuator uses a brushless DC motor which is controlled by an Application Specific Integrated Circuit (ASIC) and a microprocessor. The microprocessor provides the intelligence to the ASIC to provide a constant rotation rate and to know the actuator's exact position. The ASIC monitors and controls the brushless DC motor's rotation and provides a Digital Rotation Sensing (DRS) function to prevent damage to the actuator in a stall condition. The position feedback signal is generated without the need for mechanical feedback potentiometers using DRS. The actuator may be stalled anywhere in its normal rotation without the need of mechanical end switches. The actuator cannot burn out from being stalled before full rotation is achieved.

The FSAFB24-SR (-SC), FSAFB24-SR-S (-SC), is mounted directly to control shafts up to 1.05" diameter by means of its universal clamp and anti-rotation bracket. A crank arm and several mounting brackets are available for damper applications where the actuator cannot be directly coupled to the damper shaft. The spring return system provides the specified torque to the application during a power interruption. The FSAFB24-SR (-SC), FSAFB24-SR-S (-SC), actuator is shipped at +5° (5° from full fail-safe) to provide automatic compression against damper askets for tight shut-off.

Dimensions (Inches [mm])



FSAFB24-SR(-SC), FSAFB24-SR-S(-SC)

Fire & Smoke, Fail-Safe, Spring Return, Proportional 2-10 VDC Actuators



Accessories	
AV 8-25	Shaft extension
IND-AFB	Damper position indicator
KH-AFB	Crank arm
K7-2	Universal clamp for up to 1.05" dia jackshafts
TF-CC US	Conduit fitting
Tool-06	8mm and 10 mm wrench
ZG-100	Universal mounting bracket
ZG-101	Universal mounting bracket
ZG-118	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-AFB	Crank arm adaptor kit
ZG-AFB118	Crank arm adaptor kit
ZS-100	Weather shield (metal)
ZS-150	Weather shield (polycarbonate)
ZS-260	Explosion-proof housing
ZS-300	NEMA 4X housing

NOTE: When using FSAFB24-SR and FSAFB24-SR-S actuators, only use accessories listed on this page. For actuator wiring information and diagrams, refer to Belimo Wiring Guide.

Typical Specification

Proportional 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 jackshaft up to a 1.05" diameter. A manual override shall be provided for positioning the damper open before power is available on a new construction project. The actuator must provide proportional damper control in response to a 2 to 10 VDC or, with the addition of a 500Ω resistor, a 4 to 20 mA control input from an electronic controller or positioner. Control wiring shall conform to Belimo Americas wiring schematics. The actuators shall be a flip-over design so that they may be used for either clockwise or counterclockwise fail-safe operation. Actuators shall use a brushless DC motor controlled by a microprocessor and be protected from overload at all angles of rotation. Run time shall be constant, and independent of torque. A 2 to 10 VDC feedback signal shall be provided for position feedback. Actuators shall be cULUS listed, 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

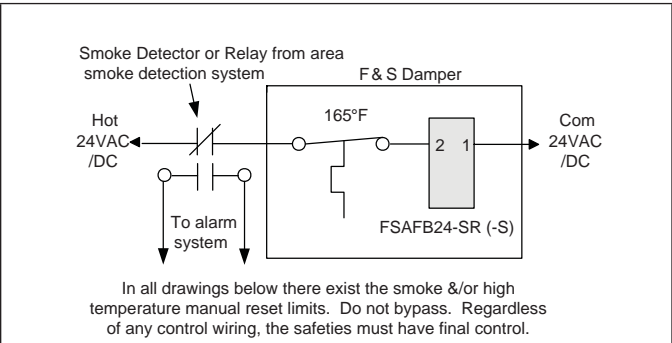
- 1 Provide overload protection and disconnect as required.
- 2 CAUTION Equipment Damage! Actuators may be connected in parallel if not mechanically mounted to the same shaft. Power consumption and input impedance must be observed.
- 3 Actuator may also be powered by 24 VDC.

APPLICATION NOTES

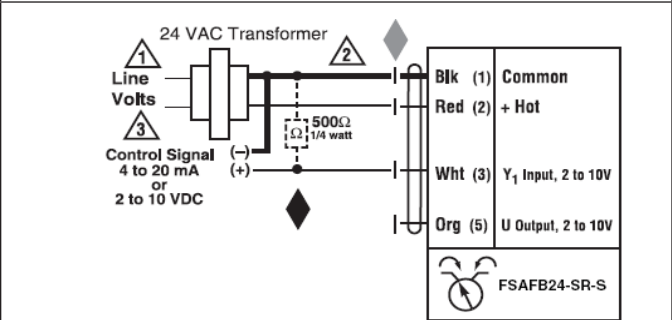
- Meets UL requirements without the need of an electrical ground connection.
- The ZG-R01 500 Ω resistor may be used.

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.

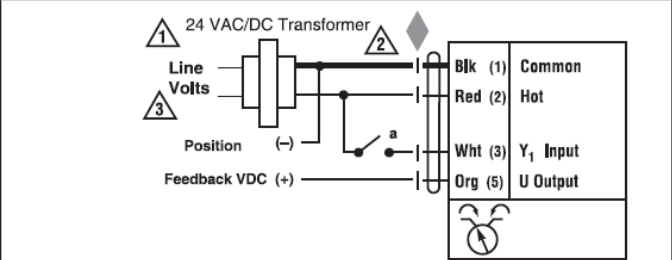
Safety Note:
Screw a conduit fitting into the actuator's metal bushing. Jacket the actuator's input and output wiring with suitable flexible conduit. Properly terminate the conduit in a suitable junction box.



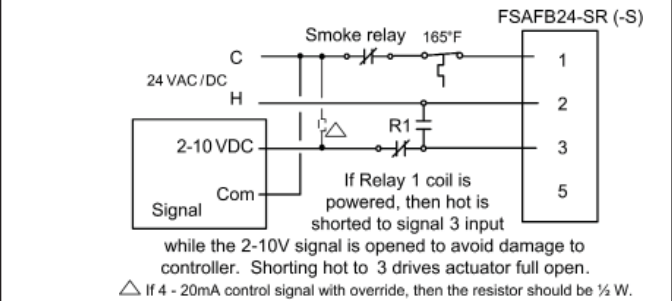
Smoke detection and Primary Sensor



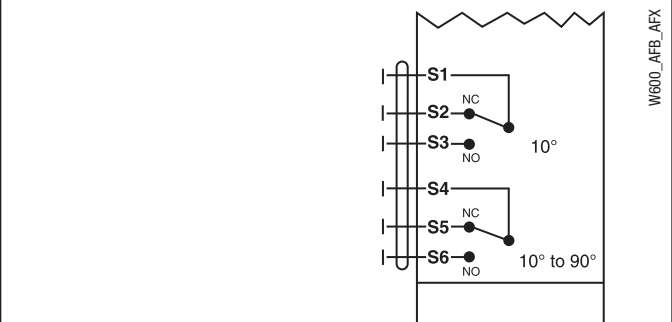
VDC/4-20 mA



On/Off Control



Override Open



Auxiliary Switches for FSAFB24-SR-S(-SC)

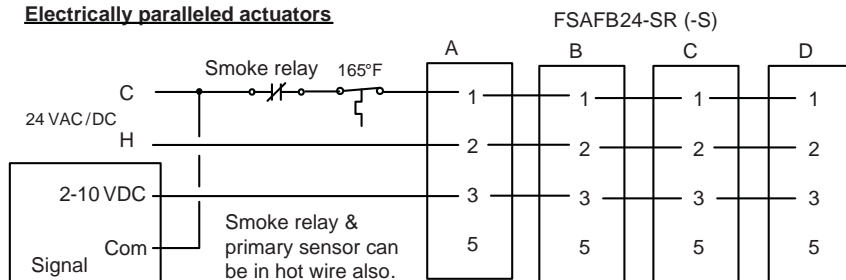
Applications

For mounting instructions visit:

https://www.belimo.us/bellib/Damper_Actuators/AFB_NFB_Installation.pdf

Parallel Wiring

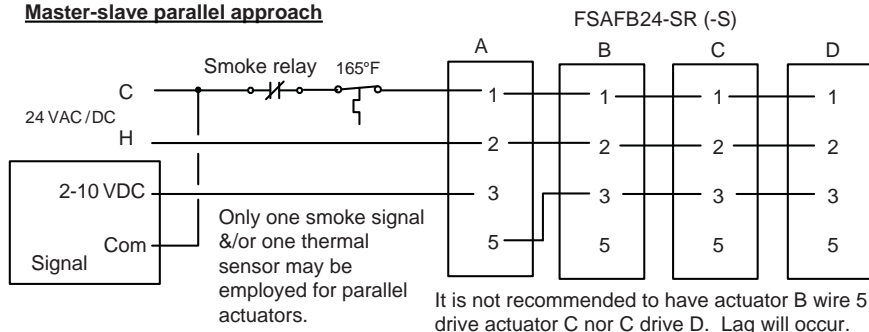
Electrically paralleled actuators



Only one smoke signal &/or one thermal sensor may be employed for parallel actuators.

Any wire 5 FBK could be used to indicate position or to drive other actuators.

Master-slave parallel approach

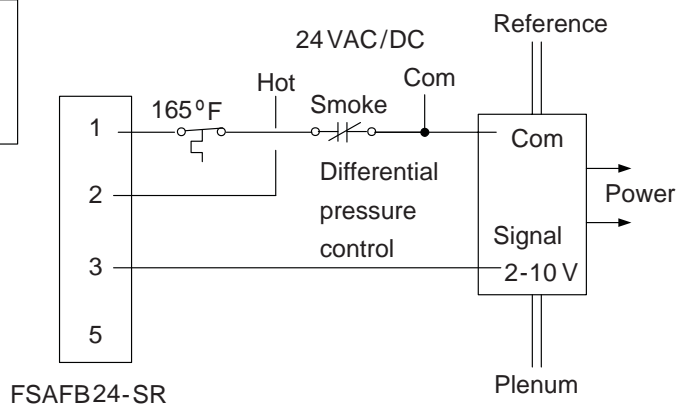
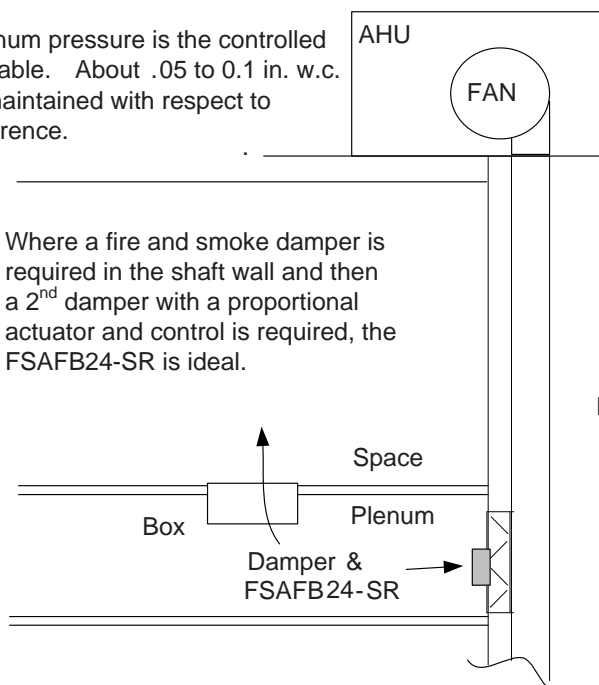


It is not recommended to have actuator B wire 5 drive actuator C nor C drive D. Lag will occur.

Underfloor Air Conditioning

Plenum pressure is the controlled variable. About .05 to 0.1 in. w.c. is maintained with respect to reference.

Where a fire and smoke damper is required in the shaft wall and then a 2nd damper with a proportional actuator and control is required, the FSAFB24-SR is ideal.



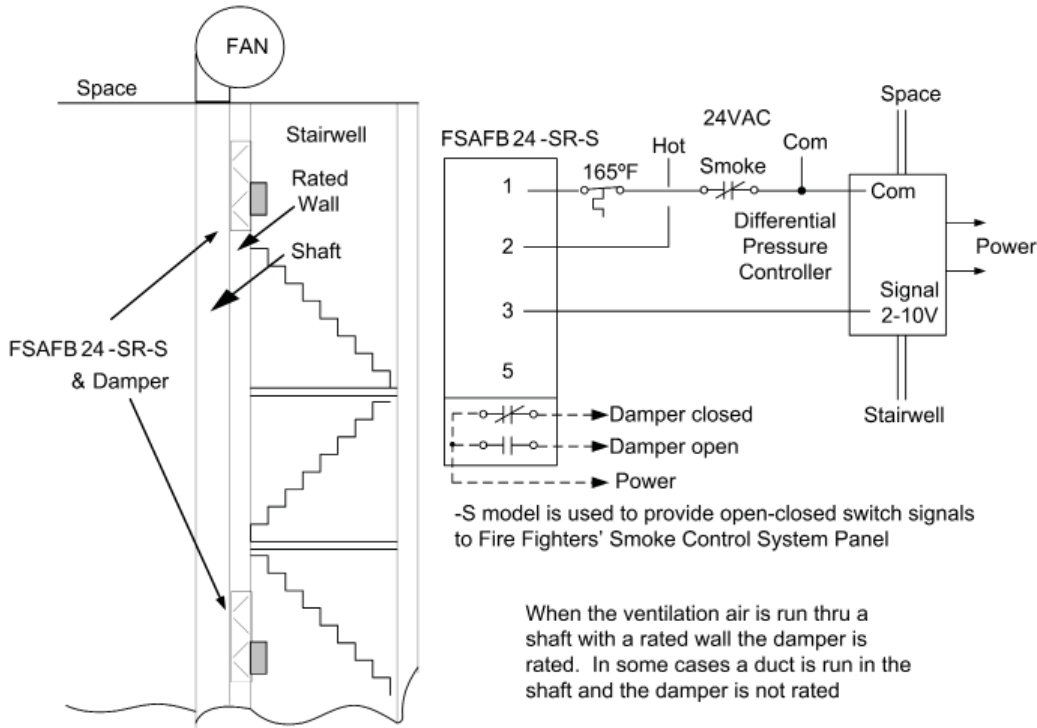
Typically, a duct smoke detector or an area smoke detection system controls the damper – “Smoke” relay contacts above. No auxiliary switches are needed if the damper is not considered part of an engineered smoke control system.

FSAFB24-SR(-SC), FSAFB24-SR-S(-SC)

Fire & Smoke, Fail-Safe, Spring Return, Proportional 2-10 VDC Actuators

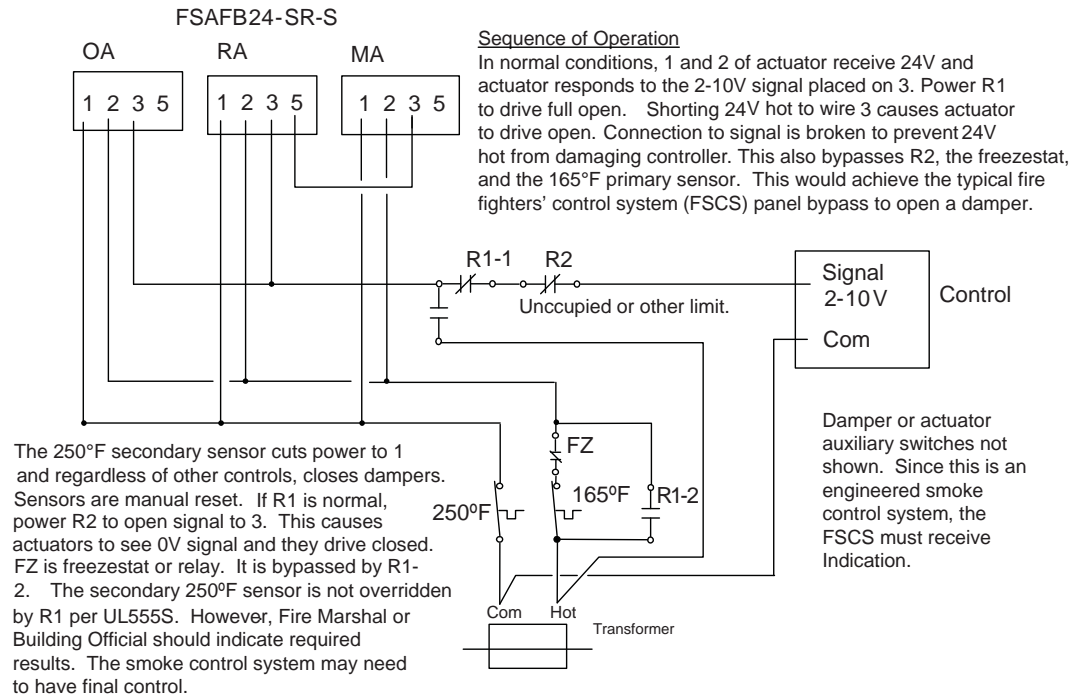


Stairwell Pressurization



Economizer with reopenable dampers

(Typical for many proportional applications.)



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