Fire and smoke spring return actuator FSAF24(-S) US

- *For two position control of UL555S rated dampers in HVAC systems.*
- *Torque 15 Nm [1)]*
- *Running time: motor < 75s, spring return < 20 s*
- *Manual Override function*
- *Nominal voltage AC/DC 24 V*
- *1 wire control*

Technical data

Electric data	Nominal voltage	AC 24 V / 50/60 Hz DC 24 V
	Power supply range	AC 19.2 ... 28.8 V, DC 21.6 ... 28.8 V
	Power consumption	7.5 W @ running / 2 W @ holding
	For wire sizing	12 VA
	Connection cable Auxilary Switch (-S)	1 m, 18 GA, 2 color coded leads 1 m, 18 GA, 6 appliance leads 1/2" conduit connector
Function data	Torque - Motor - Spring return	15 Nm constant [1)] 15 Nm [1)]
	Direction of rotation	selectable by CW/CCW installation
	Angle of rotation	max. 95°
	Auxilary switch (-S)	2 SPDT, 7(2.5)A, 250V ⧈ one fixed at 10°, one adjustable 30° to 90°
	Running time - Motor - Spring return	< 75 s constant < 20 s
	Sould power level	Motor max. 45 dB (A), Spring approx. 62dB (A)
	Position indication	mechanical
	Manual override	3 mm hex crank (shipped with actuator)
Working conditions	Protection class	III (safety extra-low voltage)
	Degree of protection	IP40/NEMA1
	Agency listed	UL 873, CE
	Ambient temperature - Normal duty	…-30 ... +50°C
	- Safety duty	1/2 hr @ 250°F (121°C)
	Non-operation temperature	…-40 ... +80°C
	Humidity test	95% RH, non condensing
	Maintenance	maintenance free
Dimensions / weight	Dimensions (l x b x h)	269 x 98 x 78 mm
	Shaft diameter	15 ... 25 mm (10 ... 20 mm Optional)
	Weight	2700 g

Safety notes

⚠

- ***The spring return actuator will meet requirements of UL555 and UL555S when tested as an assembly with the damper.***
- ***The enclosure of the actuator equipment may only be opened by the manufacturer. It contains no component which the user can replace or repair.***
- ***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.***
- ***The manual override function of the actuator is designed for commissioning and test operation only and cannot be used as a permanent locking device.***

[1)] ***Torque requirements:*** When caculating the torque required to operate dampers, it is essential to take into account all the data supplied by the damper manufacturer concerning cross sectional area, design, mounting and air flow condition

Fire and smoke spring return actuator FSAF24(-S) US

Product features

Mode of Operation The actuator moves the damper to its normal working position while tension the return spring at the same time. If the power supply is interrupted, the energy stored in the spring moves the damper back to its safe position.

Simple direct mounting Simple direct mounting on the damper spindle by 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 special design clamp will not crush hollow shafts. An anti-rotation device is supplied.

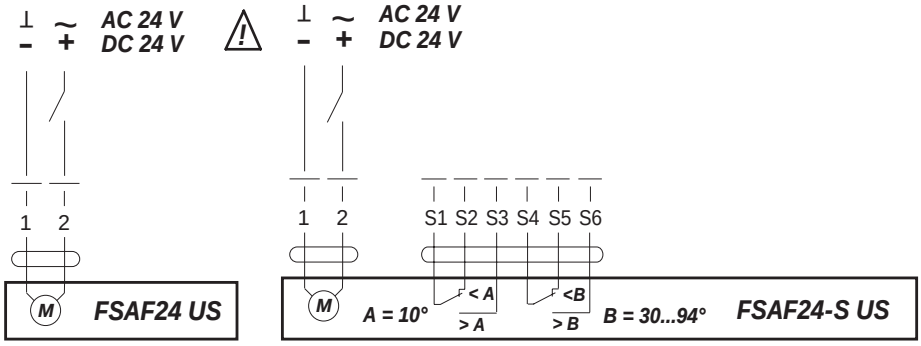
Manual override function The damper can be operated manually and fixed in any required position. Release of the locking mechanism can be achieved manually or automatically by applying the supply voltage.

Variable Aux. switch The FSAF24-S US actuator has one fixed auxiliary switch and one adjustable auxiliary switch which allows angle of rotation of 10° and between 30...90° to be signalled.

High function reliability The actuator is overload-proof, needs no limit switches, halts automatically at the end stops.

Wiring diagram

Wiring diagram ***1-wire control***



Notes:

- Connection via safety isolating transformer!
- Parallel connection of several actuator is possible. Power consumption must be observed.

Dimensions

measurement [mm]

Standard:

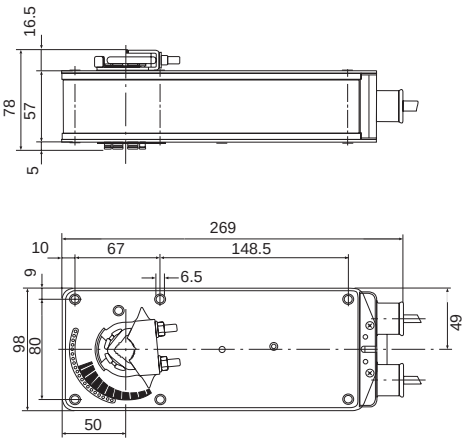
∅ 12.5 to 25 mm

Optional*

∅ 10 to 20 mm

□ 10 to 16 mm

*with K4 US clamp



70072-00001E

FSAF24-SR (-S) US Proportional Fire and Smoke Actuator

Proportional damper actuator, spring return, 24 V power. 2 to 10 VDC, and 4 to 20 mA control signal. Output signal of 2 to 10 VDC for position indication. Operation at 250F 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: 7W 11 VA ; holding: 3W 5 VA
Transformer sizing	15 VA (class 2 power source)
Electrical connection	
Motor	3 ft, 18 ga, 4 color coded leads (24V)
Auxiliary switches	3 ft, 18 ga, appliance cable 1/2" conduit connectors
Overload protection	electronic throughout 0° to 95° rotation
Operating range	2 to 10 VDC, 4 to 20 mA
Input impedance	100kΩ (0.1 mA), 500Ω
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 return 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° is spring return position)
Manual override	3mm hex crank (shipped w/actuator)
Running time	<75 sec. constant, independent of load, spring return < 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 1 / IP40
Housing material	zinc coated metal
Agency listings	cULus to UL873 and CSA C22.2 No. 24-93
Noise level	max. 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 (same as above)
Auxiliary Switch	2 x SPST 7A resistive, 2.5A inductive at 120/250VAC. UL listed, 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 crankarm 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 500Ω 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.

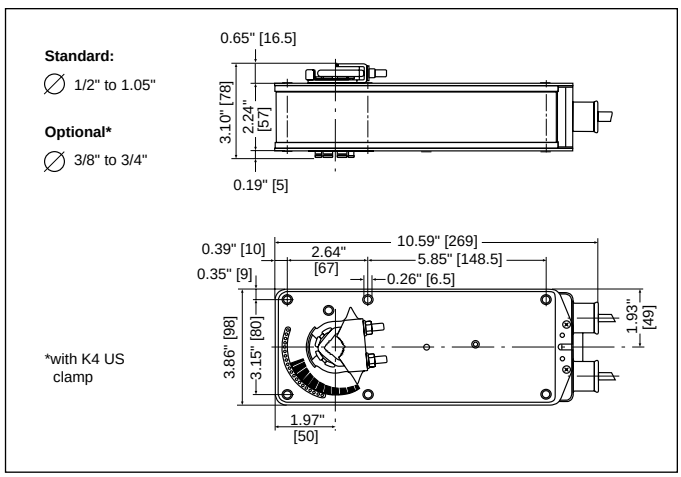
A manual override winder and locking mechanism is provided. If the manual winder is used when the actuator is powered, the actuator will release and drive closed to reset the 0 degree position.

The actuator may not be mechanically parallelled 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.

Dimensions (All numbers in brackets are metric.)



FSAF24-SR (-S) US Proportional Fire and Smoke Actuator

UL555S modulating damper actuator, spring return safety, 24 V for 2 to 10 VDC, and 4 to 20 mA control signal. Output signal of 2 to 10 VDC for position indication.

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	Crankarm for up to 3/4" round shaft (Series 2)
KH-AF-1	Crankarm 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	500Ω resistor for 0 to 20 mA control signal
ZDB-AF2	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 crankarm type installations
ZG-107	Mounting bracket for Honeywell® Mod III or Johnson® Series 100 replacement or new crankarm type installations
ZG-108	Mounting bracket for Barber Colman® MA 3../4.., Honeywell® Mod III or IV or Johnson® Series 100 replacement or new crankarm type installations
ZG-AF	Crankarm adaptor kit for AF/NF
ZG-AF108	Crankarm 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.

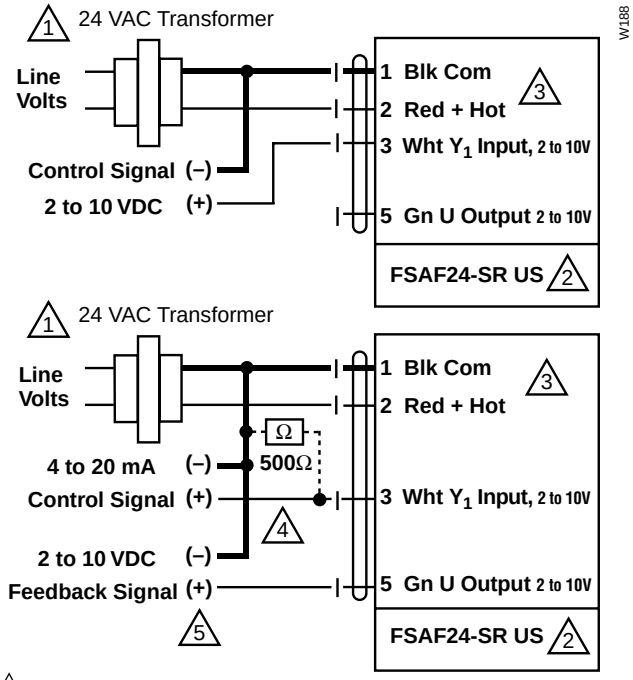
FSAF24-SR (-S) US Typical Specification

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 500Ω 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 listed, 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.

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.

Wiring diagrams



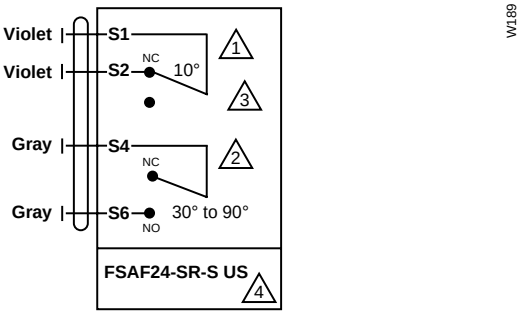
1 Provide overload protection and disconnect as required.

2 Actuators may be connected in parallel. Power consumption and input impedance must be observed.

3 Actuator may also be powered by 24 VDC.

4 The ZG-R01 500Ω resistor converts the 4 to 20 mA control signal to 2 to 10 VDC.

5 Only connect common to neg. (—) leg of control circuits



1 For end position indication, interlock control, fan startup, etc., FSAF24-SR-S US incorporates two built-in auxiliary switches: 2 x SPST, 7A resistive, 2.5A inductive 120/250 VAC, UL listed, one switch is fixed at 10°, one is adjustable 30° to 90°.

2 Meets UL requirements without the need of an electrical ground connection.

3 ⧈ Double insulated.

4 Actuators may be connected in parallel. Power Consumption must be observed.

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 since UL has stated that they do not regulate replacements.

Fire and smoke spring return actuator FSAF120(-S) US

- *For two position control of UL555S rated dampers in HVAC systems.*
- *Torque 15 Nm [1)]*
- *Running time: motor < 75s, spring return < 20 s*
- *Manual Override function*
- *Nominal voltage AC 120 V*
- *1 wire control*

Technical data

Electric data	Nominal voltage	AC 120 V / 50/60 Hz
	Power supply range	AC 108 ... 132 V
	Power consumption	9.5 W @ running / 3.5 W @ holding
	For wire sizing	12 VA
	Connection cable Auxilary Switch (-S)	1 m, 18 GA, 2 color coded leads 1 m, 18 GA, 6 appliance leads 1/2" conduit connector
Function data	Torque - Motor - Spring return	15 Nm constant [1)] 15 Nm [1)]
	Direction of rotation	selectable by CW/CCW installation
	Angle of rotation	max. 95°
	Auxilary switch (-S)	2 SPDT, 7(2.5)A, 250V ⧈ one fixed at 10°, one adjustable 30° to 90°
	Running time - Motor - Spring return	< 75 s constant < 20 s
	Sould power level	Motor max. 45 dB (A), Spring approx. 62dB (A)
	Position indication	mechanical
	Manual override	3 mm hex crank (shipped with actuator)
Working conditions	Protection class	II (double insulated)
	Degree of protection	IP40/NEMA1
	Agency listed	UL 873, CE
	Ambient temperature - Normal duty	…-30 ... +50°C
	- Safety duty	1/2 hr @ 250°F (121°C)
	Non-operation temperature	…-40 ... +80°C
	Humidity test	95% RH, non condensing
	Maintenance	maintenance free
Dimensions / weight	Dimensions (l x b x h)	269 x 98 x 78 mm
	Shaft diameter	15 ... 25 mm (10 ... 20 mm Optional)
	Weight	3100 g

Safety notes

- ***The spring return actuator will meet requirements of UL555 and UL555S when tested as an assembly with the damper.***
- ***The enclosure of the actuator equipment may only be opened by the manufacturer. It contains no component which the user can replace or repair.***
- ***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.***
- ***The manual override function of the actuator is designed for commissioning and test operation only and cannot be used as a permanent locking device.***
- ***Caution: 120 Volt!***

[1)] ***Torque requirements:*** When caculating the torque required to operate dampers, it is essential to take into account all the data supplied by the damper manufacturer concerning cross sectional area, design, mounting and air flow condition

Fire and smoke spring return actuator FSAF120(-S) US

Product features

Mode of Operation The actuator moves the damper to its normal working position while tension the return spring at the same time. If the power supply is interrupted, the energy stored in the spring moves the damper back to its safe position.

Simple direct mounting Simple direct mounting on the damper spindle by 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 special design clamp will not crush hollow shafts. An anti-rotation device is supplied.

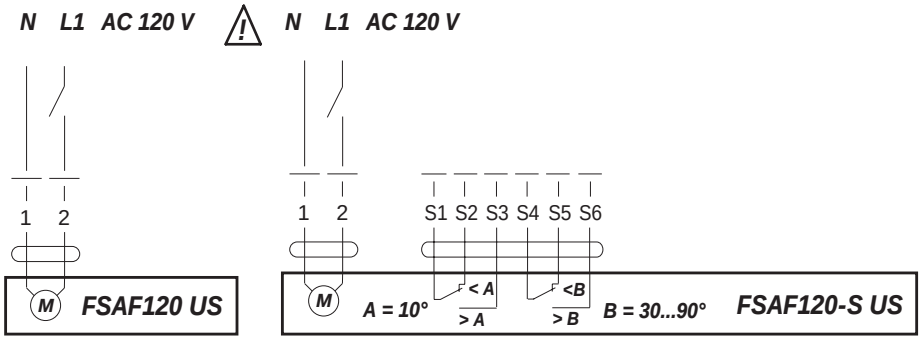
Manual override function The damper can be operated manually and fixed in any required position. Release of the locking mechanism can be achieved manually or automatically by applying the supply voltage.

Variable Aux. switch The FSAF120-S US actuator has one fixed auxiliary switch and one adjustable auxiliary switch which allows angle of rotation of 10° and between 30...90° to be signalled.

High function reliability The actuator is overload-proof, needs no limit switches, halts automatically at the end stops.

Wiring diagram

Wiring diagram ***1-wire control***



Notes:

- Parallel connection of several actuator is possible. Power consumption must be observed.

Dimensions

measurement [mm]

Standard:

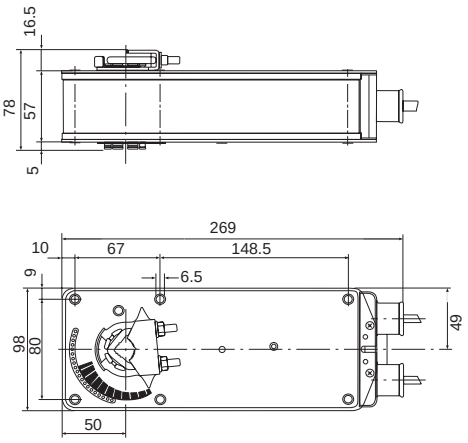
∅ 12.5 to 25 mm

Optional*

∅ 10 to 20 mm

□ 10 to 16 mm

*with K4 US clamp



Fire and smoke spring return actuator FSAF230(-S) US

- **For two position control of UL555S rated dampers in HVAC systems.**
- **Torque 15 Nm [1)]**
- **Running time: motor < 75s, spring return < 20 s**
- **Manual Override function**
- **Nominal voltage AC 230 V**
- **1 wire control**

Technical data

Electric data	Nominal voltage	AC 230 V / 50/60 Hz
	Power supply range	AC 197.8... 262.2 V
	Power consumption	11 W @ running / 3.5 W @ holding
	For wire sizing	10 VA
	Connection cable Auxilary Switch (-S)	1 m, 18 GA, 2 color coded leads 1 m, 18 GA, 6 appliance leads 1/2" conduit connector
Function data	Torque - Motor - Spring return	15 Nm constant [1)] 15 Nm [1)]
	Direction of rotation	selectable by CW/CCW installation
	Angle of rotation	max. 95°
	Auxilary switch (-S)	2 SPDT, 7(2.5)A, 250V ⧈ one fixed at 10°, one adjustable 30° to 90°
	Running time - Motor - Spring return	< 75 s constant < 20 s
	Sould power level	Motor max. 45 dB (A), Spring approx. 62 dB (A)
	Position indication	mechanical
	Manual override	3 mm hex crank (shipped with actuator)
Working conditions	Protection class	III (safety extra-low voltage)
	Degree of protection	IP40 / NEMA type 1
	Agency listed	UL 873
	Ambient temperature - Normal duty	...-30 ... +50°C
	- Safety duty	1/2 hr @ 250°F (121°C)
	Non-operation temperature	...-40 ... +80°C
	Humidity test	95% RH, non condensing
	Maintenance	Maintenance free
Dimensions / weight	Dimensions (L x W x H)	269 x 98 x 78 mm
	Shaft diameter	15 ... 25 mm (10 ... 20 mm Optional)
	Weight	2700 g

Safety notes

⚠

- **The spring return actuator will meet requirements of UL555 and UL555S when tested as an assembly with the damper.**
- **The enclosure of the actuator equipment may only be opened by the manufacturer. It contains no component which the user can replace or repair.**
- **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.**
- **The manual override function of the actuator is designed for commissioning and test operation only and cannot be used as a permanent locking device.**

[1)] **Torque requirements:** When caculating the torque required to operate dampers, it is essential to take into account all the data supplied by the damper manufacturer concerning cross sectional area, design, mounting and air flow condition

Fire and smoke spring return actuator FSAF230(-S) US

Product features

Mode of Operation The actuator moves the damper to its normal working position while tension the return spring at the same time. If the power supply is interrupted, the energy stored in the spring moves the damper back to its safe position.

Simple direct mounting Simple direct mounting on the damper spindle by 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 special design clamp will not crush hollow shafts. An anti-rotation device is supplied.

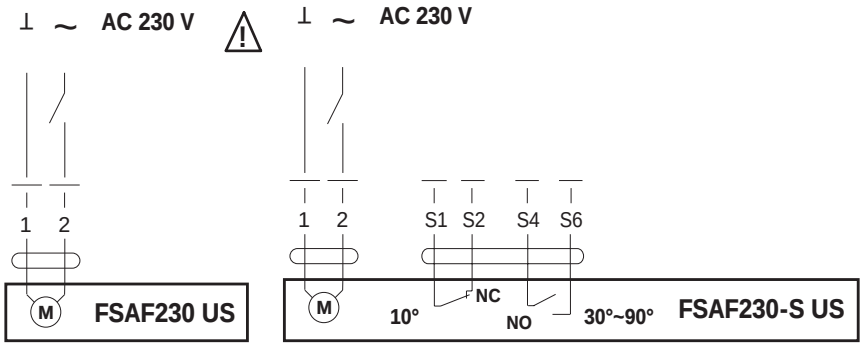
Manual override function The damper can be operated manually and fixed in any required position. Release of the locking mechanism can be achieved manually or automatically by applying the supply voltage.

Variable Aux. switch The FSAF230-S US actuator has one fixed auxiliary switch and one adjustable auxiliary switch which allows angle of rotation of 10° and between 30...90° to be signalled.

High function reliability The actuator is overload-proof, needs no limit switches, halts automatically at the end stops.

Wiring diagram

Wiring diagram **1-wire control**



Notes:

- Connection via safety isolating transformer!
- Parallel connection of several actuator is possible. Power consumption must be observed.

Dimensions

measurement [mm]

Standard:

∅ 12.5 to 25 mm

Optional*

∅ 10 to 20 mm

□ 10 to 16 mm

*with K4 US clamp