

TF Series Spring Return Direct Coupled Actuator



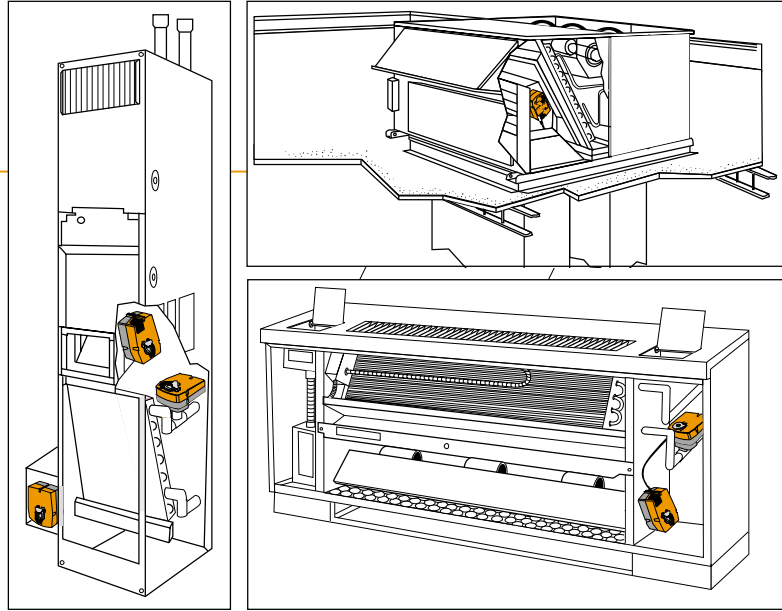
Minimum 18 in-lb torque

- For damper areas up to 4.5 sq-ft*

Applications

Cost effective quality and performance for a range of applications including:

- Classroom Unit Ventilators
- Fan/Coil Units
- Economizer Units
- Airhandlers
- Control Dampers
- VAV Terminal Units



Actuators in bold have BDCM

TF Series - At A glance

		TF24 US (p. 98)	TF24-S US (p. 98)	TF120 US (p. 100)	TF120-S US (p. 100)	TFC120-S US (p. 102)	TF24-3 US (p. 104)	TF24-3-S US (p. 104)	TF24-SR US (p. 106)	TF24-SR-S US (p. 106)	TF24-MFT US (p. 108)
Torque:	18 in-lb	●	●	●	●	●	●	●	●	●	●
Power supply:	24 VAC/DC**	●	●				●	●	●	●	●
	120 VAC			●	●	●					
	230 VAC			●	●						
Control signal:	on-off	●	●	●	●	●					
	floating point						●	●			
	proportional 2 to 10 VDC								●	●	
	Multi-Function										●
Running time motor:	<75 sec	●	●	●	●						
	< 30 sec					●					
	95 sec constant						●	●	●	●	
	Adj. 75 to 300 sec***										●
	spring:<25 sec	●	●	●	●	●	●	●	●	●	●
External direction of rotation switch						●	●	●	●	●	
Plenum rated cable						●		●		●	
Appliance cable	●	●	●	●	●		●		●	●	
Conduit fitting	●	●	●	●	●	●	●	●	●	●	
Built-in auxiliary switch		●		●	●		●		●	●	

General wiring(p. 114) Installation instructions ..(p. 110-115)
 Start-up and checkout ..(p. 116)

*Based on 4 in-lb/ft² damper torque loading. Parallel blade. No edge seals.
 Note: TF24-3 (-S) US is only 24 VAC. *Default 150 seconds

TF24 (-S) US

On-off, Spring Return Fail-Safe, 24V



Technical Data	TF24 (-S) US
Power supply	24VAC ± 20%, 50/60Hz 24VDC ± 10%
Power consumption	running: 2.5 W holding: 1.3 W
Transformer sizing	5 VA (class 2 power source)
Electrical connection	3 ft, 18 GA appliance cable (-S models have 2 cables) 1/2" conduit connector
Overload protection	electronic throughout 0 to 95° rotation
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)
Auxiliary switch (-S models)	1 x SPDT 3A (0.5A) @ 250 VAC, UL listed adjustable 0° to 95°
Running time (nominal)	motor: < 75 sec (0 to 18 in-lb) spring: < 25 sec @ -4°F to +122°F [-20°C to +50°C] < 60 sec @ -22°F [-30°C]
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 2 / IP42
Housing material	UL94 - 5VA
Agency listings†	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1, CSA C22.2 No. 24-93, CE acc. to 89/336/EEC (and 2006/95/EC for -S versions)
Noise level	max: running < 50 db (A) spring return 62 db (A)
Servicing	maintenance free
Quality standard	ISO 9001
Weight	TF24 1.4 lbs (0.6 kg) TF24-S 1.5 lbs (0.7 kg)

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

Torque min. 18 in-lb, for control of air dampers

Application

For on-off, fail-safe control of dampers in HVAC systems. Actuator sizing should be done in accordance with the damper manufacturer's specifications. Control is on-off from an auxiliary contact, or a manual switch.

The actuator is mounted directly to a damper shaft from 1/4" up to 1/2" in diameter by means of its universal clamp, 1/2" shaft centered at delivery. A crank arm and several mounting brackets are available for applications where the actuator cannot be direct coupled to the damper shaft.

Operation

The TF series actuators provide true spring return operation for reliable fail-safe application and positive close off on air tight dampers. The spring return system provides consistent torque to the damper with, and without, power applied to the actuator.

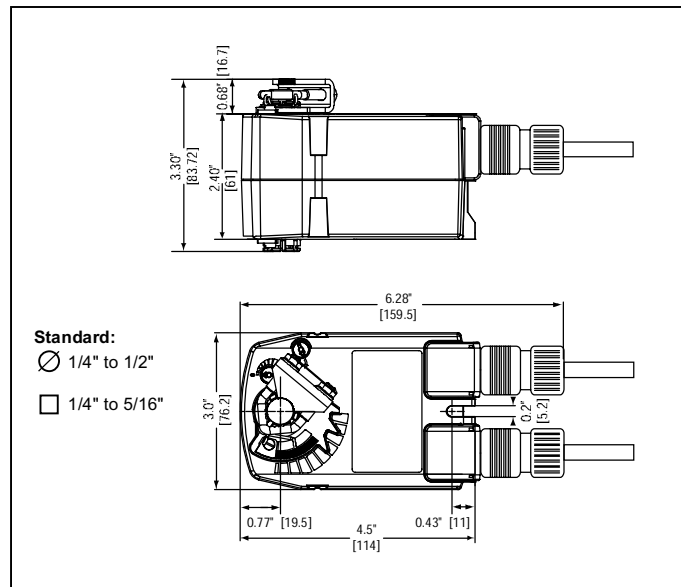
The TF series provides 95° of rotation and is provided with a graduated position indicator showing 0° to 90°. The actuator may be stalled anywhere in its normal rotation without the need of mechanical end switches. Power consumption is reduced in holding mode.

The TF24-S US versions are provided with 1 built-in auxiliary switch. This SPDT switch is provided for safety interfacing or signaling, for example, for fan start-up. The switching function is adjustable between 0° and 95°.

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 [All numbers in brackets are in millimeters.]



Accessories

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

Note: When using TF24 US and TF24-S US actuators, only use accessories listed on this page.

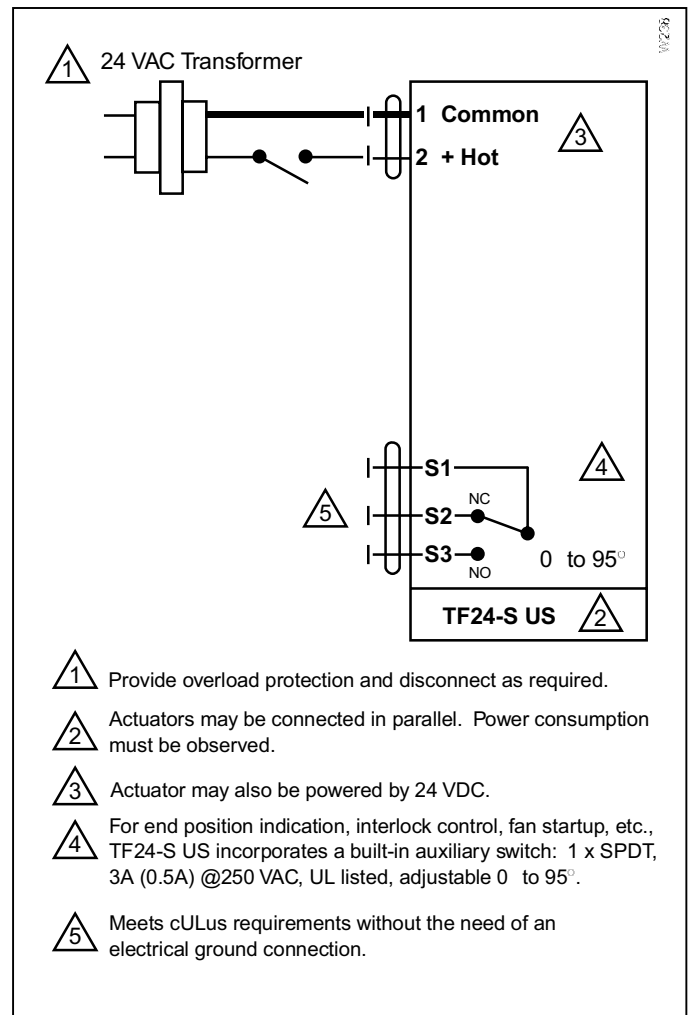
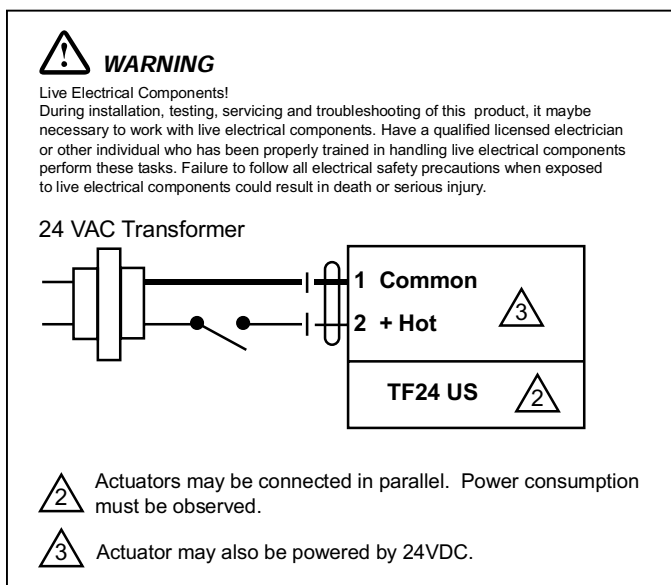
For Actuator Wiring Information and Diagrams, Please See Belimo Wiring Guide (pg 349).

TF24 (-S) US Typical Specification

On-off spring return damper actuators shall be direct coupled type which require no crankarm 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, 1 SPDT auxiliary switch shall be provided having the capability of being adjustable. Actuators with auxiliary switch must be constructed to meet the requirements for Double Insulation so an electrical ground is not required to meet agency listings. Actuators shall be cULus listed certified, have a 5 year warranty, and be manufactured under ISO 9001 International Quality Control Standards. Actuators shall be as manufactured by Belimo.

TF

Wiring Diagrams



On-off wiring for TF24 US

TF24-SR (-S) US



Proportional Damper Actuator, Spring Return Fail-Safe, 24 V for 2 to 10 VDC, or 4 to 20 mA Control Signal.



Technical Data	TF24-SR (-S) US
Power supply	24 VAC \pm 20% 50/60 Hz 24 VDC \pm 10%
Power consumption	running: 2.5 W; holding: 1 W
Transformer sizing	4 VA (class 2 power source)
Electrical connection	TF24-SR US 3 ft, 18 GA plenum rated cable TF24-SR-S US 3 ft, 18 GA appliance cables (2) 1/2" conduit connector
Overload protection	electronic throughout 0 to 95° rotation
Operating range Y	2 to 10 VDC, 4 to 20mA
Input impedance	100 k (0.1 mA), 500 Ω
Angle of rotation	max. 95°, adjust. with mechanical stop
Torque	18 in-lb [2 Nm]
Direction of rotation	spring: reversible with cw/ccw mounting motor: reversible with built-in switch
Position indication	visual indicator, 0° to 95° (0° is spring return position)
Auxiliary switch (TF24-SR-S us)	1 x SPDT 3A (0.5A) @ 250 VAC, UL listed adjustable 0° to 95° (double insulated)
Running time	motor: 95 sec constant, independent of load spring: < 25 sec @-4°F to +122°F [-20°C to +50°C] < 60 sec @-22°F [-30°
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 2 / IP42
Housing material	UL94-5VA
Agency listings†	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1, CSA C22.2 No. 24-93, CE acc. to 89/336/EEC (and 2006/95/EC for -S versions)
Noise level	max: running < 35 db (A) spring return 62 dB (A)
Servicing	maintenance free
Quality standard	ISO 9001
Weight	TF24-SR 1.4 lbs (0.6 kg) TF24-SR-S 1.5 lbs (0.7 kg)

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

Torque min. 18 in-lb, for control of air dampers

Application

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

The actuator is mounted directly to a damper shaft from 1/4" up to 1/2" in diameter by means of its universal clamp, 1/2" shaft centered at delivery. A crank arm and several mounting brackets are available for applications where the actuator cannot be direct coupled to the 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.

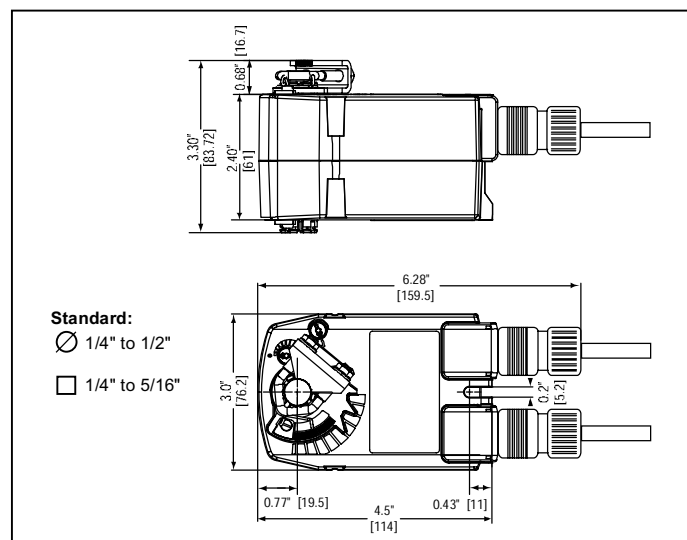
Operation

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

The TF24-SR (-S) US 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 fail-safe position. The ASIC monitors and controls the brushless DC motor's rotation and provides a digital rotation sensing function to prevent damage to the actuator in a stall condition. The actuator may be stalled anywhere in its normal rotation without the need of mechanical end switches. Power consumption is reduced in holding mode.

The TF24-SR-S US version is provided with 1 built-in auxiliary switch. This SPDT switch is provided for safety interfacing or signaling, for example, for fan start-up. The switching function is adjustable between 0° and 95°. The auxiliary switch in the TF24-SR-S US is double insulated so an electrical ground is not necessary.

Dimensions [All numbers in brackets are in millimeters.]



Accessories

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

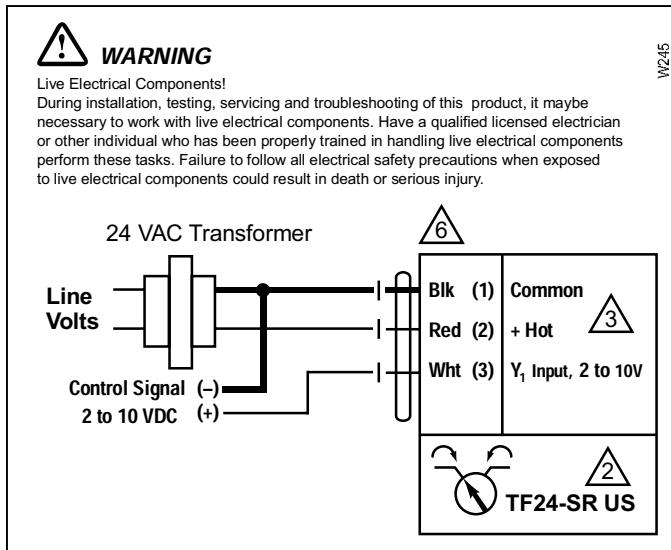
Note: When using TF24-SR (-S) US actuators, only use accessories listed on this page.

For Actuator Wiring Information and Diagrams, Please See Belimo Wiring Guide (pg 349).

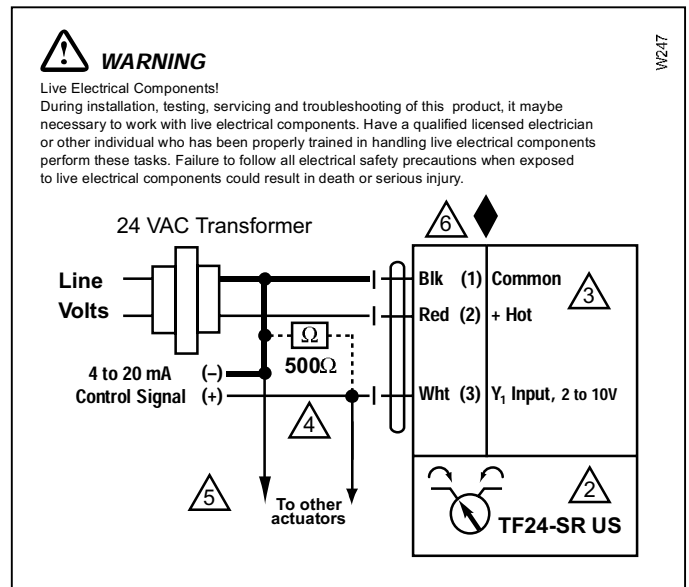
TF24-SR (-S) US Typical Specification

Spring return control damper actuators shall be direct coupled type which require no crankarm and linkage and be capable of direct mounting to a shaft up to a 1/2" diameter and center a 1/2" shaft. 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. The actuators must be designed so that they may be used for either clockwise or counterclockwise fail-safe operation. Actuators shall use a brushless DC motor controlled by a micro-processor and be protected from overload at all angles of rotation. Run time shall be constant, and independent of torque. If required, 1 SPDT auxiliary switch shall be provided having the capability of being adjustable. Actuators with auxiliary switch must be constructed to meet the requirements for Double Insulation so an electrical ground is not required to meet agency listings. Actuators shall be cULus listed certified, have a 5 year warranty, and be manufactured under ISO 9001 International Quality Control Standards. Actuators shall be as manufactured by Belimo.

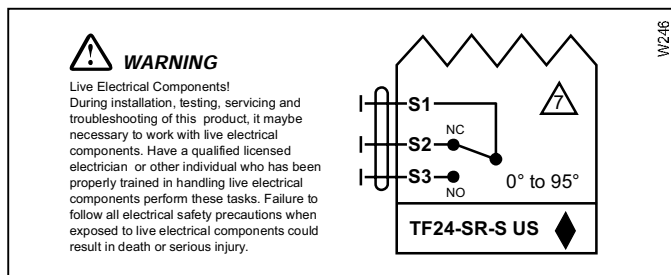
Wiring diagrams



2 to 10 VDC control of TF24-SR (-S) US



4 to 20 mA control of TF24-SR (-S) US



Auxiliary switch of TF24-SR-S US

- ② Up to 4 actuators may be connected in parallel. With 4 actuators wired to one 500 Ω resistor, a +2% shift of control signal may be required. Power consumption must be observed.
- ③ Actuator may also be powered by 24 VDC.
- ④ A 500 Ω resistor converts the 4...20 mA control signal to 2 to 10 VDC. (ZG-R01)
- ⑤ Only connect common to neg. (—) leg of control circuits.
- ⑥ Actuators with plenum rated cable do not have numbers on wires; use color codes instead.
- ⑦ For end position indication, interlock control, fan start-up, etc., TF24-SR-S us incorporates one built-in auxiliary switch: 1 x SPDT, 3A (0.5A) @250 VAC, UL listed, adjustable 0° to 95°.
- ◆ Meets cULus requirements without the need of an electrical ground connection.