

## **Chapter 23 DAMPER ACTUATOR**

### **MANUFACTURER/DISTRIBUTOR:**

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**23.1 BELIMO NFB24-SR MODULING ACTUATOR**

**23.2 BELIMO LF24 MODULING ACTUATOR**

# NFB and NFX Series Spring Return Direct Coupled Actuator

**DAMPER  
ACTUATOR**

**BELIMO**

## Minimum 90 in-lb Torque

- For damper areas up to 22 sq-ft

### SHOP DRAWING

This review is solely for the verification of general design quality and does not alleviate the responsibility of the contractor for insuring that all specification, space and installation requirements are met.

Reviewed By: M.M. Reviewed ☒  
Reviewed as noted ☐  
Date: 24 June 2016 Resubmit ☐

CHIARELLI ENGINEERING LTD.

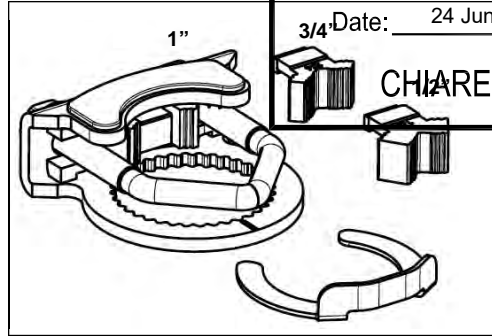
#### SHOP DRAWING

Reviewed by: Samuel Charbonneau  
Date: 21 juin 2016

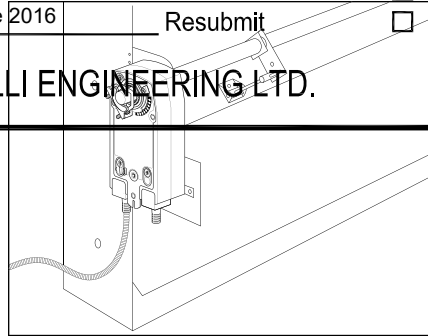
Reviewed ☒  
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Out for approval

SIFEC NORTH INC.

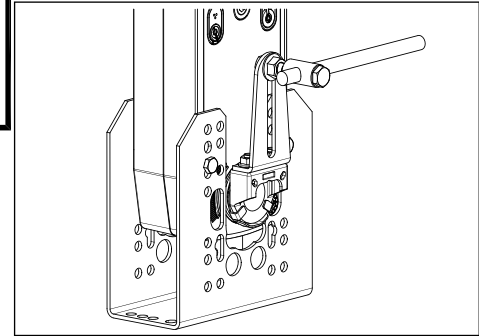
## Applications



New standard clamp fits standard 1/2" shafts to 1.05" jackshafts.



Mount directly to 1.05" jackshafts.



Linkage solutions are available when direct coupling is not possible.



Actuators in bold have BDCM

## NFB, NFX Series - At A Glance

		NFB24, NFX24 (p. 105)	NFB24 N4(H), NFX24 N4 (p. 107)	NFB24-S, NFX24-S (p. 105)	NFB24-S N4(H), NFX24-S N4 (p. 107)	NFBUP, NFXUP (p. 109)	NFBUP N4(H), NFXUP N4 (p. 111)	NFBUP-S, NFXUP-S (p. 109)	NFBUP-S N4(H), NFXUP-S N4 (p. 111)	<b>NFB24-SR, NFX24-SR (p. 113)</b>	<b>NFB24-SR N4(H), NFX24-SR N4 (p. 115)</b>	NFB24-SR-S, NFX24-SR-S (p. 113)	NFB24-SR-S N4(H), NFX24-SR-S N4 (p. 115)	NFB24-MFT, NFX24-MFT (p. 117)	NFB24-MFT N4(H), NFX24-MFT N4 (p. 119)	NFB24-MFT-S, NFX24-MFT-S (p. 117)	NFB24-MFT-S N4(H), NFX24-MFT-S N4 (p. 119)
Torque:	90 in-lb	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Power supply:	24 VAC/DC	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	120 VAC					●	●	●	●								
	230 VAC					●	●	●	●								
Control signal:	On/Off	●	●	●	●	●	●	●	●								
	Proportional 2 to 10 VDC									●	●	●	●				
	Multi-function**													●	●	●	●
Feedback signal:	2 to 10 VDC									●	●	●	●				
	VDC variable**													●	●	●	●
Running time motor:	<75 seconds	●	●	●	●	●	●	●	●								
	95 seconds constant									●	●	●	●				
	Adj. 40 to 220 seconds***													●	●	●	●
	spring: <20 seconds	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Brushless DC Motor										●	●	●	●				
External direction of rotation switch										●	●	●	●	●	●	●	●
Manual override		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Appliance rated cable, 18 GA (default)		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Plenum rated cable, 18 GA (optional)		●								●				●			
Built-in auxiliary switch, Two SPDT				●	●			●	●			●	●			●	●
NEMA 4 rated housing			●		●		●		●		●		●		●		●

Installation instructions.....(p. 121-127)

General wiring.....(p. 129)

Start-up and checkout.....(p. 130)

Electrical operations.....(p. 128)

\*Based on 4 in-lb/ft² damper torque loading. Parallel blade. No edge seals. \*\*Default 2 to 10 VDC. \*\*\*Default 150 seconds.

800-543-9038 USA

866-805-7089 CANADA

203-791-8396 LATIN AMERICA / CARIBBEAN

**DAMPER  
ACTUATOR**

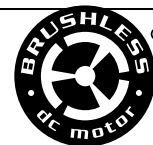
# A CLOSER LOOK...

- Cut labor costs with simple direct coupling.
- True mechanical spring return – the most reliable fail-safe.
- Mount for clockwise or counterclockwise fail-safe.
- Check damper position easily with clear position indicator.
- Don't worry about actuator burn-out. Belimo is overload-proof throughout rotation.
- Built-in mechanical stop to adjust angle of rotation.
- Manual override crank speeds installation
- Need to change control direction? Do it easily with a simple switch (modulating actuators).
- Incorporated breather membrane optimizes performance in harsh airstream environments.
- Built-in auxiliary switches are easy to use, offers feedback or signal for additional device (-S models).
- Microprocessor-controlled brushless DC motor increases actuator life span and reliability, provides constant running time (modulating actuators).
- Rugged metal on plastic housing withstands rough handling in the mechanical room.
- Standard 3 ft. appliance rated cable and conduit connector eases installation.
- Added flexibility to select clamp, electrical connection, and running time to fit your specific application with Belimo's customized line of actuators (NFX).



## The Belimo Difference

- **Customer Commitment.**  
Extensive product range. Application assistance.  
Same-day shipments. Free technical support. Five year warranty.
- **Low Installation and Life-Cycle Cost.**  
Easy installation. Accuracy and repeatability.  
Low power consumption. No maintenance.
- **Long Service Life.**  
Components tested before assembly. Every product tested before shipment.  
30+ years direct coupled actuator design.



# NFB24, NFB24-S, NFX24, NFX24-S

On/Off, Spring Return, 24 V

**DAMPER  
ACTUATOR**



Technical Data		NFB24, NFB24-S, NFX24, NFX24-S
Power supply		24 VAC $\pm$ 20% 50/60 Hz 24 VDC +20% / -10%
Power consumption	running	6 W
	holding	2.5 W
Transformer sizing		8.5 VA (class 2 power source)
Electrical connection		3 ft, 18 GA appliance cable, 1/2" conduit connector
NFB24...		-S models: two 3 ft, 18 gauge appliance cables with 1/2" conduit connectors
NFX24...		3 ft [1m], 10 ft [3m] or 16 ft [5m] 18 GA appliance or plenum cables, with or without 1/2" conduit connector -S models: two 3 ft [1m], 10 ft [3m] or 16 ft [5m] appliance cables, with or without 1/2" conduit connectors
Overload protection		electronic throughout 0 to 95° rotation
Control		on/off
Torque		90 in-lb [10 Nm] minimum
Direction of rotation	spring	reversible with CW/CCW mounting
Mechanical angle of rotation		95° (adjustable with mechanical end stop, 35° to 95°)
Running time	motor	< 75 seconds
	spring	20 seconds @ -4°F to 122°F [-20°C to 50°C]; < 60 seconds @ -22°F [-30°C]
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		<50dB(A) motor @ 75 seconds <62dB(A) spring return
Servicing		maintenance free
Quality standard		ISO 9001
Weight		4.15 lbs (1.9 kg); 4.4 lbs (2.0 kg) with switches
† Rated Impulse Voltage 800V, Type of action 1.AA (1.AA.B for -S version), Control Pollution Degree 3.		
<b>NFB24-S, NFX24-S</b>		
Auxiliary switches		2 x SPDT 3A (0.5A) @ 250 VAC, UL approved one set at +10°, one adjustable 10° to 90°

- Torque min. 90 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 up to 1.05" in diameter by means of its universal clamp. A crank arm and several mounting brackets are available for applications where the actuator cannot be direct coupled to the damper shaft.

## Operation

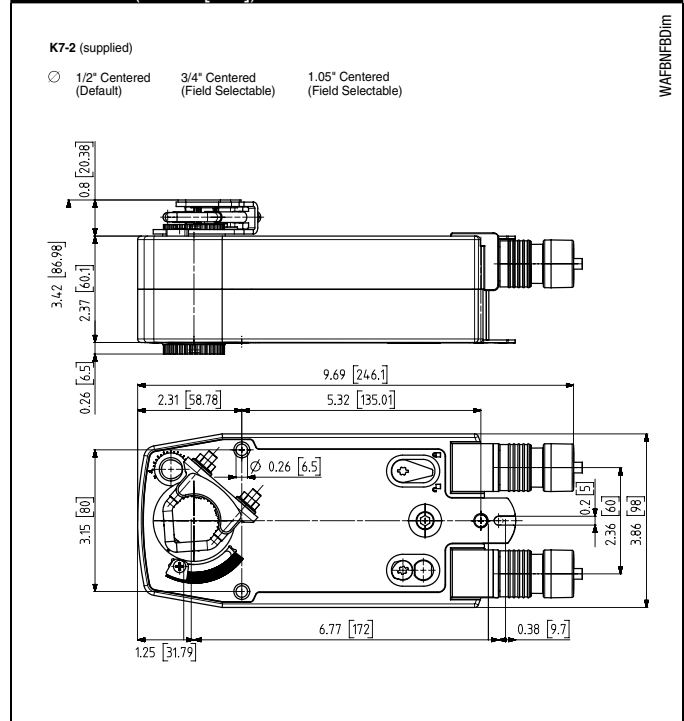
The NFB and NFX series actuators provide true spring return operation for reliable fail-safe application and positive close off on air tight dampers. The spring return system provides constant torque to the damper with, and without, power applied to the actuator.

The NFB and NFX series provides 95° of rotation and is provided with a graduated position indicator showing 0° to 95°.

The actuator may be stalled anywhere in its normal rotation without the need of mechanical end switches.

The NFB24-S and NFX24-S versions are provided with two built-in auxiliary switches. These SPDT switches are provided for safety interfacing or signaling, for example, for fan start-up. The switching function at the fail-safe position is fixed at +10°, the other switch function is adjustable between +10° to +90°. The NFB24, NFB24-S, NFX24 and NFX24-S actuator is shipped at +5° (5° from full fail-safe) to provide automatic compression against damper gaskets for tight shut-off.

## Dimensions (Inches [mm])



N40103 - 09/11 - Subject to change. © Belimo Aircontrols (USA), Inc.

## DAMPER ACTUATOR

### 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 NFB24, NFB24-S, NFX24, NFX24-S actuators, only use accessories listed on this page.

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

### Typical Specification

On/Off 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. 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 switch shall be provided having the capability of one being adjustable. Actuators with auxiliary switches 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 Approved 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!**  
Actuators may be connected in parallel.  
Power consumption and input impedance must be observed.
- 3 Actuators may also be powered by 24 VDC.
- 4 For end position indication, interlock control, fan startup, etc., NFB24-S and NFX24-S incorporates two built-in auxiliary switches: 2 x SPDT, 3A (0.5A) @250 VAC, UL Approved, one switch is fixed at +10°, one is adjustable 10° to 90°.

#### APPLICATION NOTES

- ◆ Meets cULus 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.

