BELIMO

Technical data sheet EFX24-MFT-S N4H

Customizable Fail-Safe multifunction technology actuator for controlling dampers in typical commercial HVAC applications.

- **Torque motor 270 in-lb [30 Nm]**
- **Nominal voltage AC/DC 24 V**
- **Control MFT/programmable**
- **Position feedback 2...10 V**
- **2x SPDT**
- **NEMA 4**

5-year warranty

MFT

Technical data

Electrical data	Nominal voltage	AC/DC 24 V
	Nominal voltage frequency	50/60 Hz
	Nominal voltage range	AC 19.2...28.8 V / DC 21.6...28.8 V
	Power consumption in operation	9.5 W
	Power consumption in rest position	4.5 W
	Transformer sizing	16 VA
	Power consumption heating	21 W
	Auxiliary switch	2x SPDT, 1 mA...3 A (0.5 A inductive), DC 5 V...AC 250 V, one set at 10°, one set at 85°
	Switching capacity auxiliary switch	1 mA...3 A (0.5 A inductive), DC 5 V...AC 250 V
	Electrical Connection	Terminal block(s) inside junction box with knockouts
	Overload Protection	electronic throughout 0...95° rotation
	Electrical Protection	actuators are double insulated
Functional data	Torque motor	270 in-lb [30 Nm]
	Operating range Y	2...10 V
	Operating range Y note	4...20 mA w/ ZG-R01 (500 Ω, 1/4 W resistor)
	Input impedance	100 kΩ for 2...10 V (0.1 mA), 500 Ω for 4...20 mA, 1500 Ω for PWM, On/Off and Floating point
	Operating range Y variable	Start point 0.5...30 V End point 2.5...32 V
	Operating modes optional	variable (VDC, PWM, on/off, floating point)
	Position feedback U	2...10 V
	Position feedback U note	Max. 0.5 mA
	Position feedback U variable	VDC variable
	Direction of motion motor	selectable with switch 0/1
	Direction of motion fail-safe	reversible with cw/ccw mounting
	Manual override	5 mm hex crank (3/16" Allen), supplied
	Angle of rotation	Max. 95°
	Angle of rotation note	adjustable with mechanical end stop, 35...95°
	Running Time (Motor)	150 s / 90°
	Running time motor variable	60...150 s
	Running time fail-safe	<20 s @ -22...122°F [-30...50°C], <60 s @ -40°F [-40°C]
	Adaptation Setting Range	off (default)
	Override control	MIN (minimum position) = 0% MID (intermediate position) = 50% MAX (maximum position) = 100%
	Noise level, motor	45 dB(A)
	Noise level, fail-safe	71 dB(A)

Functional data	Position indication	Mechanical
Safety data	Power source UL	Class 2 Supply
	Degree of protection IEC/EN	IP66
	Degree of protection NEMA/UL	NEMA 4
	Enclosure	UL Enclosure Type 4
	Agency Listing	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2014/30/EU and 2014/35/EU
	Quality Standard	ISO 9001
	Ambient humidity	Max. 100% RH
	Ambient temperature	-40...122°F [-40...50°C]
	Ambient temperature note	-40...50°C for actuator with integrated heating
	Storage temperature	-40...176°F [-40...80°C]
	Servicing	maintenance-free
Weight	Weight	10 lb [4.7 kg]
Materials	Housing material	Die cast aluminium and plastic casing

Footnotes

*Variable when configured with MFT options.

†Rated Impulse Voltage 800V, Type of action 1.AA.B, Control Pollution Degree 4.

Product features

Default/Configuration

Default parameters for 2 to 10 VDC applications of the EF..-MFT actuator are assigned during manufacturing. If required, custom versions of the actuator can be ordered. The parameters are variable and can be changed by three means: Factory pre-set or custom configuration, set by the customer using PC-Tool software or the handheld ZTH US.

Application

For fail-safe, modulating control of dampers in HVAC systems. Actuator sizing should be done in accordance with the damper manufacturer's specifications. A feedback signal is provided for position indication or master-slave applications. Two EF's can be piggybacked for torque loads of up to 540 in-lbs. Minimum 3/4" diameter shaft. OR Maximum of three EF's can be piggybacked for torque loads of up to 810 in-lbs. Minimum 1" diameter shaft. Master-Slave wiring for either configuration. Heater must remain powered at all times to ensure proper actuator operation at colder temperatures.

Operation

The EF..24-MFT N4 actuator provides 95° of rotation and comes with a graduated position indicator showing 0° to 95°. The actuator will synchronize the 0° mechanical stop or the physical damper mechanical stop and use this as 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 controls 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 EF..24-MFT N4 is mounted directly to control shafts up to 1.05" diameter with 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 minimum specified torque to the application during a power interruption. The EF..24-MFT N4 actuator is shipped at 5° (5° from full failsafe) to provide automatic compression against damper gaskets for tight shut-off.

Installation Note: Use 60°C/75°C copper conductor, wire size range 12-26 AWG, stranded or solid. If conduit is used, use flexible metal conduit; UL listed and CSA certified strain relief or conduit fitting suitable for outdoor applications, rated NEMA type 4, 4X, 6, 6X or watertight.

Typical specification

Spring return control 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 actuator must provide modulating 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. 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 or primary and secondary applications. 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 listed and have a 5 year warranty, and be manufactured under ISO 9001 International Quality Control Standards. Actuators shall be as manufactured by Belimo.

Factory settings

Default parameters for 2 to 10 VDC applications of the EF..-MFT actuator are assigned during manufacturing. If required, custom versions of the actuator can be ordered. The parameters are variable and can be changed by three means: Factory pre-set or custom configuration, set by the customer using PC-Tool software or the handheld ZTH US.

Accessories

Electrical accessories

Description	Type
DC Voltage Input Rescaling Module	IRM-100
Auxiliary switch, mercury-free	P475
Auxiliary switch, mercury-free	P475-1
Convert Pulse Width Modulated Signal to a 2...10 V Signal for Belimo Proportional Actuators	PTA-250
Positioner for wall mounting	SGA24
Positioner for front-panel mounting	SGF24
Gateway MP to BACnet MS/TP	UK24BAC
Gateway MP to LonWorks	UK24LON
Gateway MP to Modbus RTU	UK24MOD
Resistor, 500 Ω, 1/4" wire resistor with 6" pigtail wires	ZG-R01
Resistor kit, 50% voltage divider	ZG-R02
Transformer, AC 120 V to AC 24 V, 40 VA	ZG-X40

Mechanical accessories

Description	Type
Shaft extension 240 mm ø20 mm for damper shaft ø8...22.7 mm	AV8-25
Anti-rotation bracket EFB(X)/GKB(X)/GMB(X).	EF-P
End stop indicator	IND-EFB
Shaft clamp reversible, clamping range ø12...26.7 mm	K9-2
Ball joint suitable for damper crank arm KH8 / KH10	KG10A
Damper crank arm Slot width 8.2 mm, clamping range ø14...25 mm	KH10
Actuator arm Slot width 8.2 mm	KH-EFB
Push rod for KG10A ball joint 36” L, 3/8” diameter	SH10
Wrench 0.512 in. [13 mm]	TOOL-07
Mounting bracket for AF..	ZG-100
Jackshaft mounting bracket.	ZG-120
Damper clip for damper blade, 3.5” width.	ZG-DC1
Damper clip for damper blade, 6” width.	ZG-DC2
Mounting kit for linkage operation for flat and side installation	ZG-EFB
1.05" diameter jackshaft adaptor (12" L).	ZG-JSA-3

Tools

Description	Type
Connecting cable 16 ft [5 m], A: RJ11 6/4 ZTH EU, B: 6-pin for connection to service socket	ZK1-GEN
Connecting cable 16 ft [5 m], A: RJ11 6/4 ZTH EU, B: free wire end for connection to MP/PP terminal	ZK2-GEN
Service Tool, with ZIP-USB function, for programmable and communicative Belimo actuators, VAV controller and HVAC performance devices	ZTH US
Belimo PC-Tool, Software for adjustments and diagnostics	MFT-P
Signal simulator, Power supply AC 120 V	PS-100

Electrical installation

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.

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

Apply only AC line voltage or only UL-Class 2 voltage to the terminals of auxiliary switches. Mixed or combined operation of line voltage/safety extra low voltage is not allowed.

A Actuators with appliance cables are numbered.

1 Provide overload protection and disconnect as required.

3 Actuators may also be powered by DC 24 V.

4 Two built-in auxiliary switches (2x SPDT), for end position indication, interlock control, fan startup, etc.

5 Only connect common to negative (-) leg of control circuits.

7 A 500 Ω resistor (ZG-R01) converts the 4...20 mA control signal to 2...10 V.

8 Control signal may be pulsed from either the Hot (Source) or Common (Sink) 24 V line.

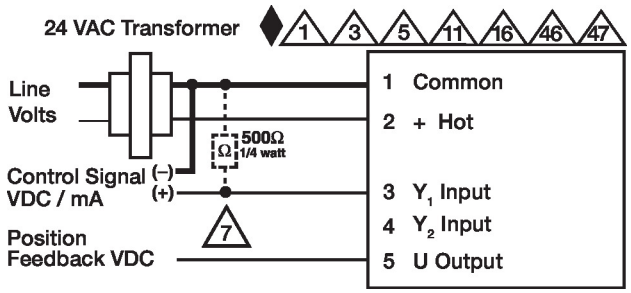
10 For triac sink the Common connection from the actuator must be connected to the Hot connection of the controller. Position feedback cannot be used with a triac sink controller; the actuator internal common reference is not compatible.

12 IN4004 or IN4007 diode. (IN4007 supplied, Belimo part number 40155).

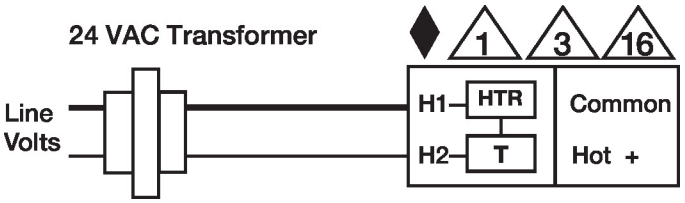
16 Actuators are provided with a numbered screw terminal strip instead of a cable.

46 Actuators may be controlled in parallel. Current draw and input impedance must be observed.

47 Master-Slave wiring required for piggy-back applications. Feedback from Master to control input(s) of Slave(s).



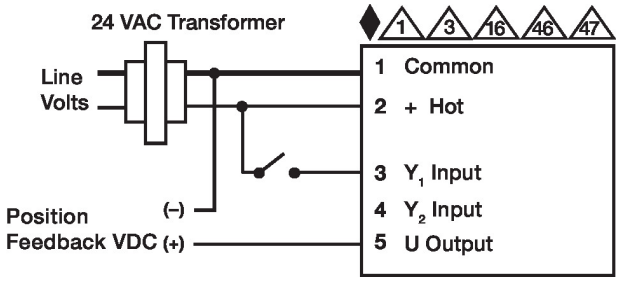
VDC/mA Control



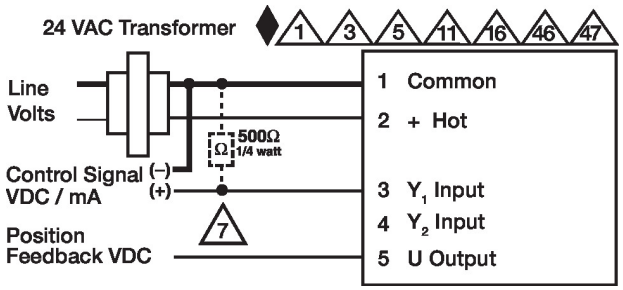
NEMA 4 Heater

Wiring diagrams

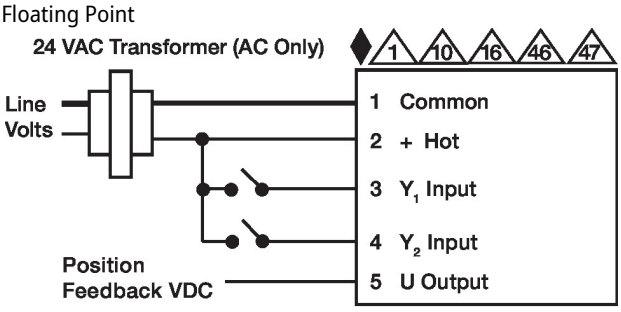
On/Off



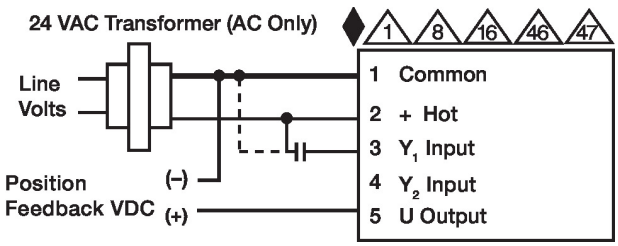
VDC/mA Control



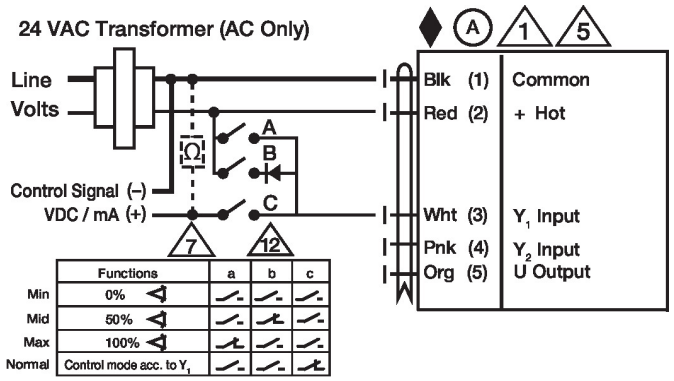
Floating Point



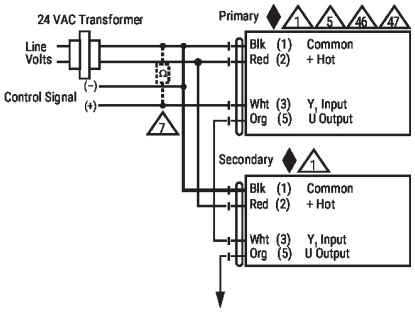
PWM Control



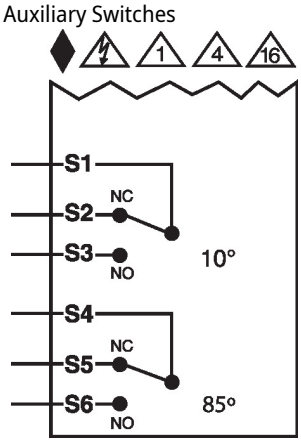
Override Control



Primary - Secondary



Auxiliary Switches



Dimensions