

AF24-MFT (-S) US

Proportional damper actuator, Spring Return Fail-Safe, Multi-Function Technology®



Technical Data	AF24-MFT (-S) US
Power supply	24 VAC, $\pm 20\%$, 50/60 Hz 24 VDC, $\pm 10\%$
Power consumption	2.5 W holding 6 W running
Transformer sizing	10 VA (Class 2 power source)
Electrical connection	3 ft, 18 GA, appliance cable, 1/2" conduit connector
Overload protection	electronic throughout 0 to 95° rotation
Operating range Y*	2 to 10 VDC 4 to 20 mA (w/500 Ω , 1/4 W resistor) ZG-R01
Input impedance	100k Ω for 2 to 10 VDC (0.1 mA) 500 Ω for 4 to 20 mA 1500 Ω for PWM, Floating point and On-Off control
Feedback output U*	2 to 10 VDC, 0.5 mA max
Torque	min 133 in-lb (15 Nm)
Direction of rotation*	spring: reversible with cw/ccw mounting motor: reversible with built-in switch
Mech. angle of rotation*	95°, adjustable 35° to 95° w/ZDB-AF2
Running time motor*	150 seconds constant
Running time spring	<20 sec spring return fail safe position
Angle of Rotation Adaptation*	Off (Default)
Override control*	Min. (Min Position) = 0% - ZS (Mid. Position) = 50% - Max. (Max. Position) = 100%
Position indication	visual indicator, 0° to 95° (0° is spring return position)
Auxiliary switches (AF24-MFT-S US)	2 x SPDT 7A (2.5A) @ 250 VAC, UL listed one set at +5°, one adjustable 25° to 85°
Manual override	3 mm hex crank (supplied)
Humidity	5 to 95% RH, non-condensing
Ambient temperature	-22 to +122° F (-30 to +50° C)
Storage temperature	-40 to +176° F (-40 to +80° C)
Housing	NEMA 2, IP54
Housing material	zinc coated metal
Noise level	less than 45 dB (A)
Agency listings	UL 873 listed, CE, CSA C22.2 No. 24 certified
Quality standard	ISO 9001
Servicing	maintenance free
Weight	6.0 lbs. (2.7 kg.)

* Variable when configured with MFT options

- Torque min. 133 in-lb
- Control 2 to 10 VDC (DEFAULT)
- Feedback 2 to 10 VDC (DEFAULT)

Application

For proportional modulation of dampers and control valves in HVAC systems. The AF24-MFT US provides mechanical spring return operation for reliable fail-safe application.

Default/Configuration

Default parameters for 2 to 10 VDC applications of the AF24-MFT US actuator are assigned during manufacturing. If required, custom versions of the actuator can be ordered. The parameters noted in the Technical Data table are variable.

These parameters can be changed by three means:

- Pre-set configurations from Belimo
- Custom configurations from Belimo
- Configurations set by the customer using the MFT-Handy® or the MFT-Actuate™ PC software application.

Operation

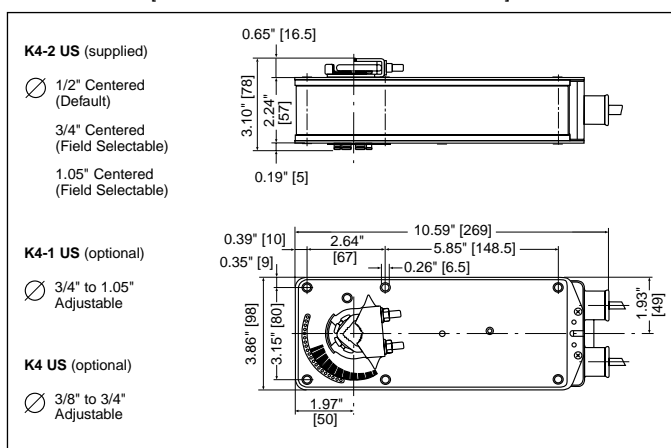
The AF24-MFT US actuator provides 95° of rotation and is provided with a graduated position indicator showing 0° to 95°. The actuator will synchronize the 0° mechanical stop or the physical damper or valve mechanical stop and use this point for its zero position during normal control operations. A unique 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.

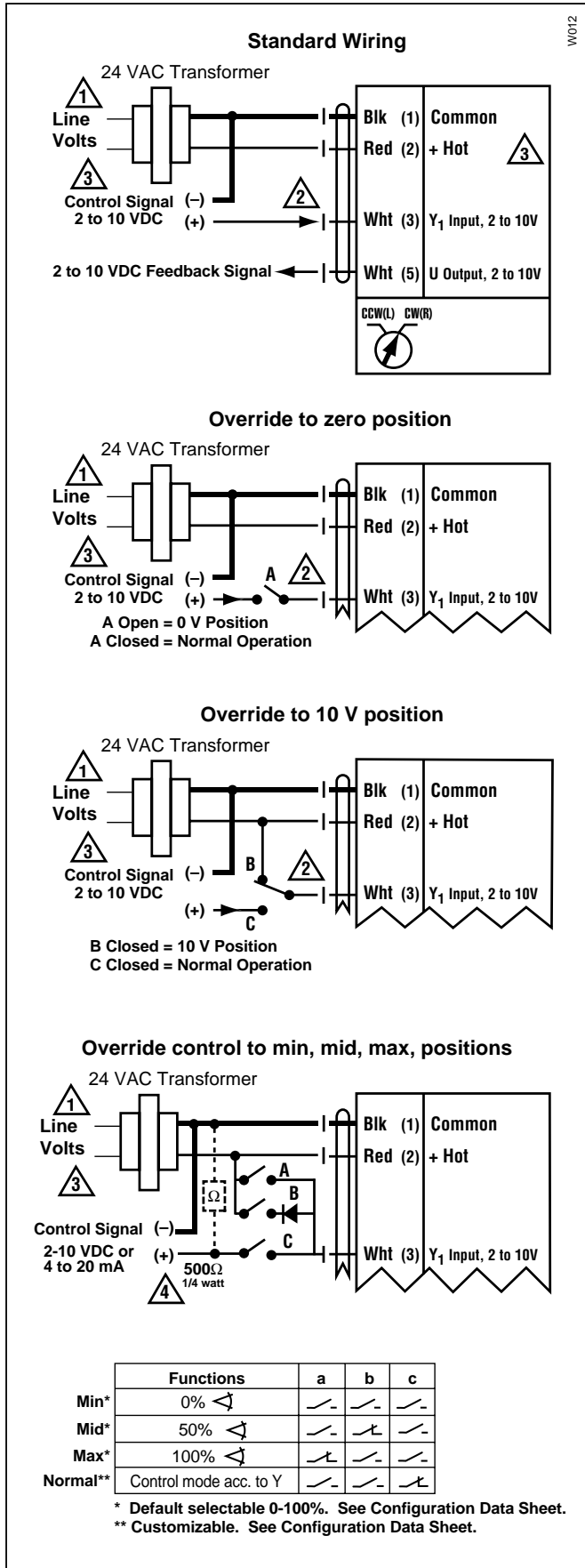
The actuator uses a brushless DC motor which is controlled by an Application Specific Integrated Circuit (ASIC) and a microprocessor. The microprocessor provides the intelligence to the ASIC to provide a constant rotation rate and to know the actuator's exact position. The ASIC monitors and controls 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 AF24-MFT US is mounted directly to control shafts up to 1.05" diameter by means of its universal clamp and anti-rotation bracket. A crankarm 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 AF24-MFT US actuator is shipped at +5° (5° from full fail-safe) to provide automatic compression against damper gaskets for tight shut-off.

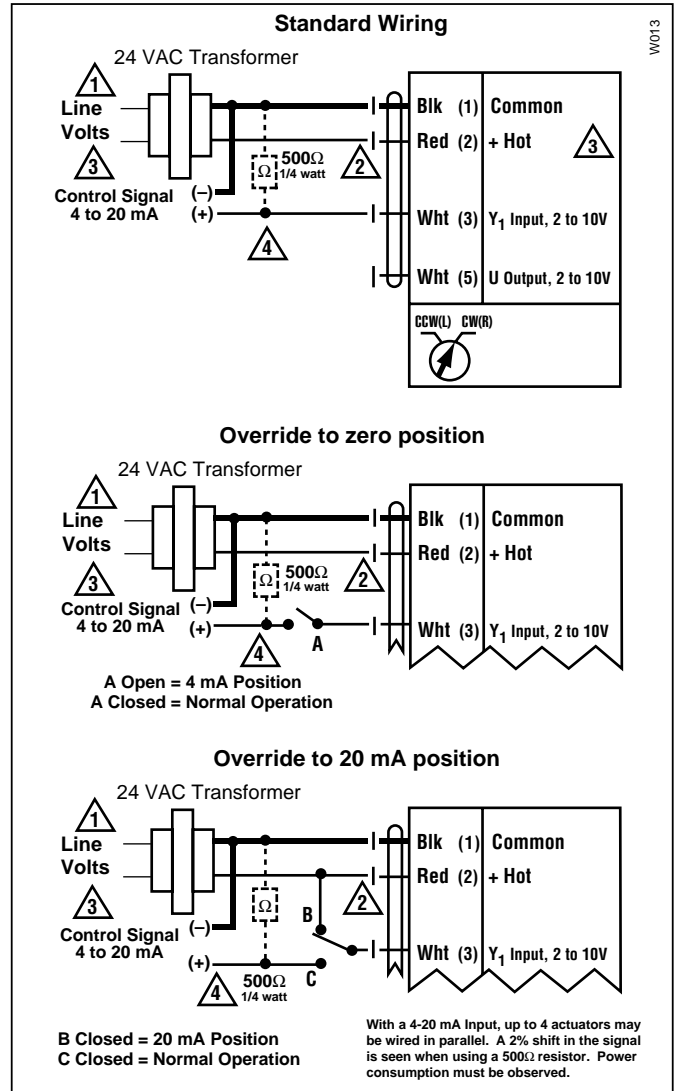
Note: Please See Documentation on Multi-Function Technology (pg 255)

Dimensions [All numbers in brackets are in millimeters.]

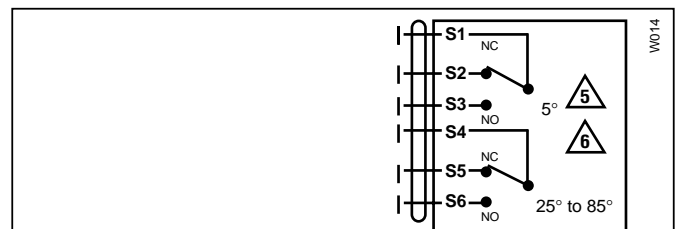




2 to 10 VDC Control Signal



4 to 20 mA Control Signal



Auxiliary Switch AF24-MFT-S US

Notes

- 1 Provide overload protection and disconnect as required.
- 2 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.
- 4 ZG-R01 may be used.
- 5 For end position indication, interlock control, fan startup, etc., AF24-MFT-S US incorporates two built-in auxiliary switches: 2 x SPDT, 7A (2.5A) @250 VAC, UL listed, one switch is fixed at +5°, one is adjustable 25° to 85°.
- 6 Meets UL and CSA requirements without the need of an electrical ground connection.

Ordering example – Non-Spring Return

The ordering process for the new Flexible non-spring return actuators is simple. First select a base actuator that meets the needs of the application and then add the desired options.

1. Base actuator **LMX24-MFT (LM100)**

Select a base actuator

- Torque or linear force, control input, position feedback, power supply...
- See page 40 for complete list of non-spring base actuators.

2. Clamp option **3/4" dia. universal clamp (6)**

Select clamp that accommodates the damper shaft

- LM defaults to a 5/8" dia. clamp, but the 3/4" option can be selected as seen in this example.
- NM and AM default to a 1/2" dia. clamp that also accommodates 3/4" and 1.05" dia. shafts.
- GM accommodates a 1.05" dia. shafts. A 3/4" dia. clamp is available for retrofits of past GM and SM types.

3. Electrical Connection option **16 ft. [5m] 18 GA, plenum rated cable (C5)**

- Default connection is a 3 ft. [1m] long cable. 10 ft [3m] or 16ft [5m] cables are also available.
- Actuators with a "-T" in the model number have a screw terminal strip, which default to a NEMA 1 enclosure rating. A NEMA 2 cover for the terminal strip can be selected.

4. Programming **P-20003 (W03)**

- For –3 and –SR type actuators only the running time can be changed. This is a one-time factory setting.
- For –MFT type actuators refer to page 41 for available configurations.

5. Total **LMX24-MFT (LM100 6 C5 W03)**

Ordering example – Spring Return

1. Base actuator **AF24-MFT-S US**

Select a base actuator

2. Programming **P-10003 (A03)** **2 – 10 VDC input / 0 – 5 VDC feedback**

Select pre-set programming code

- P-100xx (Axx) Control voltage applications
- P-200xx (Wxx) Pulse width modulation applications
- P-300xx (Fxx) Floating point applications
- P-400xx (Jxx) On/Off applications
- Or create custom MFT configuration codes, see page 41
- Or create custom MFT configurations in the field with MFT-Actuate PC software.

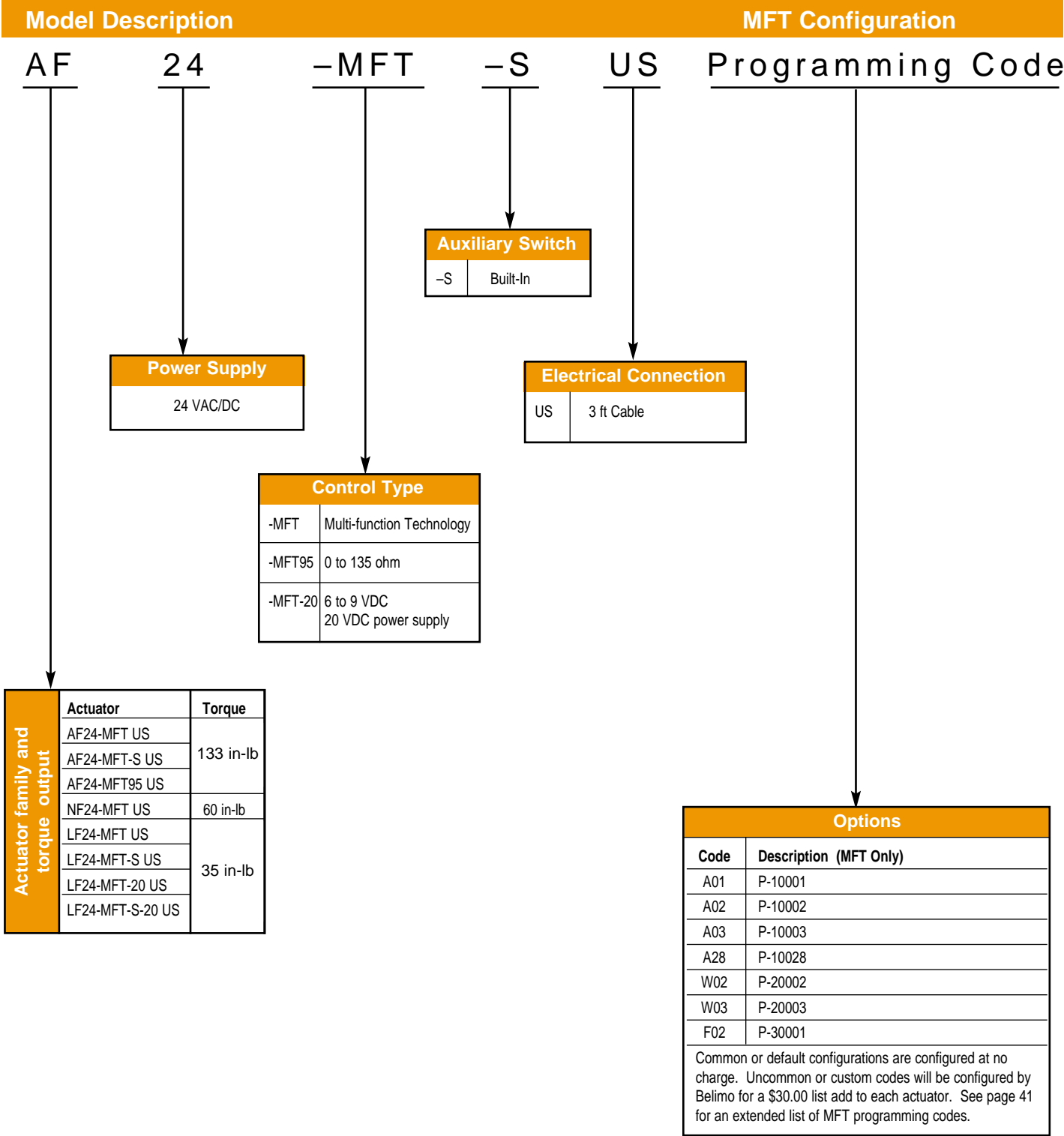
3. Total **AF24-MFT-S US + P10003**

Order confirmation and invoice example for spring return actuators:

Line Item	Model	Qty
10	AF24-MFT US P-10003	10
20	LF24-MFT US P-20002	10
30	AF24-MFT US P-10006	5
40	99981-00100	25

The part number 99981-00100 is a requirement for Belimo as a designation for all the configurations in an order. This product's description will read "MFT CONFIGURATION CHARGE, (P-.../ V-...)". It is used to confirm the correct quantities and to invoice the proper fee for the MFT configurations. The total quantity of configurations is represented in this one line item. The product line item will list the specific configuration below the actuator ordered. If you have more than one model with multiple configurations, each change in configuration will be shown on separate line items. As an example lines 10 and 30 are the same model actuator with different configurations.

Spring Return MFT Actuators



Pre-set MFT Configurations

DC Voltage Control, P-1000... (A...)



Spring Return

AF24-MFT(-S) US
133 in-lb
NF24-MFT US
60 in-lb

LF24-MFT(-S) US
35 in-lb
LF24-MFT(-S)-20 US
35 in-lb



Non-Spring Return

GMX24-MFT
360 in-lb
AMX24-MFT
180 in-lb

NMX24-MFT
90 in-lb
LMX24-MFT
45 in-lb

Application

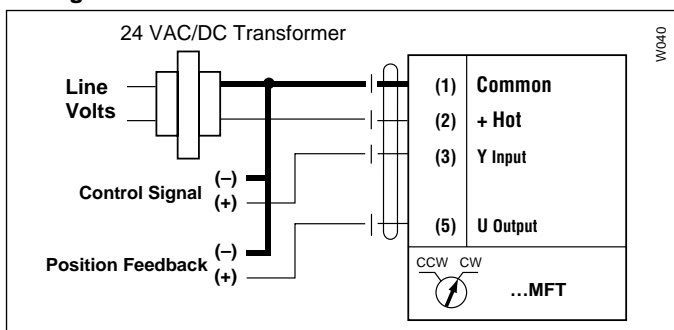
P-1000... configuration types are used for VDC control applications. Pre-set configurations are listed which offer solutions for standard control applications.

Additional pre-set configurations are listed which offer solutions for non-standard control application for:

- Adjustable Start and Stop points
- Sequencing actuators
- Combination for master slave



Wiring – VDC



Select a Configuration

VOLTAGE	Configuration Description	Code	Input Range	Position Feedback	Running Time	Torque %	Adaptation
	P-10001*	A01	2.0 to 10.0 VDC	2.0 to 10.0 VDC	150	100	MANUAL
	P-10002	A02	0.5 to 10.0 VDC	0.0 to 10.0 VDC	150	100	MANUAL
	P-10003	A03	2.0 to 10.0 VDC	0.0 to 5.0 VDC	150	100	MANUAL
	P-10004	A04	4.0 to 7.0 VDC	2.0 to 10.0 VDC	150	100	MANUAL
	P-10005	A05	6.0 to 9.0 VDC	2.0 to 10.0 VDC	150	100	MANUAL
	P-10006	A06	10.5 to 13.5 VDC	2.0 to 10.0 VDC	150	100	MANUAL
	P-10007	A07	0.5 to 5.0 VDC	2.0 to 10.0 VDC	150	100	MANUAL
	P-10008	A08	0.5 to 5.0 VDC	0.0 to 10.0 VDC	150	100	MANUAL
	P-10009	A09	5.0 to 10.0 VDC	2.0 to 10.0 VDC	150	100	MANUAL
	P-10010	A10	5.0 to 10.0 VDC	0.0 to 10.0 VDC	150	100	MANUAL
	P-10013	A13	0.5 to 10.0 VDC	2.0 to 10.0 VDC	150	100	MANUAL
	P-10015	A15	2.0 to 5.0 VDC	2.0 to 10.0 VDC	150	100	MANUAL
	P-10016	A16	2.0 to 6.0 VDC	2.0 to 10.0 VDC	150	100	MANUAL
	P-10017	A17	6.0 to 10.0 VDC	2.0 to 10.0 VDC	150	100	MANUAL
	P-10018	A18	14 to 17 VDC	2.0 to 10.0 VDC	150	100	MANUAL
	P-10020	A20	9.0 to 12.0 VDC	2.0 to 10.0 VDC	150	100	MANUAL
	P-10028	A28	0.5 to 10.0 VDC	0.0 to 10.0 VDC	100	100	MANUAL
	P-10031	A31	0.5 to 4.0 VDC	2.0 to 10.0 VDC	150	100	MANUAL
	P-10063	A63	0.5 to 4.5 VDC	0.5 to 4.5 VDC	150	100	MANUAL
	P-10064	A64	5.5 to 10.0 VDC	5.5 to 10.0 VDC	150	100	MANUAL
	P-10091	A91	2.0 to 10.0 VDC	2.0 to 10.0 VDC	95	100	MANUAL

* P-10001 (A01) is the default configuration code.



Spring Return

AF24-MFT(-S) US
133 in-lb
NF24-MFT US
60 in-lb

LF24-MFT(-S) US
35 in-lb
LF24-MFT(-S)-20 US
35 in-lb



Non-Spring Return

GMX24-MFT
360 in-lb
AMX24-MFT
180 in-lb

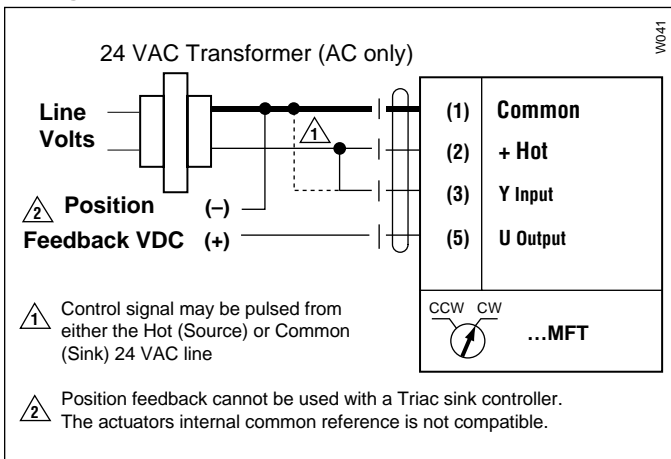
NMX24-MFT
90 in-lb
LMX24-MFT
45 in-lb

Application

P-2000... configuration types are used for Pulse Width Modulation control outputs. Most D.D.C. controllers have digital outputs which incorporate a default PWM range. This enables a D.O. to be used as a proportional output when needed. Simply select the appropriate configuration code according to your application.



Wiring – PWM, triac source and sink



Select a Configuration

Configuration Description	Code	Input Range	Position Feedback	Running Time	Torque %	Adaptation
P-20001	W01	0.59 to 2.93 sec	2.0 to 10.0 VDC	150	100	MANUAL
P-20002	W02	0.02 to 5.00 sec	2.0 to 10.0 VDC	150	100	MANUAL
P-20003	W03	0.10 to 25.50 sec	2.0 to 10.0 VDC	150	100	MANUAL
P-20004	W04	0.10 to 25.60 sec	2.0 to 10.0 VDC	150	100	MANUAL
P-20005	W05	0.10 to 5.20 sec	0.0 to 5.0 VDC	150	100	MANUAL
P-20012	W12	0.50 to 25.50 sec	0.0 to 10.0 VDC	150	100	MANUAL
P-20013	W13	0.50 to 2.93 sec	0.0 to 5.0 VDC	150	100	MANUAL
P-20014	W14	0.10 to 10.00 sec	2.0 to 10.0 VDC	150	100	MANUAL

Pre-set MFT Configurations

Floating Point Control, P-3000... (F...)



Spring Return

AF24-MFT(-S) US
133 in-lb
NF24-MFT US
60 in-lb

LF24-MFT(-S) US
35 in-lb
LF24-MFT(-S)-20 US
35 in-lb



Non-Spring Return

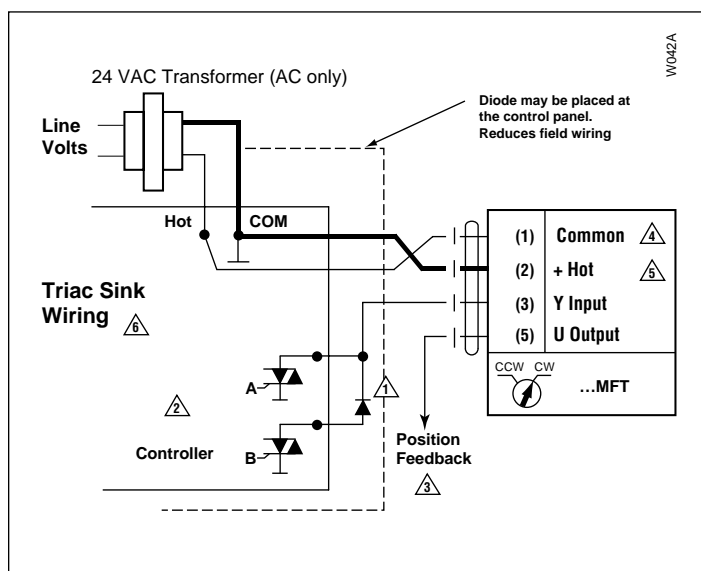
GMX24-MFT
360 in-lb
AMX24-MFT
180 in-lb

NMX24-MFT
90 in-lb
LMX24-MFT
45 in-lb

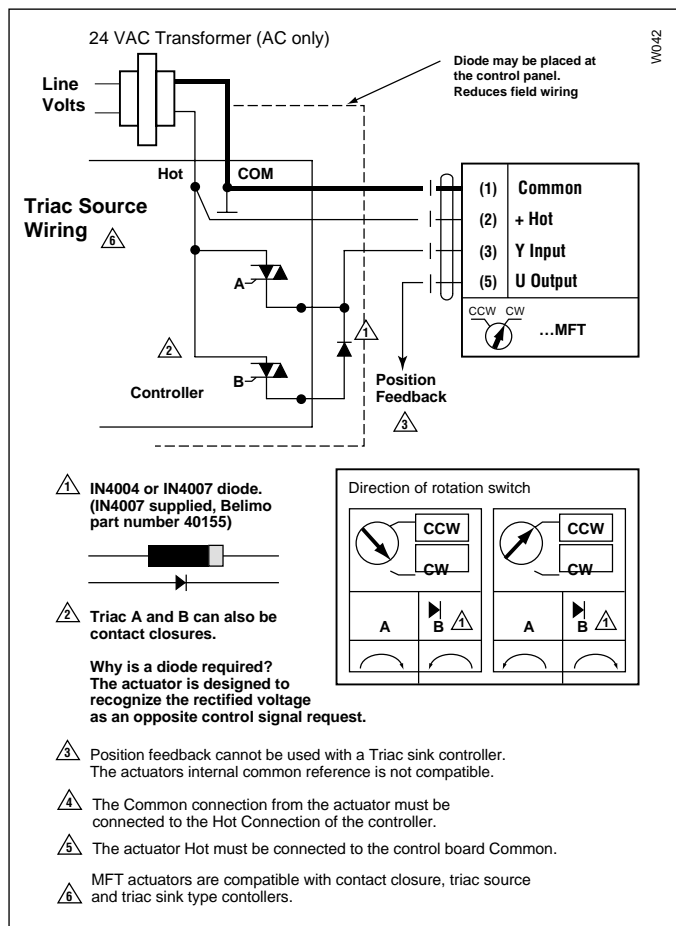
Application

P-3000... configuration types are used for floating point control outputs. In this application MFT actuators offer constant running time and standard feedback options. A IN4004 or IN4007 diode is required for spring return actuators only.

Wiring – Floating Point



Note: Diode is internal on non-spring return type actuators, connect to controller using wires 3 and 4.



Note: Diode is internal on non-spring return type actuators, connect to controller using wires 3 and 4.

Select a Configuration

Configuration Description	Code	Input Range	Position Feedback	Running Time	Torque %	Adaptation
P-30001	F01	Floating Point	2.0 to 10.0 VDC	150	100	MANUAL
P-30002	F02	Floating Point	0.0 to 10.0 VDC	150	100	MANUAL
P-30003	F03	Floating Point	2.0 to 10.0 VDC	100	100	MANUAL
P-30004	F04	Floating Point	0.0 to 5.0 VDC	100	100	MANUAL
P-30005	F05	Floating Point	0.0 to 10.0 VDC	100	100	MANUAL
P-30006	F06	Floating Point	0.0 to 5.0 VDC	150	100	MANUAL
P-30007	F07	Floating Point	2.0 to 10.0 VDC	300	100	MANUAL
P-30008	F08	Floating Point	2.0 to 10.0 VDC	75	100	MANUAL
P-30009	F09	Floating Point	2.0 to 10.0 VDC	85	100	MANUAL
P-30010	F10	Floating Point	0.0 to 2.5 VDC	150	100	MANUAL



Spring Return

AF24-MFT(-S) US	LF24-MFT(-S) US
133 in-lb	35 in-lb
NF24-MFT US	LF24-MFT(-S)-20 US
60 in-lb	35 in-lb



Non-Spring Return

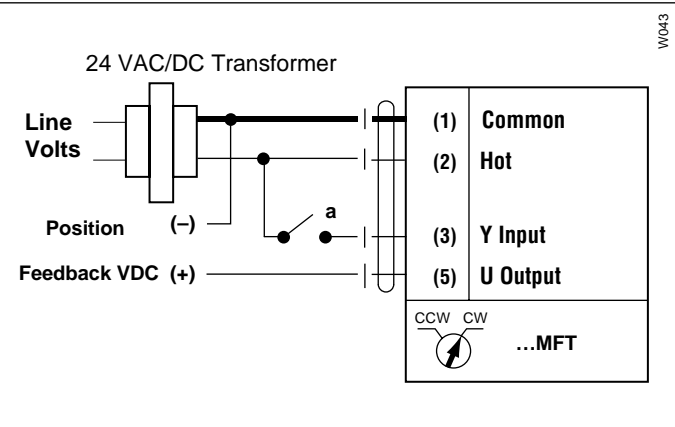
GMX24-MFT	NMX24-MFT
360 in-lb	90 in-lb
AMX24-MFT	LMX24-MFT
180 in-lb	45 in-lb

Application

P-4000... configuration types are used for on/off control outputs. The configuration allows for service replacement of on/off actuators when a true on/off actuator is not available. In addition the MFT actuator offers additional functionality in the on/off mode, such as configuration P-40003 with minimum position and 2 to 10 VDC feedback.



Wiring – Two Position



Select a Configuration

ON/OFF CONTROL	Configuration Description	Code	Input Range	Position Feedback	Running Time	Torque %	Adaptation
	P-40001	J01	On/Off	2.0 to 10.0 VDC	75	100	MANUAL
	P-40002	J02	On/Off	2.0 to 10.0 VDC	150	100	MANUAL
	P-40003	J03	On/Off	2.0 to 10.0 VDC	75	100	MANUAL
	P-40004	J04	On/Off	0.0 to 5.0 VDC	100	100	MANUAL
	P-40005	J05	On/Off	0.0 to 10.0 VDC	100	100	MANUAL

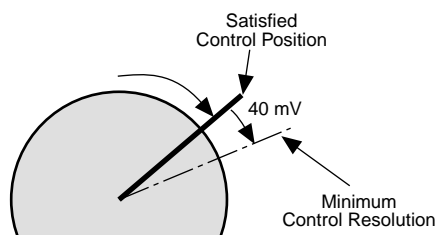
Control		
Specifications	Parameter Variables	Description
INPUT	VDC	<p>P-100...(A...) configuration types are used for VDC control applications. Pre-set configurations are listed which offer solutions for standard control applications. Additional pre-set configurations are list which offer solutions for non-standard control application for:</p> <ul style="list-style-type: none"> • Sequencing Actuators • Adjustable Start and Stop Points • Combination for Master Slave
	Pulse Width Modulation (PWM)	<p>P-200... (W...) configuration types are used for pulse width modulation control outputs with four standard ranges. There must be at least one second between the min pulses allowed (0.02 sec.) and the max pulse allowed (50 sec.). (eg: 0.02 to 1.02 sec.)</p>
	Floating Point	<p>P-300... (F...) configuration types are used for floating point control outputs. In this application MFT actuators offer constant running time and standard feedback options. A 1N4004 diode is required for spring return actuators. The actuator is designed to recognize the rectified voltage as an opposite control signal request.</p>
	On/Off	<p>P-400... (J...) configuration types are used for on/off control outputs. The configuration allows for service replacement of on/off actuators when a true on/off actuator is not available. In addition the MFT actuator offers additional functionality in the on/off mode, such as configuration P-40003 (J03) with minimum position and 2 to 10 VDC feedback.</p>
FEEDBACK	Position Feedback	<p>Position Feedback Range</p> <ul style="list-style-type: none"> • Start: 0.5 to 8 VDC Selectable • Stop: 2 to 10 VDC Selectable <p>The default-operating mode of the U5 output is 2 to 10 VDC for position feedback. Matching the controllers feedback input voltage is possible by selecting a pre-set configuration (page 278) or by creating a custom configuration (page 279).</p>
	Control Sensitivity	<p>Normal (Default)</p> <p>MFT actuators are designed with a unique non-symmetrical dead band. The actuator follows an increasing control signal with a 80 mV resolution. If the signal changes in the opposite direction, the actuator will no respond until the control signal changes by 200 mV. This allows the MFT actuator to track even the slightest deviation very accurately, yet allowing the actuator to "wait" for a much larger change in control signal. <i>See figure 2.</i></p>
SENSITIVITY		<p>Reduced</p> <p>Upon detecting an un-stable control loop, the "reduced" setting can be manually selected via the PC software. This will reduce the sensitivity of the actuator by 50%. Meaning, control accuracy will now be 160 mV for signal changes in the same direction. And a 400 mV signal change in the opposite direction is needed for the actuator to change direction. Once driving in the opposite direction the actuator will respond in 160 mV increments.</p> <p>Upon improving the control loop stability you can return the actuator to the "Normal" mode.</p>

Figure 2
Control Accuracy and Stability (AF / NF / LF)

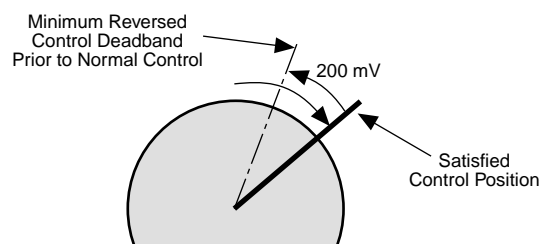
All MFT actuators have built-in brushless DC motors which provide better accuracy and longer service life.

The ...MFT US actuators are designed with a unique non-symmetrical deadband. The actuator follows an increasing or decreasing control signal with a 40 mV resolution. If the signal changes in the opposite direction, the actuator will not respond until the control signal changes by 200 mV. This allows these actuators to track even the slightest deviation very accurately, yet allowing the actuator to “wait” for a much larger change in control signal due to control signal instability.

AF / NF / LF Actuators responds to a 40 mV signal when not changing direction from stop position.



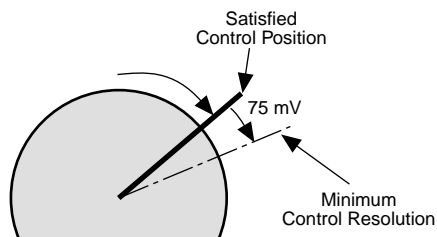
AF / NF / LF Actuators responds to a 200 mV signal when reversing direction from stop position.


Control Accuracy and Stability (GM / AM / NM / LM / AH / LH / LU)

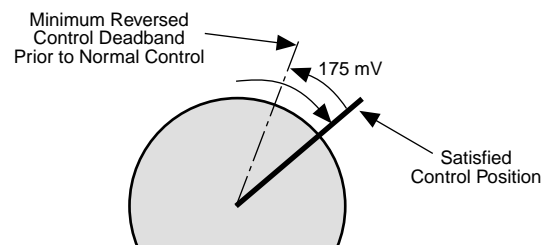
All Belimo actuators have built-in brushless DC motors which provide better accuracy and longer service life.

Belimo non-spring return actuators are designed with a unique non-symmetrical deadband. The actuator follows an increasing or decreasing control signal with a 75 mV resolution. If the signal changes in the opposite direction, the actuator will not respond until the control signal changes by 175 mV. This allows these actuators to track even the slightest deviation very accurately, yet allowing the actuator to “wait” for a much larger change in control signal due to control signal instability.

Actuator responds to a 75 mV signal when not changing direction from stop position.

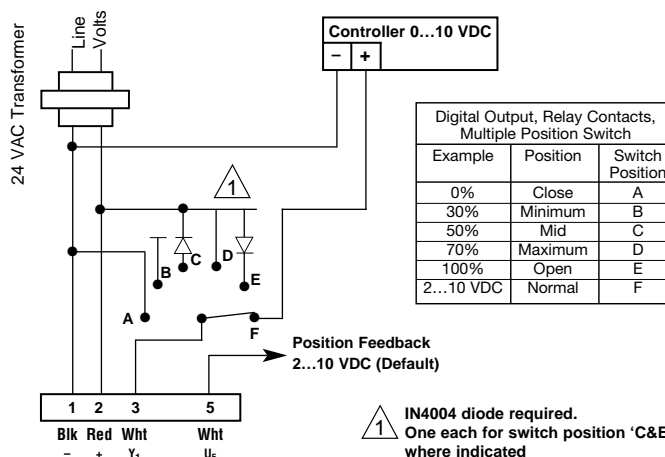
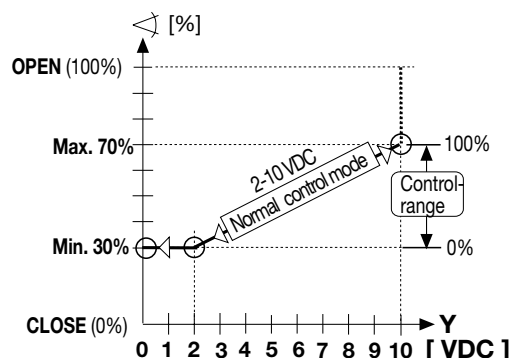


Actuator responds to a 175 mV signal when reversing direction from stop position.



Motion		
Specifications	Parameter Variables	Description
RUNNING TIME	AF / NF / LF	Running time is selectable allowing for customizing the actuator for the application at hand. Adjustable running time allows for: <ul style="list-style-type: none"> • Matching HVAC system sequence of operation. • Improving control loop stability. • Reducing actuating noise (slower running). • Retrofit applications
	GM	
	AM	
	NM	
	LM	The running time is constant and independent of load.
ROTATION	Direction of Rotation	The direction of rotation can be "Direct" or "Reverse" acting of the control signal. The direction of rotation is selected from a CW and CCW switch located on the actuator. An alternative method of changing the direction of rotation is to use the PC-Tool software. This option allows you to make remote set-up corrections without having the need to be at the actuator. Selection of the direction of rotation is only possible via the PC-Tool software or manually with the switch on the actuator. Selection via a preset configuration is not an option.
	Intermediate Position Control (Override Control)	All intermediate settings are adjustable from 0 to 100%. Programmed as default, these control positions are possible by using the wiring diagram in Figure 3. The override functions can be used as a means to test the actuator's functionality during equipment servicing or troubleshooting. Intermediate positions can also be integrated into the control circuit as a part of the sequence of operation. The Min, Mid, and Max positions can be used in any MFT control mode. <ul style="list-style-type: none"> • VDC: For stand-alone controllers where a minimum position is needed. • PWM: Eliminate add-on accessories. • Floating Point: New functionality to a common application. • On/Off: New functionality to a common application. <ul style="list-style-type: none"> – Satisfy combustion air requirements or boiler sequencing with O/A damper. – Eliminates secondary minimum position dampers.

Figure 3 - Forced Overrides

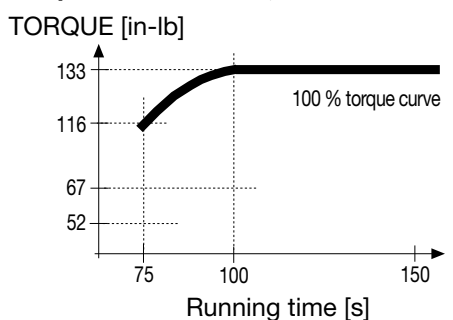


Motion

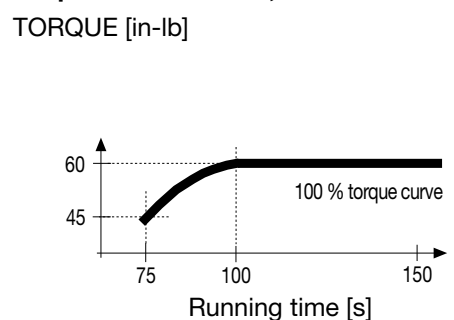
Specifications	Parameter Variables	Description
Adaptation	OFF	When the manual override button is depressed, and released, the actuator will perform synchronization. The actuator will simply drive to the mechanical zero position and return to its last control position.
	ON – Manual	<p>The default setting for adaptation is “ON – Manual”. When the ON-Manual setting is selected, adaptation is initiated by:</p> <ul style="list-style-type: none"> • Pressing the manual override button twice (GM / AM / NM / LM). • Clicking the manual override crank twice (AF). • Clicking the CW/CCW switch twice (NF and LF). <p>When adaptation is selected, (On-Manual or Automatic) the actuator will drive one full cycle to its mechanical end stops OR the valves mechanical seats. Upon completion of this cycle the actuators working range (input, feedback and running time) will be adapted to the actual mechanical angle of rotation.</p>
	ON – Automatic	When the ON-Automatic setting is selected at every power-up the actuator will automatically adapt to the mechanical angle of rotation. Also upon pressing the manual override button or CW/CCW switch, adaptation is initiated (See above).
Mechanical Relationship	Sound and Running Time	All Actuators As the speed of the actuator increases, there is an increase in the sound power level.
	Torque and Running Time	Spring Return (AF / NF / LF) Though the running time remains constant, at approximately the 100-second range there is a loss in output torque. This is due to the association of runtime to torque. To gain a faster running time there is a loss in torque. See figure 4

Figure 4

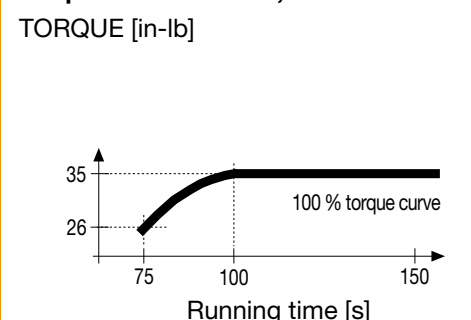
Torque and Run Time, AF24-MFT US



Torque and Run Time, NF24-MFT US



Torque and Run Time, LF24-MFT US



Service Specifications		
	Parameter Variables	Description
DISPLAYS	Identification	Serial Number
		Displays the actuators internal serial number. The serial number is also printed on a label at the side of the actuator.
	Actuator Type / Software Version	
	Displays the actuator nomenclature (AF24-MFT US) and MFT software version.	
	Assembly Location	
	Displays the where the actuator was assembled.	
	Setpoint	
	Displays the actual control input position as a percentage. As signal input changes you will see the setpoint percentage change accordingly.	
	Actual Values	Actual
	Displays the actual position as a percentage. As the setpoint changes the actual position percentage will increase or decrease accordingly. If the actuator is capable of rotating the damper or valve, this can be of benefit when troubleshooting an application.	
	Function	Control Type & Setting
		Displays the actual control type and operating range.
		Feedback Type & Setting
		Displays the actual feedback signal type and operating range.
		Torque % Setting
		Displays the actual torque setting.
		Running Time
		Displays the actual running time as programmed.
		Direction of Rotation
		Displays the status of the direction of rotation option (Normal or Reversed).
	Min, Mid, Max Position	
	Displays the actual position setting of the Intermediate position control. See page 270 for more details.	
	Adaptation	
	Displays the actual setting of the adaptation function (OFF, ON-Manual, ON-Automatic). See page 271 for more information.	
	Sensitivity / Hysteresis	
	Displays the actual setting of the sensitivity button (Normal or Reduced).	
	Synchronization	
	Displays the actual setting of the synchronization function (Normal, Sync at 0%, Sync at 100%).	
FUNCTIONS	Data Log	Total Time / Operating Time
		Total number of hours the actuator is connected to a power supply.
		Active Time
		Total number of hours the actuator is in mechanical motion.
		Stop / Go Ratio (Hunting %)
		Displays a percentage the total number of hours the actuator has spent in mechanical motion, comparing the total time to the active time.
	Sensitivity	Normal, Reduced
	Displays the setting of the sensitivity function. See page 268 for more information.	
	Messages	
	Displays all messages present. Messages can be deleted as well.	
	Function Test	
	This function enables you to check for complete opening and closing of the actuator.	
	The test report contains:	
	<ul style="list-style-type: none"> • Information on the Project • Identification on the Actuator • A list of fault messages pending before the start of the test • The test steps and results • The current actuator settings 	
	This is of benefit when troubleshooting an application, as the actuator will drive the damper or valve. This gives an opportunity to observe the installation to identify any possible problems.	
	Adaptation	See Adaptation on page 271.
	Initiates the adaptation feature of the MFT actuator. The actuators working range (input, feedback, and running time) will be adapted to the actual angle of rotation.	
	This is of benefit when troubleshooting an application, as the actuator will drive the damper or valve. This gives you an opportunity to observe the installation to identify any possible problems.	
	Synchronization	Normal
		At initial commissioning, when the manual override button is pressed, the actuator runs to a default position defined by the position of the CW/CCW direction of rotation switch.
		Sync at 0%
	At each power-up (includes power failures), the actuator runs to a default position defined by the position of the CW/CCW direction of rotation switch.	
	Sync at 100%	
	At each power-up (includes power failures), the actuator runs to a default position of the CW/CCW direction of rotation switch.	

ATTENTION

Please note the method of wiring multiple Belimo ...MFT US actuators to a single control shaft for damper and valve applications.

MFT= Master-Slave

Applications which require more torque than one actuator is a very common installation. The current Belimo solution is to mount multiple actuators onto the damper or valve. In the past this required the installer to wire the actuators in a "master-slave" arrangement. This was typical for the AF24-SR US actuator.

By adding more actuators you can effectively increase the torque proportional to the minimum specified torque times the number of actuators. This is a normal installation typically seen on the following installations.

- Large dampers or valves
- Large multiple section dampers
- Rack and Pinion style globe valves
- Ball or Butterfly valves

For retro-fit of an existing AF24-SR US which is wired in "Master-Slave", rewire the installation so the remaining AF24-SR US is now the "Master" and the new AF24-MFT US is the "Slave".

Multiple actuators mounted to one control shaft

Model	Max. Qty Per Shaft	Torque Generated
AF24-MFT(-S) US	4	532 in-lb
NF24-MFT(-S) US	1	60 in-lb
LF24-MFT(-S) US	1	35 in-lb
GMX24-MFT	2	720 in-lb
AMX24-MFT	1	180 in-lb
NMX24-MFT	1	90 in-lb
LMX24-MFT	1	45 in-lb

The wiring method for multiple actuators mounted to shafts which are **not** mechanically connecting other actuators is to wire the control signal in parallel with each actuator

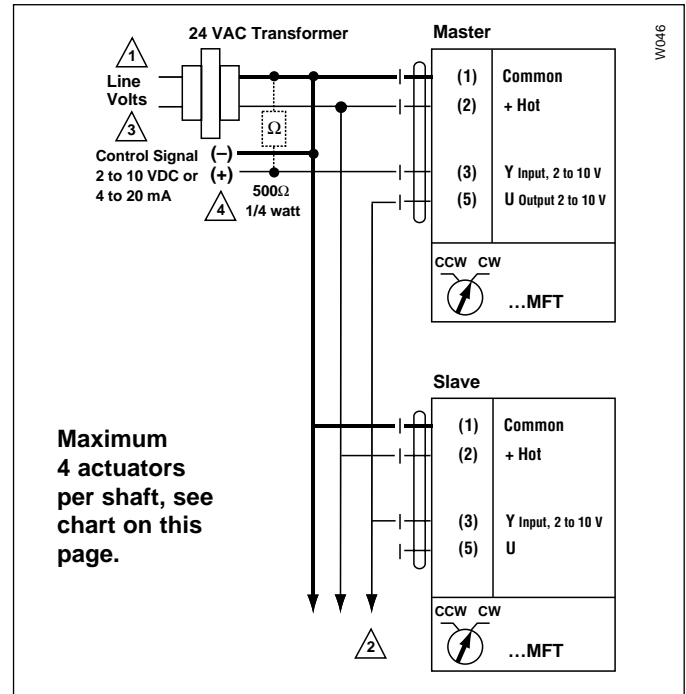
Multiple XM24-MFT95...

Exception: No mechanical dual mounting of AF24-MFT95 US is possible. Electrical parallel wiring of AF24-MFT95 US is possible only for mechanically separate applications.

Solution: For increased torque requirement use AF24-MFT95 US as a master and the slave must be an AF24-MFT US. The masters feedback must match the slaves input signal. (Both are default 2-10 VDC.)

Notes

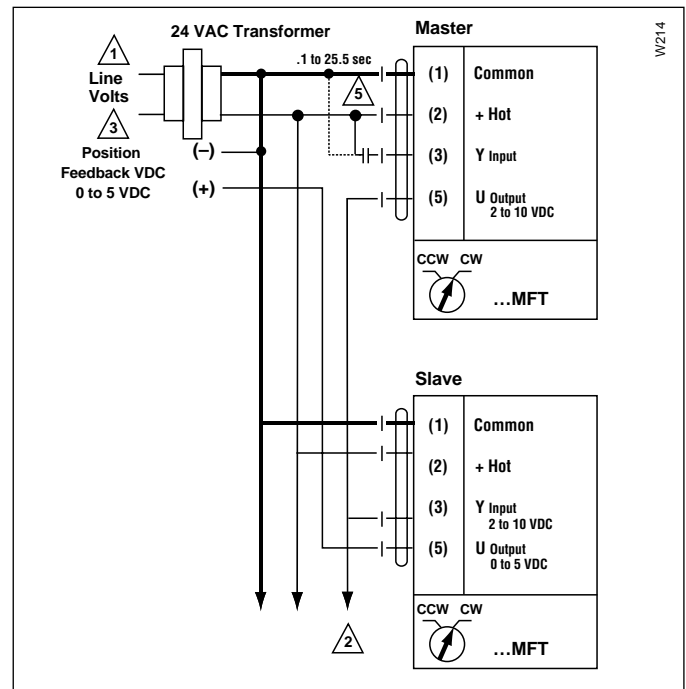
- 1 Provide overload protection and disconnect as required.
- 2 Actuators may be connected in parallel if not mechanically mounted to the same shaft. Power consumption and input impedance must be observed.
- 3 Actuator may also be powered by 24 VDC.
- 4 ZG-R01 may be used.
- 5 Control signal may be pulsed from either the Hot or Common 24 VAC line.



Wiring multiple ...MFT actuators to one shaft. All MFT actuators are wired in master-slave configuration.

Wiring of multiple ...MFT actuators on valves must be master-slave (wires 3-5).

MFT actuator configurations should also co-ordinate with each other. Meaning the master input = controllers output. Master output = slave input. Slave output = controller input.



Controller Output	Master Feedback	Slave Input	Slave Feedback
0.1 to 25.5 sec	2 to 10 VDC	2 to 10 VDC	0 to 5 VDC