

INTRODUCTION

This application guide provides you with information needed to select the actuator and, if necessary, select accessories needed for your application. The guide provides actuator sizing instructions and selection tables for:

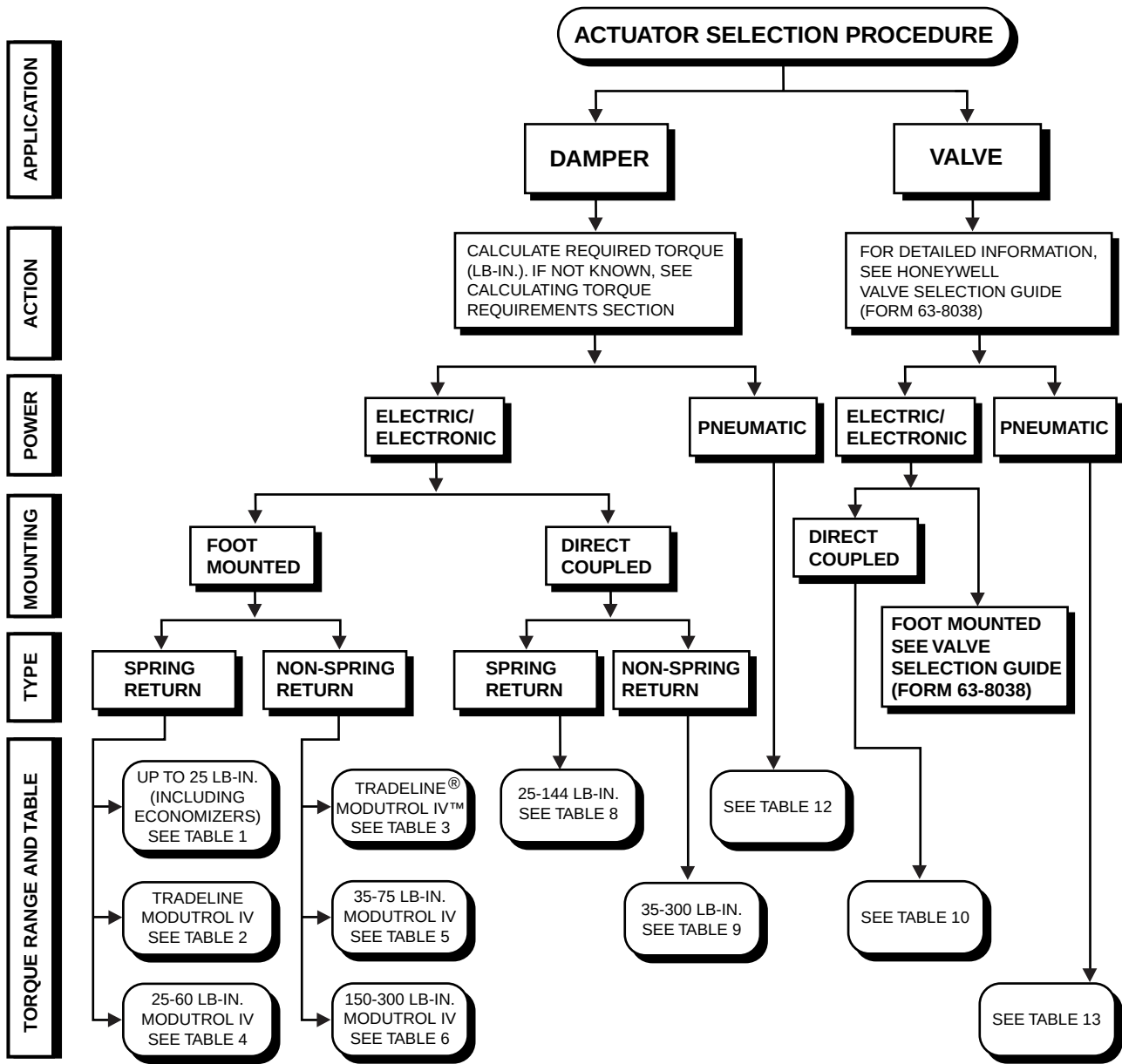
- Electric/electronic damper actuators.
- Pneumatic damper actuators.

NOTE: Information needed to select an actuator for a valve application is in the Valve Selection Guide (form 63-8038).

NOTE: For basic information on each family of actuators, see the Actuator Product Overview.

The Actuator Selection Guide has an outline of decisions and steps to select actuators.

Actuator Selection Procedure



M11573

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MOTOR/ACTUATOR PRODUCT OVERVIEW

For Dampers

Foot-mounted and Specialty

M436, M836 Two-position Spring Return Motors

Motor for residential and light commercial damper applications. Includes an adjustable single-pole, double-throw (spdt) auxiliary switch, a crankarm assembly, and a shaft coupling assembly.

Mounting: Foot-mounted or Direct Coupled

Torque:

M836B: 15 lb-in.

M836A, M436: 20 lb-in.

Stroke: 75°

Power:

M836: 24 Vac

M436: 120 Vac

Timing:

M836B: 25 sec

M836A, M436: 30 sec

Temperature Range: 32 to 125°F (0 to 52°C)

See page 16

M436, M836



M833 Two-position Actuator

Bimetal-driven actuator for residential damper applications.

Mounting: Direct Coupled

Torque: 6 lb-in.

Stroke: 90°

Power: 24 Vac

Timing: 18 min

Maximum Temperature:

Cooling applications: 140°F (60°C)

Heating applications: 85°F (29°C)

See page 16

M833



M835 Two-position Zone Motor

Controls the zone or changeover damper in heating or air-conditioning applications.

Mounting: Direct Coupled

Torque: 4 lb-in.

Stroke: 60°

Power: 24 Vac

Maximum Temperature:

Cooling applications: 140°F (60°C)

Heating applications: 200°F (93°C)

Timing:

Opening: 80 sec

Closing: 160 sec

See page 16

M835



M842 Two-position Actuator

Bimetal-driven actuator for damper applications requiring small force.

Mounting: Direct Coupled

Torque: 6 lb-in.

Stroke: 90°

Power: 24 Vac

Timing: 18 min

Temperature Range:

Cooling applications: 140°F (60°C)

Heating applications: 80°F (27°C)

See page 16

M842



M847 Two-position Spring Return Draft Actuator

Actuator to operate the draft damper on solid fuel furnaces or boilers.

Mounting: Foot-mounted

Torque: 30 oz-in.

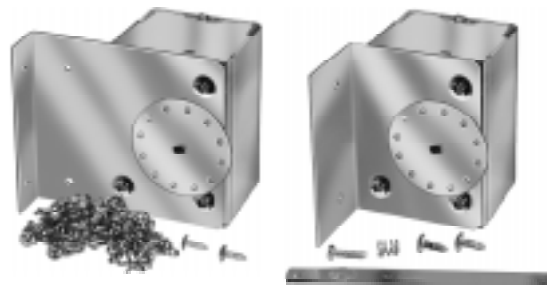
Stroke: 45°

Power: 24 Vac

Timing: 20 sec

Temperature Range: 40 to 125°F (4 to 52°C)

See page 16



M847



**M6415, M7405,
M7415, M8405,
M8415**

M6415, M7405, M7415, M8405, M8415 Spring Return Motors

Provide two-position (M8415), three-position (M8405), floating (M6415), or modulating (M7405, M7415) control of economizer systems, ventilation and combustion air dampers.

Mounting: Foot-mounted

Torque: 25 lb-in.

Stroke: 90°

Power: 24 Vac

Timing: 90 sec

Temperature Range: -25 to 125°F (-32 to 52°C)

See page 16



**M4185, M4186,
M8185, M6285,
M6286**

M4185, M4186, M8185 Two-Position Spring Return Modutrol IV™ Motors

Used to operate dampers or valves in applications where spring return upon power failure is necessary or desirable.

Mounting: Foot-mounted

Torque: 60 lb-in.

Power:

M8185: 24 Vac

M4185/M4186: 120 Vac

Temperature Range: -40 to 150°F (-40 to 67°C)

Stroke: 90°, 160°, and 90/160° (adjustable) models.

Timing:

90° stroke: 30 sec

160° stroke: 60 sec

See pages 16, 18

M6285, M6286 Floating Spring Return Modutrol IV™ Motors

Three-wire spdt floating control motors with an internal, electrically isolated feedback potentiometer. Use in damper or valve applications when spring return on power failure is necessary.

Mounting: Foot-mounted

Torque: 60 lb-in.

Stroke: 90° and 160° models.

Power: 24 Vac

Temperature Range: -40 to 150°F (-40 to 67°C)

Timing:

90° stroke: 30 sec

160° stroke: 60 sec

See pages 16, 18



**M6184, M6194,
M6284, M6294**

M6184, M6194 Floating Non-spring Return Modutrol IV™ Motors

Three-wire spdt floating control motors used with dampers or valves.

Mounting: Foot-mounted

Torque:

M6184: 150 lb-in.

M6194: 300 lb-in.

Power: 24 Vac

Temperature Range: -40 to 150°F (-40 to 67°C)

Stroke: 90°, 160°, and 90/160° (adjustable) models.

Timing:

M6184: 90° stroke: 15 sec and 30 sec models.

160° stroke: 30 sec and 60 sec models.

M6194: 90° stroke: 120 sec

160° stroke: 240 sec

See pages 17, 20

M6284, M6294 Floating Non-spring Return Modutrol IV™ Motors

Three-wire spdt floating control motors with an internal electrically isolated feedback potentiometer. Use with dampers or valves.

Mounting: Foot-mounted

Torque:

M6284: 150 lb-in.

M6294: 300 lb-in.

Power: 24 Vac

Temperature Range: -40 to 150°F (-40 to 67°C)

Stroke: 90°, 160°, and 90/160° (adjustable) models.

Timing:

M6284: 90° stroke: 30 sec

160° stroke: 60 sec

M6294: 90° stroke: 120 sec

160° stroke: 240 sec

See pages 17, 20

Overview: Foot-mounted and Specialty Damper Actuators

M7164 Modulating Non-spring Return Modutrol IV™ Motor

Proportioning control motors for damper or valve applications with a modulating 10.5 to 13.5 Vdc input.

Mounting: Foot-mounted

Torque: 35 lb-in.

Stroke: 90°

Power:

M7164A: 24 Vac

M7164G: 120 Vac

Timing: 30 sec

Temperature Range: -40 to 150°F (-40 to 67°C)

See page 19

**M7164, M7274,
M7284, M7294,
M7364, M7384**



M7274, M7284, M7294 Modulating Non-spring Return Modutrol IV™ Motors

Proportioning control motors for damper or valve applications with a modulating 2 to 10 Vdc or 4 to 20 mA input.

Mounting: Foot-mounted

Torque:

M7274: 75 lb-in.

M7284: 150 lb-in.

M7294: 300 lb-in.

Power: 24 Vac and 120 Vac models.

Stroke: 90° and 160° models.

Temperature Range: -40 to 150°F (-40 to 67°C)

Timing:

M7274: 160° stroke: 60 sec

M7284: 90° stroke: 30 sec

160° stroke: 60 sec

M7294: 160° stroke: 120 sec

See pages 19, 20, 21

M7364, M7384 Modulating Non-spring Return Modutrol IV™ Motors

Proportioning control motors for damper or valve applications with a W936, or W945 control input.

Mounting: Foot-mounted

Torque:

M7364: 35 lb-in.

M7384: 150 lb-in.

Stroke:

M7364: 160°

M7384: 90°

Temperature Range: -40 to 150°F (-40 to 67°C)

Power: 24 Vac and 120 Vac models.

Timing:

90° stroke: 30 sec

160° stroke: 60 sec

See pages 19, 20

M7185, M7186 Modulating Spring Return Modutrol IV™ Motor

Proportioning control motors for damper or valve applications with a modulating 4 to 7 Vdc input.

Mounting: Foot-mounted

Torque: 60 lb-in.

Stroke: 160°

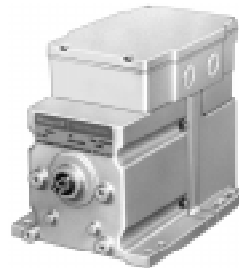
Power: 24 Vac

Timing: 60 sec

Temperature Range: -40 to 150°F (-40 to 67°C)

See page 18

**M7185, M7186,
M7285, M7286**



M7285, M7286 Modulating Spring Return Modutrol IV™ Motor

Proportioning control motors for damper or valve applications with a modulating 2 to 10 Vdc or 4 to 20 mA input.

Mounting: Foot-mounted

Torque: 60 lb-in.

Stroke: 90° and 160° models.

Temperature Range: -40 to 150°F (-40 to 67°C)

Power: 24 Vac and 120 Vac models.

Timing:

90° stroke: 30 sec

160° stroke: 60 sec

See page 18



**M7385, M7685,
M9185, M9186**

M7385, M7685 Modulating Spring Return Modutrol IV™ Motor

Proportioning control motors for damper or valve applications with a modulating 14 to 17 Vdc or W936 control input.

Mounting: Foot-mounted
Torque: 60 lb-in. Stroke: 160°
Power: 24 Vac Timing: 60 sec
Temperature Range: -40 to 150°F (-40 to 67°C)
See page 18

M9185, M9186 Modulating Spring Return Modutrol IV™ Motor

Reversing proportioning control motors for damper or valve applications with Series 90 control input.

Mounting: Foot-mounted
Torque: 60 lb-in. Stroke: 90° and 160° models.
Power: 24 Vac
Timing:
90° stroke: 30 sec 160° stroke: 60 sec
Temperature Range: -40 to 150°F (-40 to 67°C)
See pages 16, 18



**M9164, M9174,
M9184, M9194**

M9164, M9174, M9184, M9194 Modulating Non-spring Return Modutrol IV™ Motors

Reversing proportioning control motors for damper or valve applications with Series 90 control input.

Mounting: Foot-mounted
Power:
M9164: 24, 120, 220, and 240 Vac models.
M9174: 24 Vac and 120 Vac models.
M9184, M9194: 24 Vac
Stroke: 90°, 160°, and 90/160° (adjustable) models.
Temperature Range: -40 to 150°F (-40 to 67°C)
Torque:
M9164: 35 lb-in. M9174: 75 lb-in.
M9184: 150 lb-in. M9194: 300 lb-in.
Timing:
M9164: 90° stroke: 30 sec 160° stroke: 60 sec
M9174: 160° stroke: 60 sec
M9184: 90° stroke: 15 sec and 30 sec models.
160° stroke: 30 sec and 60 sec models.
M9194: 90° stroke: 120 sec 160° stroke: 240 sec
See pages 17, 19, 20, 21

Direct Coupled

Spring Return

ML6175, ML6185, ML6275, ML6285, ML7275, ML7285, ML8175, ML8185, ML9175, ML9185 Spring Return Direct Coupled Actuators

Designed for control of building HVAC dampers. Suitable for use with two-position (ML8175, ML8185), floating spdt (ML6175, ML6185), floating spdt with an internal feedback potentiometer (ML6275, ML6285), electronic modulating (ML7275, ML7285), or electronic Series 90 (ML9175, ML9185) systems.

Mounting: Direct Coupled

Stroke: 95°

Power: 24 Vac

Timing: 88 sec at 60 Hz, 106 sec at 50 Hz

Temperature Range: -30 to 140°F (-34 to 60°C)

Torque:

ML6175, ML6275, ML7275, ML8175, ML9175: 25 lb-in.

ML6185, ML6285, ML7285, ML8185, ML9185: 50 lb-in.

See page 24

**ML6175, ML6185, ML6275,
ML6285, ML7275, ML7285,
ML8175, ML8185, ML9175,
ML9185**



ML4465, ML8465, ML7475 Spring Return Direct Coupled Actuators

Designed for control of building Heating Ventilating and Air Conditioning (HVAC) dampers. Suitable for use with two-position spdt (ML4465, ML8465) or electronic modulating (ML7475) systems.

Mounting: Direct Coupled

Torque: 105 lb-in.

Stroke: 90°

Power:

ML8465, ML7475: 24 Vac

ML4465: 115 Vac

Timing: 70 sec

Temperature Range: -22 to 122°F (-30 to 50°C)

See page 24

**ML4465, ML8465,
ML7475**



ML4195, ML6195, ML6295, ML7295, ML8195 Spring Return

Direct Coupled Actuator

Designed for control of building HVAC dampers. Suitable for use with two-position (ML4195, ML8195), floating spdt (ML6195), floating spdt with an internal feedback potentiometer (ML6295), or electronic modulating (ML7295) systems.

Mounting: Direct Coupled

Torque: 144 lb-in.

Stroke: 90°

Timing: 90 sec

Temperature Range: -22 to 130°F (-30 to 54°C)

Power:

ML6195, ML6295, ML7295, ML8195: 24 Vac

ML4195: 115 Vac

See page 25

**ML4195, ML6195,
ML6295, ML7295,
ML8195**



Non-Spring Return



ML6161

ML6161, ML7161 Non-spring Return Direct Coupled Actuators

Used to control dampers in applications such as Variable Air Volume (VAV) terminal units. Suitable for use with floating spdt (ML6161), or electronic modulating systems (ML7161).

Mounting: Direct Coupled

Torque: 35 lb-in.

Power: 24 Vac

Temperature Range: 32 to 130°F (0 to 54°C)

Stroke: Selectable 45°, 60°, and 90° clockwise or counterclockwise.

Timing:

ML6161: 90 sec, 3 min, and 7 min models.

ML7161: 90 sec

See page 25



ML7174

ML6174, ML7174 Non-spring Return Direct Coupled Actuators

Used to control dampers in applications such as VAV terminal units. Suitable for use with floating spdt (ML6174), or electronic modulating systems (ML7174).

Mounting: Direct Coupled

Torque: 70 lb-in.

Power: 24 Vac

Temperature Range: 20 to 125°F (-7 to 52°C)

Stroke: Selectable 45°, 60°, and 90° clockwise or counterclockwise.

Timing:

ML6174: 90 sec, 3 min, and 7 min models.

ML7174: 90 sec

See page 26



**ML6184, ML6284,
ML7284, ML9184**

ML6184, ML6284, ML7284, ML9184 Non-spring Return Direct Coupled Actuators

Designed for control of building HVAC dampers. Suitable for use with floating spdt (ML6184), floating spdt with an internal feedback potentiometer (ML6284), electronic modulating (ML7284), or electronic Series 90 systems (ML9184).

Mounting: Direct Coupled

Torque: 150 lb-in.

Stroke: 95°

Power: 24 Vac

Timing: 92 sec

Temperature Range: -20 to 140°F (-29 to 60°C)

See page 26



**ML6194, ML6294,
ML7294, ML9194,**

ML6194, ML6294, ML7294, ML9194 Non-spring Return Direct Coupled Actuators

Designed for control of dampers in HVAC applications. Suitable for use with floating spdt (ML6194, ML6294), or electronic modulating (ML7294) or Series 90 systems (ML9194).

Mounting: Direct Coupled

Torque: 300 lb-in.

Stroke: 95°

Power: 24 Vac

Timing: 165 sec

Temperature Range: -40 to 140°F (-40 to 60°C)

See page 26

Overview: Pneumatic Damper Actuators

Pneumatic

MP516 Pneumatic Unit Ventilator Actuator

Sturdy, compact, rolling diaphragm pneumatic damper actuator.

Mounting: Foot mounted

Stroke: 2-1/4 in.

Diaphragm: 11 sq in.

Available Spring Ranges:

3-12 psi

4-8 psi

5-12 psi

Temperature Range: -20 to 160°F (-29 to 71°C)

See page 33



MP516

MP909A Pneumatic Actuator

Proportionally controls dampers in air terminal units, fan coil units, and unit ventilators.

Aluminum body, piston-type, rolling diaphragm pneumatic damper actuator.

Recommended for Direct Replacement only. (For new and retrofit, use MP909D).

Mounting: Foot mounted

Stroke: 3-1/2 in.

Diaphragm: 2.82 sq in.

Available Spring Ranges:

2-7 psi

3-13 psi

5-10 psi

7-13 psi

Temperature Range: -20 to 106°F (-29 to 41°C)

See page 32



MP909A

MP909D Pneumatic Actuator

Provides proportional control of VAV terminal units, mixing boxes and small dampers.

Pneumatic damper actuator with aluminum body and barb connector.

Mounting: Foot mounted

Stroke:

2.38 in.

3 in.

Diaphragm: 3 sq in.

Available Spring Ranges:

3-8 psi

5-10 psi

8-13 psi

Temperature Range: 50 to 140°F (10 to 60°C)

See page 32



MP909D

MP909E and H Pneumatic Actuators

Provide proportional control of dampers, VAV terminal units, and mixing boxes. Models

available for use with UL classified leakage rated (smoke) dampers. MP909H includes

positive positioner.

Mounting: Trunnion and right angle bracket.

Stroke:

3.1 in.

4 in.

Diaphragm: 6.6 sq in.

Available Spring Ranges:

2.5-6.5 psi

3-13 psi

5-10 psi

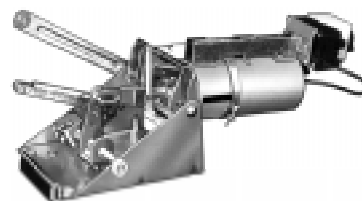
9-13 psi

Temperature Range:

MP909E: -28 to 160°F (-33 to 71°C)

MP909H: -20 to 160°F (-29 to 71°C) (limited by positioner)

See page 32



MP909E,H

**MP913****MP913 Pneumatic Actuator**

Provides proportional control of dampers, VAV dampers, and high velocity mixing boxes.

Mounting:

Flat bracket

Angle bracket

No bracket

Stroke: 1 in.

Diaphragm: 2.82 sq in.

Available Spring Ranges:

5-10 psi

10-15 psi

Temperature Range: 50 to 140°F (10 to 60°C)

See page 32

**MP918A,B****MP918A and B Pneumatic Actuators**

Provide proportional control of dampers. Models available for use with UL classified leakage rated (smoke) dampers.

MP918A includes positive positioner.

Mounting: Models available with various types of mounting hardware.

Stroke: 3.5 in.

Diaphragm: 23.8 sq in.

Available Spring Ranges:

3-7 psi

3-13 psi

5-10 psi

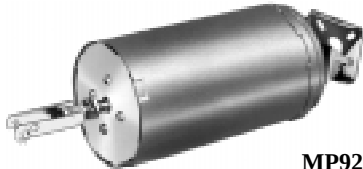
8-13 psi

Temperature Range:

MP918A: -20 to 160°F (-29 to 71°C)

MP918B: -40 to 160°F (-40 to 71°C)

See page 33

**MP920****MP920 Pneumatic Actuator**

Suitable for fan inlet vane control applications in a VAV system. Includes positive positioner.

Mounting: Swivel mount from either end to a pipe, floor, or wall surface.

Stroke: 6 in.

Diaphragm: 24.8 sq in.

Spring Range: 7-13 psi

Temperature Range: -20 to 158°F (-29 to 70°C)

See page 33

For Valves Electric/Electronic

V2045 Non-spring Return Direct Coupled Actuator

Provides two-position control of the V5045 Valve. Can be operated manually.

Mounting: Direct Coupled

Power: 24 Vac

Stroke: 1/4 to 3/8 in.

See page 27

Temperature Range: 32 to 125°F (0 to 52°C)

V5045



M6410, M7410 Non-spring Return Direct Coupled Actuators

Used to control V5852, V5853, V5862, and V5863 Valves. Suitable for use with floating spdt (M6410), or electronic modulating systems (M7410).

Mounting: Direct Coupled

Stem Force: 40.5 lb

Power: 24 Vac

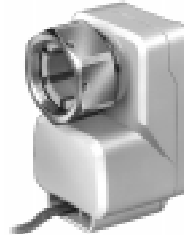
Temperature Range: 32 to 140°F (0 to 60°C)

Stroke: 1/4 in.

Timing: 125 seconds

See page 27

M6410



M7410



ML684, ML7984 Non-spring Return Direct Coupled Actuators

Used to control V5011 or V5013 Valves. Suitable for use with electronic modulating (ML7984 only), two-position, floating spdt, or Series 90 systems.

Mounting: Direct Coupled

Stem Force: 160 lb

Power: 24 Vac

Temperature Range: 32 to 130°F (0 to 54°C)

Stroke: Up to 3/4 in.

Timing: 60 seconds

See page 27

ML684, ML7984



ML6421, ML7421 Non-spring Return Direct Coupled Actuators

Used to control standard Honeywell valves in HVAC applications. Suitable for use with two-position or floating spdt (ML6421) or electronic modulating systems (ML7421). Can be operated manually.

Mounting: Direct Coupled

Stem Force: 405 lb

Power: 24 Vac

Stroke:

ML6421A, ML7421A: 3/4 in.

ML6421B, ML7421B: 1-1/2 in.

Timing:

ML6421A, ML7421A: 95 seconds

ML6421B, ML7421B: 175 seconds

Temperature Range: 14 to 122°F (-10 to 50°C)

See page 27

ML6421, ML7421



ML6425, ML7425 Spring Return Direct Coupled Actuators

Used to control standard Honeywell valves in HVAC applications. Suitable for use with two-position or floating spdt (ML6421) or electronic modulating systems (ML7421).

Mounting: Direct Coupled

Stem Force: 135 lb

Power: 24 Vac

Stroke: 3/4 in.

Timing: 90 seconds

Temperature Range: 14 to 122°F (-10 to 50°C)

See page 27

ML6425, ML7425





MP953C
Without Positioner

MP953F
With Positioner



Pneumatic

MP953 Pneumatic Direct Coupled Actuator

Sturdy rolling diaphragm pneumatic valve actuator. Available with or without positive positioner.

Mounting: Direct Coupled

Stroke: 3/4 or 1-1/2 in.

Diaphragm:

MP953C, E: 5, 8, or 13 sq in.

MP953D, F: 7-1/8 sq in.

Available Spring Ranges:

MP953C, D: 2 – 7, 4 – 11, or 8 – 12 psi

MP953E, F: 3, 5, or 10 psi span

Action:

MP953C, E: Direct acting

MP953D, F: Reverse acting

Temperature Range: 0 to 140°F (0 to 60°C)

See page 34



MP958

MP958 Pneumatic Direct Acting Direct Coupled Actuator

Pneumatic actuator for use with V5852, V5862, V5853, and V5863 Valves.

Mounting: Direct Coupled

Maximum Diaphragm Temperature: 250°F (121°C)

Available Spring Ranges:

2-5 psi

3-10 psi

8-11 psi

See page 34

OUTPUT DRIVE			
	ROTATION	ACTION	SHAFT
4		NON-SPRING RETURN	DUAL- ENDED SHAFT
5	N.C.	SPRING RETURN	
6	N.O.		
1		NON-SPRING RETURN	SINGLE ENDED SHAFT
2	N.C.	SPRING RETURN	
3	N.O.		

SPECIFICATION NUMBER
FURTHER IDENTIFIES MOTOR

CONTROL SERIES (FIRST TWO DIDGITS)	
41	SERIES 40, TWO-POSITION, LINE VOLTAGE
61	SERIES 60, FLOATING CONTROL
62	SERIES 60, FLOATING WITH FEEDBACK POTENTIOMETER
71	4-7, 6-9, 10.5-13.5 VDC CONTROL
72	4-20 MA OR 2-10 VDC CONTROL
73	W936 CONTROL
76	14-17 VDC WITH MINIMUM POSITION
79	SPECIALS
81	SERIES 80, TWO-POSITION, LOW VOLTAGE
91	SERIES 90, PROPORTIONING CONTROL
94	PROPORTIONAL FLAME SAFEGUARD FIRING RATE MOTOR

TORQUE DESIGNATION		
	TORQUE	
	SPRING RETURN	NON-SPRING RETURN
6	————	35 LB-IN.
7	25 LB-IN.	75 LB-IN.
8	60 LB-IN.	150 LB-IN.
9	————	300 LB-IN.

SUFFIX LETTER						
APPLIES TO ALL MODELS EXCEPT SERIES 79						
NUMBER OF AUX. SWITCHES			SPECIAL FUNCTION	STROKE	ELECTRICAL ROTATION	
1	2	3				
A	B	C	STANDARD	FIXED	N.C.	
—	—	Q	ADJ. ZERO AND SPAN			
D	E	F	STANDARD	ADJUSTABLE	N.O.	
G	H	J	STANDARD	FIXED		
K	L	M	STANDARD	ADJUSTABLE		

M11574

OUTPUT DRIVE	
1	NON-SPRING RETURN
4	
5	SPRING RETURN

SPECIFIC MODEL EXTENSION
FURTHER IDENTIFIES MOTOR; FOR EXAMPLE: 2XXX = INDICATES INTEGRATED DECLUTCH

CONTROL SERIES (FIRST TWO DIGITS)	
41,44	SERIES 40, TWO-POSITION, LINE VOLTAGE
61	SERIES 60, FLOATING CONTROL
62	SERIES 60, FLOATING WITH FEEDBACK POTENTIOMETER
71	2-10 Vdc, AND 4-20 mA
72	2-10 Vdc, 0-10 Vdc, OR 4-20 mA WITH FEEDBACK
74	2-10 Vdc OR 0-10 Vdc,
81,84	SERIES 80, TWO-POSITION, LOW VOLTAGE
91	SERIES 90, PROPORTIONING CONTROL

TORQUE		
	SPRING RETURN	NON-SPRING RETURN
6	105 LB-IN. ^a	35 LB-IN.
7	25 LB-IN.	70 LB-IN.
8	50 LB-IN.	150 LB-IN.
9	144 LB-IN. ^b	300 LB-IN.

SUFFIX LETTER							ADDED FEATURES
B			A ⁰ C ^C	D			
A	C	D	F			H	
	X		X			X	AUXILIARY SWITCH
		X	X				TIMEOUT
						X	ADJ. ZERO AND SPAN
				X	X		CONDUIT CONNECTOR

M11575

CALCULATING TORQUE REQUIREMENTS

See Appendices A and B to determine the minimum torque requirements for your damper application.

Appendix A: Determining damper actuator torque requirements, including tables for Honeywell dampers.

Appendix B: Determining damper actuator torque requirements when using a non-Honeywell damper.

NOTE: If you require torque information for valve actuator sizing, refer to the Honeywell Valve Selection Guide, form 63-8038.

Things to Think About When Selecting a Damper Actuator

Actuator torque is standard; for example, compare two foot-mounted actuators from different manufacturers. If they are both rated for 50 pound-inches of torque at the same temperature, they both provide 50 pound-inches of torque.

NOTE: Damper actuator torque requirements in Appendix A resulted from Honeywell Inc. testing and apply only to the Honeywell Inc. dampers listed. Damper torque requirements in Appendix B follow industry averages of manufacturers' published figures and can be used as a guide.

IMPORTANT

Whenever possible, refer to the manufacturers' published specifications for size and torque requirements.

ELECTRIC/ELECTRONIC ACTUATORS

Foot-Mounted Actuators

Tables 1 through 6 provide listings for foot-mounted actuators with torque ratings ranging from less than 25 lb-in. through 300 lb-in. Fourteen TRADELINE® Modutrol™ IV Motors and accessories can be configured to replace all previous Honeywell Modutrol® motors and most OEM Modutrol motors. These motors are listed in Tables 2 and 3 and in italicized type in Tables 4 through 6. See the Modutrol IV Motor Order Number Guide for a breakdown of the Modutrol IV Motor part numbering system.

Foot-Mounted Actuator Accessories

Table 7 lists the accessories for the foot-mounted actuators listed in Tables 1 through 6.

Direct Coupled Actuators

Direct coupled damper actuators connect directly to the damper shaft and need no linkages or connecting accessories.

Table 8 lists the spring return direct coupled damper actuators and Table 9 lists the non-spring return direct coupled damper actuators. Direct coupled valve actuators are listed in Table 10.

Direct Coupled Actuator Accessories

Table 11 lists accessories available for direct coupled actuators.

PNEUMATIC ACTUATORS

Pneumatic actuators provide proportional control of air, steam or hot or cold liquids in HVAC systems by controlling dampers or valves. Table 12 lists pneumatic damper actuators. Table 13 lists pneumatic valve actuators. Table 14 lists pneumatic actuator accessories.

TABLE 1. LOW TORQUE/SPECIALTY (UP TO 25 LB-IN) SPRING RETURN FOOT-MOUNTED ACTUATORS.

Torque (lb-in.)	Power (volts)	Stroke (degrees)	Timing (sec)	CONTROL SIGNAL					Model	Comments
				On/Off spst	Floating spdt	4 to 20 mA	2 to 10 Vdc	6 to 9 Vdc		
30 oz-in.	24 Vac	45	20	■					M847A1072	Arm linkage (3.8 in.)
									M847A1080	Chain linkage (38 in.)
4		60	80	■					M835A1051	—
6		90	18 min	■					M833A1007	Heat actuated, direct coupled
									M842A1008	Thermally driven, direct coupled
15		75	25	■					M836B1033	Can be mounted as direct coupled
20			30	■					M836A1042	
				■					M436A1116	
				■					M436A1124	
				■					M436A1124	
25		90	90		■				M6415A1016 ^a	Spring return cw.
					b	c	d	e	M7405A1016 ^a	Spring return cw.
									M7415A1006 ^a	Spring return cw.
									M7415B1004 ^a	Spring return ccw.
				f					M8405A1006 ^a	Spring return cw.
				■					M8415A1004 ^a	

■ Primary interface, no additional components needed.

^a Economizers available.

OPTIONAL ACCESSORIES:

^b Sensor-controller floating motor.

^c Use Q769B 4-20 mA adapter.

^d Use Q769C 0-10 Vdc adapter or 2-10 Vdc adjustable adapter.

^e Use Q769A 6-9 Vdc adapter.

^f Three-position, with field-adjustable minimum position control.

TABLE 2. TRADELINE® MODUTROL IV™ SPRING RETURN FOOT-MOUNTED ACTUATORS.

Torque (lb-in.)	Power (volts)	Control Mode	Stroke (degrees)	Timing (sec)	Adapter Bracket	CONTROL SIGNAL										Modutrol IV OS Number	Comments
						On/Off spst	Floating spdt	135 ohm	4 to 20 mA	2 to 10 Vdc	4 to 7 Vdc	6 to 9 Vdc	10.5 to 13.5 Vdc	14 to 17 Vdc	W936		
25	24	Series 90	90/160	30/60	Yes			■	ab	a	c	c	c	d	e	M9175D1014	—
60		Series 62	90	30			■									M6285A1013	With auxiliary feedback potentiometer.
			160	60			■									M6285A1005	
		Series 80	90/160	30/60		■										M8185D1006	—
		Series 90						■	ab	a	c	c	c	d	e	M9185D1004	

■ Primary interface, no additional hardware required.

OPTIONAL ACCESSORIES:

^a Use Q7230A1005 Interface Module (4 to 20 mA or 2 to 10 Vdc).

^b Use 4074EED Resistor Kit or 221508A Resistor Board.

^c Use Q7130A1006 Interface Module (4-7, 6-9, 10.5-13.5 Vdc).

^d Use Q7630A1001 Interface Module (14-17 Vdc).

^e Use Q7330A1004 Interface Module (W936 Control).

TABLE 3. TRADELINE® MODUTROL IV™ NON-SPRING RETURN FOOT-MOUNTED ACTUATORS.

Torque (lb-in.)	Power (volts)	Control Mode	Stroke (degrees)	Timing (sec)	220738A Adapter Bracket	CONTROL SIGNAL										Tradeline® Modutrol IV OS Number	Comments
						On/Off spst	Floating spdt	135 ohm	4 to 20 mA	2 to 10 Vdc	4 to 7 Vdc	6 to 9 Vdc	10.5 to 13.5 Vdc	14 to 17 Vdc	W936		
35	24	Series 90	90/160	30/60	Yes			■	ab	a	c	c	c	d	e	M9164D1009	—
75							■	ab	a	c	c	c	d	e	M9174D1007		
150		Series 60					■								M6184D1035		
		Series 62					■								M6284D1000	With auxiliary feedback potentiometer.	
300		Series 90						■	ab	a	c	c	c	d	e	M9184D1013	—
											M9184D1021	Tapped auxiliary shaft.					
	Series 60	120/240		■								M6194D1017	—				
	Series 62			■							M6294D1008	With auxiliary feedback potentiometer.					
	Series 90				■	ab	a	c	c	c	d	e	M9194D1003	—			

■ Primary interface, no additional hardware required.

OPTIONAL ACCESSORIES:

- ^a Use Q7230A1005 Interface Module (4 to 20 mA or 2 to 10 Vdc).
- ^b Use 4074EED Resistor Kit or 221508A Resistor Board.
- ^c Use Q7130A1006 Interface Module (4-7, 6-9, 10.5-13.5 Vdc).
- ^d Use Q7630A1001 Interface Module (14-17 Vdc).
- ^e Use Q7330A1004 Interface Module (W936 Control).

NOTE: Fourteen TRADELINE® Modutrol IV™ Motors and accessories can be configured to replace all previous Honeywell Modutrol® Motors, and most OEM Modutrol Motors. These motors are listed in italicized type in Table 4 and in Tables 5 and 6.

TABLE 4. 25-60 LB-IN. SPRING RETURN FOOT-MOUNTED MODUTROL IV ACTUATORS.

Torque (lb-in.)	Power (volts)	Control Mode	Stroke (degrees)	Timing (sec)	Aux Switch	220738A Adapter Bracket	CONTROL SIGNAL										Modutrol IV OS Number	Comments				
							On/ Off spst	Floating spdt	135 ohm	4 to 20 mA	2 to 10 Vdc	4 to 7 Vdc	6 to 9 Vdc	10.5 to 13.5 Vdc	14 to 17 Vdc	W936						
25	24	Series 90	90/160	30/60	—	Yes			■	ab	a	c	c	c	d	e	M9175D1014	TRADELINE®				
	No							■	ab	a	c	c	c	d	e	M9175D1006	—					
60	24	Series 80	90/160	30/60	—	Yes	■										M8185D1006	TRADELINE®				
			160	60		No	■									M8185A1002	—					
		Series 62	90	30	—	Yes		■									M6285A1013	TRADELINE® with auxiliary feedback potentiometer.				
			160	60				■								M6285A1005						
		—	—	—	No		■										M6286G1001	Normally open, with auxiliary feedback potentiometer.				
							■										M6285C1001	With auxiliary feedback potentiometer.				
						2		■														
		Series 90	90	30	—	No				■	ab	a	c	c	c	d	e	M9185A1026	—			
			90/160	30/60	—	Yes				■	ab	a	c	c	c	d	e	M9185D1004	TRADELINE®			
		—	—	—	No					■	ab	a	c	c	c	d	e	M9185E1019	—			
										■	ab	a	c	c	c	d	e	M9185A1018				
		—	—	—	—	—	—				■	ab	a	c	c	c	d	e	M9186G1006	Normally open.		
											■	ab	a	c	c	c	d	e	M9185C1006	—		
		2-10 Vdc	—	—	—	—	—						■						M7285A1045			
																				M7286G1009	Normally open.	
		4-7 Vdc	—	—	—	—	—							■					M7185A1004	—		
																				M7186G1000	Normally open.	
		14-17 Vdc	—	—	—	—	—										■		M7685A1009	—		
		W936	—	—	—	—	—											■	M7385A1010	W936, W945 Control.		
		120	120	Series 40	160	60	—	No	■											M4185A1001	—	
						1	■													M4185B1009		
4-20 mA	90			30	—														M4186H1005	Normally open.		
				2						■									M7285A1003	With screw terminals.		
—	160			60	—															M7285C1009		
				2							■									M7285Q1008	With screw terminals, adjustable null/span.	
—	—			—	—	—														M7285A1011	With screw terminals.	
																						M7285C1017
—	—			—	—	—															M7285Q1016	With screw terminals, adjustable null/span.
Multi	Series 40	90	30	1	■													M4185B1058	—			
		160	60		■												M4185B1017					

■ Primary interface, no additional hardware required.

OPTIONAL ACCESSORIES:

- ^a Use Q7230A1005 Interface Module (4 to 20 mA or 2 to 10 Vdc).
- ^b Use 4074EED Resistor Kit or 221508A Resistor Board.
- ^c Use Q7130A1006 Interface Module (4-7, 6-9, 10.5-13.5 Vdc).
- ^d Use Q7630A1001 Interface Module (14-17 Vdc).
- ^e Use Q7330A1004 Interface Module (W936 Control).

NOTE: Fourteen TRADELINE® Modutrol IV™ Motors and accessories can be configured to replace all previous Honeywell Modutrol® Motors, and most OEM Modutrol Motors. These motors are listed in italicized type in Table 5 and in Tables 4 and 6.

TABLE 5. 35-75 LB-IN. NON-SPRING RETURN FOOT-MOUNTED MODUTROL IV ACTUATORS.

Torque (lb-in.)	Power (volts)	Control Mode	Stroke (degrees)	Timing (sec)	Aux Switch	220738A Adapter Bracket	CONTROL SIGNAL										Modutrol IV OS Number	Comments
							On/ Off spst	Floating spdt	135 ohm	4 to 20 mA	2 to 10 Vdc	4 to 7 Vdc	6 to 9 Vdc	10.5 to 13.5 Vdc	14 to 17 Vdc	W936		
35	24	10.5 - 13.5V	90	30	—	No								■			M7164A1017	—
		Series 90	90/160	30/60		Yes			■	ab	a	c	c	c	d	e	M9164A1120	
									■	ab	a	c	c	c	d	e	M9164D1009	TRADELINE®
			160	60		No			■	ab	a	c	c	c	d	e	M9164A1070	—
									■	ab	a	c	c	c	d	e	M9164C1001	
		W936			2									■	M7364A1023			
					—										■	M7364A1023	W936, W945 Control.	
	120	Series 90	90	30	—	No			■	ab	a	c	c	c	d	e	M9164A1005	—
			160	60	2				■	ab	a	c	c	c	d	e	M9164C1068	
					—				■	ab	a	c	c	c	d	e	M9164A1021	
					2				■	ab	a	c	c	c	d	e	M9164C1050	
		10.5 - 13.5V	90	30	—									■			M7164G1030	Normally open.
							W936											
		220	Series 90	160	60					■	ab	a	c	c	c	d	e	M9164A1088
	240							■	ab	a	c	c	c	d	e	M9164A1013		
75	24	Series 90	90/160	30/60	—	Yes			■	ab	a	c	c	c	d	e	M9174D1007	TRADELINE®
		2-10 Vdc	160	60		No					■					M7274A1006	—	
	120	Series 90	90	30	1				■	ab	a	c	c	c	d	e	M9174B1027	—
			160	60	2				■	ab	a	c	c	c	d	e	M9174C1025	
					1				■	ab	a	c	c	c	d	e	M9174B1043	
					2				■	ab	a	c	c	c	d	e	M9174C1033	

■ Primary interface, no additional hardware required.

OPTIONAL ACCESSORIES:

- a Use Q7230A1005 Interface Module (4 to 20 mA or 2 to 10 Vdc).
- b Use 4074EED Resistor Kit or 221508A Resistor Board.
- c Use Q7130A1006 Interface Module (4-7, 6-9, 10.5-13.5 Vdc).
- d Use Q7630A1001 Interface Module (14-17 Vdc).
- e Use Q7330A1004 Interface Module (W936 Control).

MOTOR/ACTUATOR SELECTION GUIDE

Foot-Mounted/Specialty Actuators

NOTE: Fourteen TRADELINE® Modutrol IV™ Motors and accessories can be configured to replace all previous Honeywell Modutrol® Motors, and most OEM Modutrol Motors. These motors are listed in italicized type in Table 6 and in Tables 4 and 5.

TABLE 6. 150-300 LB-IN. NON-SPRING RETURN FOOT-MOUNTED MODUTROL IV ACTUATORS.

Torque (lb-in.)	Power (volts)	Control Mode	Stroke (degrees)	Timing (sec)	Aux Switch	220738A Adapter Bracket	CONTROL SIGNAL										Modutrol IV OS Number	Comments
							On/ Off spst	Floating spdt	135 ohm	4 to 20 mA	2 to 10 Vdc	4 to 7 Vdc	6 to 9 Vdc	10.5 to 13.5 Vdc	14 to 17 Vdc	W936		
150	24	Series 60	90	30	—	No		■									M6184A1015	—
			90/160	15/30				■									M6184D1001	
				30/60		Yes		■									M6184D1035	TRADELINE®
					2	No		■									M6184F1014	—
						Yes		■									M6284D1000	TRADELINE® with auxiliary feedback potentiometer.
		Series 62	90/160		2	No		■									M6284F1013	With auxiliary feedback potentiometer.
									■	ab	a	c	c	c	d	e	M9184A1035	—
									■	ab	a	c	c	c	d	e	M9184C1031	
									■	ab	a	c	c	c	d	e	M9184D1005	
			90/160	15/30	—				■	ab	a	c	c	c	d	e	M9184D1013	TRADELINE®
				30/60		Yes			■	ab	a	c	c	c	d	e	M9184D1021	TRADELINE® tapped auxiliary shaft.
					2	No			■	ab	a	c	c	c	d	e	M9184F1000	—
					—				■	ab	a	c	c	c	d	e	M9184F1034	Tapped auxiliary shaft.
			160	60					■	ab	a	c	c	c	d	e	M9184A1019	—
		2-10 Vdc	90	30							■						M7284A1079	
																	M7284G1001	Normally open.
		W936	90	30												■	M7384A1011	W936, W945 Control.
	120	Series 60	160	30	—	No		■									M6184A1023	—
		Series 62	90	30				■									M6284A1055	
			160	60				■									M6284A1048	With auxiliary feedback potentiometer.
		4-20 mA	90	30						■							M7284A1004	With screw terminals.
					2					■							M7284C1000	
					—												M7284Q1009	With screw terminals, adjustable null/span.
										■							M7284A1012	With screw terminals.
			160	60	2					■							M7284C1018	
					—												M7284Q1017	With screw terminals, adjustable null/span.

continued on next page

TABLE 6. 150-300 LB-IN. NON-SPRING RETURN FOOT-MOUNTED MODUTROL IV ACTUATORS (Continued).

Torque (lb-in.)	Power (volts)	Control Mode	Stroke (degrees)	Timing (sec)	Aux Switch	220738A Adapter Bracket	CONTROL SIGNAL										Modutrol IV OS Number	Comments	
							On/ Off spst	Floating spdt	135 ohm	4 to 20 mA	2 to 10 Vdc	4 to 7 Vdc	6 to 9 Vdc	10.5 to 13.5 Vdc	14 to 17 Vdc	W936			
300	24	Series 60	90/160	120/240	—	Yes		■									M6194D1017	TRADELINE®	
					1	No		■									M6194E1006	—	
		Series 62			—	Yes		■										M6294D1008	TRADELINE®, with auxiliary feedback potentiometer.
									■	ab	a	c	c	c	d	e	M9194D1003	TRADELINE®	
		Series 90			1	No		■	ab	a	c	c	c	d	e	M9194E1000	—		
										■								M7294A1010	
				2-10 Vdc	160	120	—											M7294G1009	Normally open.

■ Primary interface, no additional hardware required.

OPTIONAL ACCESSORIES:

- ^a Use Q7230A1005 Interface Module (4 to 20 mA or 2 to 10 Vdc).
- ^b Use 4074EED Resistor Kit or 221508A Resistor Board.
- ^c Use Q7130A1006 Interface Module (4-7, 6-9, 10.5-13.5 Vdc).
- ^d Use Q7630A1001 Interface Module (14-17 Vdc).
- ^e Use Q7330A1004 Interface Module (W936 Control).

TABLE 7. FOOT-MOUNTED ACTUATOR ACCESSORIES.

Description	Part Number	Application Comments
Adapter, 0-10 Vdc/2-10 Vdc adjustable	Q769C	M7405, M7415 Motors.
Adapter, 4-20 mA	Q769B	
Adapter, 6-9 Vdc	Q769A	
Auxiliary switch kit, 1 switch	203762A	Modutrol IV TRADELINE Motors.
Auxiliary switch kit, 2 switches	203762B	
Auxiliary switch, 1 spst	220736A	Modutrol Motors (requires 220738A to use Mod IV Motor).
Auxiliary switch, 2 spst	220736B	
Ball joint	27518	5/16 inch rod.
Bracket, adapter	220738A	for Mod IV Motors to match Mod III shaft height.
Bracket, adapter, bag assembly	7640JN	M833, M842, M436, M836 Motors.
Bracket, DR/ZR valve, Modutrol Motor	7640QY	Modutrol Motors.
Bracket, external damper mount	101662A	Series 90 Modutrol Motors.
Bracket, mounting	198545	M833, M842, M436, M836 Motors.
Bracket, mounting, bag assembly	7640JM	
Coupling	7617DM	Explosion Proof Housings.
Crank arm adapter	220767A	Drive two dampers with one crank arm (requires 220738A to use with Mod IV Motor).
Crank arm assembly	4074EGR	M6415, M7405, M7415, M8405, M8415 Motors.
Crank arm drive, bag assembly	7640JL	M833, M842, M436, M836 Motors.
Crank arm, adjustable	7617ADW	Dampers (requires 220738A to use with Mod IV Motor).
Crank arm, heavy duty	4074EQE	Dampers, 300 lb-in. motors (requires 220738A to use with Mod IV Motor).
Crank arm, infinitely adjustable	221455A	Dampers (requires 220738A to use with Mod IV Motor).
Direct drive, bag assembly	7640JE	M833, M842, M436, M836 Motors.
Economizer™ adapter kit	203977A	Modutrol IV Motors with W859 Economizer.
Economizer™ control	W957	Series 90 Modutrol IV (requires 203977A).
Economizer™ logic modules, solid state	W6210A,D; W7210A,D	Series 62 and 72 Modutrol IV Motors.
Economizer™ logic module, solid state	W7459	M7405, M7415, M8405, M8415 Motors.
Enclosure, terminal	7640QF	
Housing, explosion proof	ES-650-117	Modutrol IV Motors (requires 220738A).
Housing, explosion proof	ES-650-118	Modutrol IV Motors with ext. aux switches (requires 220738A).
Interface module, 2-10 Vdc/4-20 mA	Q7230A1005	Series 90 Motor.
Interface module, 4-7, 6-9, 10.5-13.5 Vdc	Q7130A1006	
Interface module, 14-17 Vdc with min pos	Q7630A1001	
Interface module, W936 Control Interface	Q7330A1004	
Linkage	Q298	M833, M842, M436, M836 Motors.
Linkage, two damper	Q298B	M6415, M7405, M7415, M8405, M8415 Motors.
Linkage, valve	Q100A1007	V51B Valve 1-1/2 to 2 inch (requires 220738A to use with Mod IV Motor).
Linkage, valve	Q100A1015	V51B Valve 2-1/2 to 3 inch (requires 220738A to use with Mod IV Motor).
Linkage, valve	Q100A1023	V51B Valve 4 inch (requires 220738A to use with Mod IV Motor).

continued on next page

TABLE 7. FOOT-MOUNTED ACTUATOR ACCESSORIES (Continued).

Description	Part Number	Application Comments
Linkage, valve, 80/160 lb, 1-3/8 in. bonnet	Q5001D1000	V5011, V5013 Valves, 3/4 in. stroke (other strokes available with custom cams).
Linkage, valve, 160/320 lb, 1-3/8 in. bonnet	Q5001D1018	
Linkage, valve, 160/320 lb, 1-7/8 in. bonnet	Q5001D1026	
Potentiometer, auxiliary	Q181A1072	Series 90 Motor, does not include cover.
Potentiometer, auxiliary (one)	Q181A1007	Series 90 Motor, includes cover.
Potentiometers, auxiliary (two)	Q181A1015	
Potentiometers, auxiliary (three)	Q181A1064	Series 90 Motor, does not include cover.
Potentiometer, auxiliary, (34.5 ohms)	Q68B1039	Series 90 Motor.
Potentiometer, auxiliary, (58.0 ohms)	Q68B1013	
Potentiometer, auxiliary, (86.0 ohms)	Q68B1005	
Potentiometer, manual, (135 ohms)	S443A1007	Remote manual control of Series 90 Motor.
Potentiometer, min pos, cover mount (135 ohms)	Q209E1002	Series 90 Modutrol IV Motor.
Potentiometer, min pos, cover mount (270 ohms)	Q209E1010	
Potentiometer, min pos, ext (135 ohms)	S963B1128	Series 90 Motor.
Potentiometer, min pos, int (135 ohms)	Q209F1001	Series 90 Modutrol IV Motor.
Potentiometer, min pos, int (270 ohms)	Q209F1019	
Potentiometer, min pos, motor mounted	Q709A	M6415, M7405, M7415, M8405, M8415 Motors.
Potentiometer, min pos, remote, (270 ohms)	S963B1136	M6415, M7405, M7415, M8405, M8415, and Series 90 Motors.
Potentiometer, remote manual, (135 ohms)	112894FD	Series 90 Motor.
Potentiometer, remote manual, (270 ohms)	112894FB	
Potentiometer, remote manual, (270 ohms)	112894FE	
Potentiometer, remote manual, (72 ohms)	112894FE	
Q607 mounting, bag assembly	4074BRU	M833, M842, M436, M836 Motors.
Resistor board	221508A	Includes 4074BYK, 4074EAU, 4074EDC, 4074EED.
Resistor kit, 4-20 mA	4074EDC	One Series 90 Motor from 4 to 20 mA Controller.
Resistor kit, 4-20 mA	4074EED	1 to 4 Series 90 Motors from 4 to 20 mA Controller.
Resistor kit, Series 90	4074BYK	2-6 Series 90 Motors in Unison.
Resistor kit, W973	4074EAU	2-3 Series 90 Motors from W973.
Screw terminal adapter	220741A	Modutrol IV Motor.
Screw terminal adapter	4074EHB	M6415, M7405, M7415, M8405, M8415 Motors.
Sensor, discharge air	C7046A	
Sensor, enthalpy, solid state	C7400	
Sensor, mixed or discharge air	C7150B1004	
Switch, aux	4074EKV	M6416, M7405, M7415, M8405, M8415 Motors.
Transformer, 120 Vac, 50/60 Hz	198162EA	Modutrol IV Motor (internal mount).
Transformer, 120/208/240 Vac, 50/60 Hz	198162AA	
Transformer, 220 Vac, 50/60 Hz	198162GA	
Transformer, 24 Vac, 50/60 Hz, isolation	198162JA	
Weatherproofing kit, NEMA 4	4074ERU	Modutrol IV Motor.

TABLE 8. 25-144 LB-IN. SPRING RETURN DIRECT COUPLED ACTUATORS.

NOTE: All models include 1m cable.

Torque (lb-in.)	Power (Vac)	Control Mode	Stroke (degrees)	Timing (sec)	Auxiliary Switch	CONTROL SIGNAL					OS Number	Comments
						On/Off spst	Floating spdt	4 to 20 mA	2 to 10 Vdc	135 ohms ^a		
25	24	Series 80	95	88/106		■					ML8175A1009	—
											ML8175D1006	Timeout.
					2	■					ML8175C1007	2 aux switches.
											ML8175F1004	Timeout; 2 aux switches; 1m cable.
							■				ML6175A1001	—
											ML6175D1008	Timeout.
					2		■				ML6175C1009	2 aux switches.
											ML6175F1006	Timeout; 2 aux switches.
							■				ML6275A1009	500 ohm feedback.
											ML6275D1006	500 ohm feedback; timeout.
					2		■				ML6275C1007	500 ohm feedback; 2 aux switches.
											ML6275F1004	500 ohm feedback; timeout; 2 aux switches.
									■		ML7275A1008	—
										■		ML7275D1005
							■			ML7275D1013	Timeout.	
					2				■		ML7275C1006	2 aux cable.
							■			ML7275F1003	Timeout; 2 aux switches.	
								■		ML7275F1011	Timeout; 2 aux switches.	
										■	ML9175A1008	—
										ML9175D1005	Timeout.	
					2					■	ML9175C1006	2 aux switches.
											ML9175F1003	Timeout; 2 aux switches.
50	24	Series 80	95	88/106		■					ML8185A1008	—
											ML8185D1005	Timeout.
					2	■					ML8185C1006	2 aux switches.
											ML8185F1003	Timeout; 2 aux switches.
							■				ML6185A1000	—
											ML6185D1007	Timeout.
					2		■				ML6185C1008	2 aux switches.
											ML6185F1007	Timeout; 2 aux switches.
							■				ML6285A1008	500 ohm feedback.
											ML6285D1007	Timeout; 500 ohm feedback.
					2		■				ML6285C1006	500 ohm feedback; 2 aux switches.
											ML6285F1003	Timeout; 2 aux switches; 500 ohm feedback.
									■		ML7285A1007	—
											ML7285D1004	Timeout.
							■			ML7285D1012	Timeout.	
					2				■		ML7285C1005	2 aux switches.
		2					■			ML7285F1002	Timeout; 2 aux switches.	
		2						■		ML7285F1010	Timeout; 2 aux switches.	
										■	ML9185A1007	—
											ML9185D1020	Timeout.
					2					■	ML9185C1005	2 aux switches.
												ML9185F1002
105	115	Series 40	90	70		■					ML4465A1008	Line voltage.
	24	Series 80				■					ML8465A1004	—
		Series 70							■		ML7475A1012	Adjustable zero and volt span.
										0-10		ML7475A1004

^a 135 ohm slidewire or Honeywell Electronic Series 90™.

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TABLE 8. 25-144 LB-IN. SPRING RETURN DIRECT COUPLED ACTUATORS (Continued).

Torque (lb-in.)	Power (Vac)	Control Mode	Stroke (degrees)	Timing (sec)	Auxiliary Switch	CONTROL SIGNAL					OS Number	Comments	
						On/Off spst	Floating spdt	4 to 20 mA	2 to 10 Vdc	135 ohms ^a			
144	115	Series 40	90	90		■					ML4195A1001	—	
		2			■					ML4195C1009	2 aux switches.		
	24	Series 80				■					ML8195A1007	—	
					2	■					ML8195C1005	2 aux switches.	
		Series 60					■				ML6195A1009	—	
		Series 62			2		■				ML6295C1005	2 aux switches; feedback (0-1000 ohms).	
		Series 70							0-10		ML7295A1006	0.5 to 9.5 Vdc control span.	
					2					0-10		ML7295C1004	2 aux switches; 0.5 to 9.5 Vdc control span.
												ML7295H1009	2 aux switches; adj zero (0 to 5 Vdc) and span (2-30 Vdc).
							■				ML7295A1014	—	
		2					■				ML7295C1012	2 aux switches.	

^a 135 ohm slidewire or Honeywell Electronic Series 90™.

TABLE 9. 35-300 LB-IN. NON-SPRING RETURN DIRECT COUPLED ACTUATORS.

NOTE: 35/70 lb-in. non-spring return models have terminal connections. 150/300 lb-in. non-spring return models include 1m cable.

Torque (lb-in.)	Power (Vac)	Control Mode	Stroke (degrees)	Timing (sec)	Auxiliary Switch	CONTROL SIGNAL				Declutch	OS Number	Comments	
						Floating spdt	4 to 20 mA	2 to 10 Vdc	135 ohms ^c				
35	24	Series 60	45,60,90	90		■					ML6161A1001	Output for feedback (200976A,C). ^a	
										■	ML6161A2009	Output for feedback (200976A,C); declutch. ^a	
											ML6161B1000	— ^b	
										■	ML6161B2008	Declutch. ^b	
											ML6161B2024	Declutch. ^a	
											ML6161C1009	Output for feedback (200976A,C); conduit connection cover. ^a	
										■	ML6161C2007	Output for feedback (200976A,C); conduit connection cover; declutch. ^a	
											ML6161D1008	Conduit connection cover. ^a	
										■	ML6161D2006	Conduit connection cover; declutch. ^a	
				3 min	■						ML6161A1027	Output for feedback (200976A,C). ^a	
										■	ML6161A2025	Output for feedback (200976A,C); declutch. ^a	
											ML6161B1190	— ^b	
										■	ML6161B2065	Declutch. ^b	
											ML6161C1025	Output for feedback (200976A,C); conduit connection cover. ^a	
										■	ML6161C2023	Output for feedback (200976A,C); conduit connection cover; declutch. ^a	
											ML6161D1024	Conduit connection cover. ^a	
										■	ML6161D2022	Conduit connection cover; declutch. ^a	
										7 min	■		
				■	ML6161A2017	Output for feedback (200976A,C); declutch. ^a							
					ML6161B1018	— ^b							
				■	ML6161B2016	Declutch. ^b							
					ML6161B2032	Declutch. ^a							
					ML6161C1017	Output for feedback (200976A,C); conduit connection cover. ^a							
				■	ML6161C2015	Output for feedback (200976A,C); conduit connection cover; declutch. ^a							
					ML6161D1016	Conduit connection cover. ^a							
				■	ML6161D2014	Conduit connection cover; declutch. ^a							
		Series 70	45,60,90	90				■	■			ML7161A1000	— ^a
											■	ML7161A2008	Declutch. ^a

^a Includes 4074ENJ assembly. See Table 11.^b Includes 4074ENY assembly. See Table 11.^c 135 ohm slidewire or Honeywell Electronic Series 90™.

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TABLE 9. 35-300 LB-IN. NON-SPRING RETURN DIRECT COUPLED ACTUATORS (Continued).

Torque (lb-in.)	Power (Vac)	Control Mode	Stroke (degrees)	Timing (sec)	Auxiliary Switch	CONTROL SIGNAL				Declutch	OS Number	Comments
						Floating spdt	4 to 20 mA	2 to 10 Vdc	135 ohms ^c			
70	24	Series 60	45,60,90	90		■				■	ML6174A2002	Output for feedback (200976A,C) ^a
						ML6174B2001	— ^b					
						ML6174B2019	— ^a					
						ML6174C2000	Integral enclosure; Output for feedback (200976A,C) ^a					
						ML6174D2009	Integral enclosure. ^a					
				3 min		■					ML6174A2010	Output for feedback (200976A,C) ^a
						ML6174C2026	Integral enclosure; Output for feedback (200976A,C) ^a					
				7 min		■					ML6174A2028	Output for feedback (200976A,C) ^a
						ML6174B2027	— ^b					
						ML6174B2035	— ^a					
						ML6174C2018	Integral enclosure; Output for feedback (200976A,C) ^a					
						ML6174D2017	Integral enclosure. ^a					
						ML7174A2001	— ^a					
		Series 70		90		■	■					
150	24	Series 60	95	92		■				■	ML6184A1003	—
						■					ML6184D1000	Timeout.
					2	■					ML6184C1001	2 aux switches.
		Series 62				■					ML6184F1008	2 aux switches.
						■					ML6284A1001	500 ohm feedback.
						■					ML6284D1008	500 ohm feedback; timeout.
					2	■					ML6284C1009	500 ohm feedback; 2 aux switches.
											ML6284F1006	500 ohm feedback; timeout; 2 aux switches.
		Series 70					■				ML7284D1007	Timeout.
					2		■				ML7284F1005	Timeout; 2 aux switches.
								■			ML7284A1018	—
								■			ML7284D1015	Timeout.
					2			■			ML7284C1008	2 aux switches.
		Series 90							■		ML7284F1013	Timeout; 2 aux switches.
									■		ML9184A1000	—
									■		ML9184D1007	Timeout.
					2				■		ML9184C1008	2 aux switches.
									■		ML9184F1005	Timeout; 2 aux switches.
300	24	Series 60	95	92		■				■	ML6194A1002	—
						■					ML6194D1009	Timeout.
					2	■					ML6194C1000	2 aux switches.
		Series 62				■					ML6194F1007	Timeout; 2 aux switches.
						■					ML6294A1000	500 ohm feedback.
						■					ML6294D1007	500 ohm feedback; timeout.
					2	■					ML6294C1008	500 ohm feedback; 2 aux switches.
											ML6294F1005	500 ohm feedback; timeout; 2 aux switches.
		Series 70					■				ML7294D1014	Timeout.
					2		■				ML7294F1012	Timeout; 2 aux switches.
								■			ML7294A1009	—
								■			ML7294D1006	Timeout.
					2			■			ML7294C1007	2 aux switches.
		Series 90							■		ML7294F1004	Timeout; 2 aux switches.
									■		ML9194A1009	—
									■		ML9194D1006	Timeout.
					2				■		ML9194C1007	2 aux switches.
											ML9194F1004	Timeout; 2 aux switches.

^a Includes 4074ENJ assembly. See Table 11.

^b Includes 4074ENY assembly. See Table 11.

^c 135 ohm slidewire or Honeywell Electronic Series 90™.

TABLE 10. DIRECT COUPLED VALVE ACTUATORS.

NOTE: All models are powered with 24 Vac.

Spring Return	Force (lbf)	Stroke (in.)	Timing (sec)	Power (Vac)	CONTROL SIGNAL					Model	Comments
					On/Off spst	Floating spdt	4 to 20 mA	2 to 10 Vdc	135 ohm ^d		
No	40.5	1/4	125	24		■				M6410A1011	UL94-5V plenum rated.
										M6410A1029	UL94-5V plenum rated.; includes conduit connector.
								■ ^a		M7410E1036	Direct/reverse acting switch; UL94-5V plenum rated.
										M7410F1000	Direct/reverse acting switch; UL94-5V plenum rated; includes conduit connector.
	160	3/4	60 75		■					ML684A1025	—
							■	■	■	ML7984A3001	Replaces all ML784 and ML984 standard models; use with V5011F & G.
										ML7984A3019	Replaces all ML784 and ML984 standard models; use with V5011a & C.
										ML7984B3000	For use with pulse width modulation control.
No ^c	405	3/4	90	24	■ ^b					V2045A1038	For use with V5045 Valve only.
						■				ML6421A1009	Includes 1/2 in. conduit connector knockouts.
							■	■	■	ML7421A1008	Includes 1/2 in. and 3/4 in. conduit connector knockouts.
					■	0-10		ML7421A1024			
		1 1/2	175			■				ML6421B1032	Includes 1/2 in. conduit connector knockouts.
							■	■	■	ML7421B1007	Includes 1/2 in. and 3/4 in. conduit connector knockouts.
						■	0-10		ML7421B1015		
Yes	135			3/4	90	24		■			
										ML6425B3013	Retracts actuator stem on power failure, includes conduit connector and one knockout.
							■	■		ML7425A3013	Extends actuator stem on power failure, includes conduit connector and one knockout.
										ML7425B3012	Retracts actuator stem on power failure, includes conduit connector and one knockout.

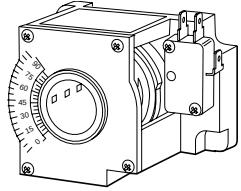
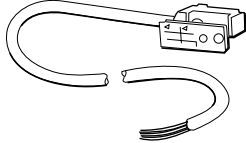
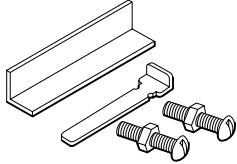
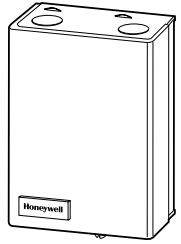
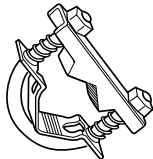
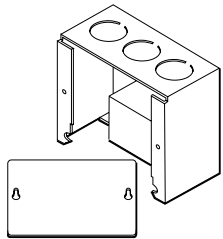
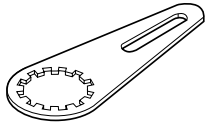
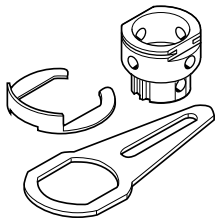
^a Adjustable, operates on 2-10 Vdc or 0-10 Vdc.

^b Requires the use of a SPDT controller.

^c Actuator includes manual opener.

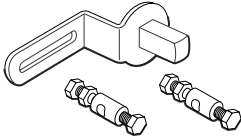
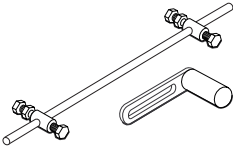
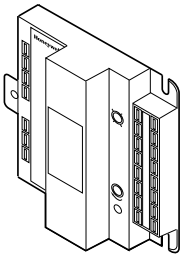
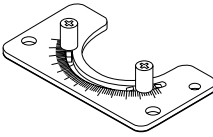
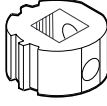
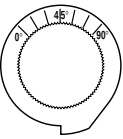
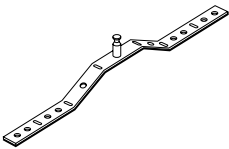
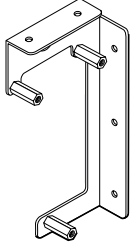
^d 135 ohm slidewire or Honeywell Electronic Series 90™.

TABLE 11. DIRECT COUPLED ACTUATOR ACCESSORIES.

Description	Accessory Part Number	Use With Direct Coupled Damper Actuator	
		Non-spring Return	Spring Return
Auxiliary Switch, for 3/8 in. or 1/2 in. shaft 	201052A,B,C	ML6161, ML7161	
Auxiliary Switch, Two 	203409		ML8465
Bag Assembly Kit (one stop pin and shaft adapter) Bag Assembly Kit (one stop pin, shaft adapter, two minimum position screws) 	4074ENY	35 lb-in. ML6161, ML7161; 70 lb-in. ML6174, ML7174 see Table 9 for specific models	
	4047ENJ		
Case and Cover 	7640QW	ML6161, ML6174, ML7161, ML7174	
Clamp Assembly, Damper Shaft 	203416		ML8465, ML4465, ML7475
Conduit Connector 	203901		ML8465, ML7475
Crank Arm Adapter 	205685	150 lb-in.	
	205846	300 lb-in.	
Crank Arm Assembly (hub insert with set screws, retaining ring and crankarm) 	205870		25 or 50 lb-in.

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TABLE 11. DIRECT COUPLED ACTUATOR ACCESSORIES (Continued).

Description	Accessory Part Number	Use With Direct Coupled Actuator	
		Non-spring Return	Spring Return
Crank Arm Kit (includes two ball joint connectors) 	205830A		25 or 50 lb-in.
Crank Arm Set, Linear 	203405		ML8465, ML7475
Economizer™ Logic Module, Solid State 	W6210A, D,		Honeywell Series 62 DCAs
	W7210A, D		Honeywell Series 72 DCAs
End Stop Kit 	205850B		25 or 50 lb-in.
Hub Insert, 3/4 in. round 	205617	150 lb-in.	
Hub Insert, 3/8 in.	205753	150 lb-in.	25 or 50 lb-in.
Hub Insert, 1/2 in.	205755		
Hub Insert, 5/8 in.	205758		
Hub and retaining ring, 1 in. round 	205843B	300 lb-in.	
Hub and retaining ring, 3/4 in. round or square	205856B		
Hub, 5/8 in. round or square	205849A		
Limiter, Angular Rotation 	203407		ML8465, ML7475
Mounting Bracket 	203415		ML8465, ML7475
Mounting Kit, 3-Point, bracket and 3 standoffs 	205820A		25 or 50 lb-in.
Mounting Kit, Tandem, bracket, 6 standoffs and drive shaft extension	205840A	150 lb-in. 300 lb-in.	25 or 50 lb-in.

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TABLE 11. DIRECT COUPLED ACTUATOR ACCESSORIES (Continued).

Description	Accessory Part Number	Use With Direct Coupled Actuator	
		Non-spring Return	Spring Return
Potentiometer, Feedback 0 to 1000 ohm	200976C	ML6161A,C, ML6174A,C	
Potentiometer, Feedback 0 to 500 ohm	200976A		
Potentiometer, Remote Minimum Position	205860	Actuator with 0/4-20 mA, or 0/2-10 Vdc control signal	
Potentiometer, Remote Minimum Position, NEMA 4 mount	205860A		
Shaft Adapter, 1 in.	205880		25 or 50 lb-in.
Shaft Extension	203406		ML8465, ML7475
Shaft Reducer	203404		ML8465, ML7475
Short Shaft Adapter	4047EVK	ML6161, ML7161, ML6174, ML7174	

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TABLE 11. DIRECT COUPLED ACTUATOR ACCESSORIES (Continued).

Description	Accessory Part Number	Use With Direct Coupled Valve Actuator	
		Non-spring Return	Spring Return
Auxiliary Switch, Dual (for 24 Vac use only)	43191680-102	ML6421, ML7421	
Auxiliary Switch, Dual (for 24 Vac use only)	43191680-105		ML6425, ML7425
Motor Brush Replacement Kit	272775	ML7984	
Mounting Hardware Bag Assembly	40003793-003	ML684/ML7984	
Potentiometer, Dual Auxiliary (220 ohm)	43191679-103	ML6421A, ML7421A	
Potentiometer, Dual Auxiliary (220 ohm)	43191679-104	ML6421B, ML7421B	
Potentiometer, Single Auxiliary	43191679-101	ML6421A	
Potentiometer, Single Auxiliary	43191679-102	ML6421B	
Potentiometer, Single Auxiliary (10k ohm)	43191679-111		ML6425, ML7425
Potentiometer, Single Auxiliary (220 ohm)	43191679-112		ML6425, ML7425
Resistor Kit	272822	ML7984	
Switch, one spst	272630A	ML684/ML7984	
Switches, two spst	272630B	ML684/ML7984	

TABLE 12. PNEUMATIC DAMPER ACTUATORS.

Diaphragm (sq in.)	Stroke (in.)	Spring Range (psi)	Torque at 18 psi main pressure (lb-in.)			Temperature Limits (°F)	Positive Positioning	Damper Actuator OS Number		
			Shaft Position							
			Retracted	Midstroke	Extended					
2.82	1	5-10	6	2	9	50-140	No	MP913A1029		
								MP913A1037		
		10-15	11		3			MP913A1052		
								MP913A1003		
								MP913A1011		
	3.5	2-7	10	10	54	-20-160		MP909A1652 ^a		
		3-13	15		25			MP909A1014 ^a		
		5-10	25		40			MP909A1645 ^a		
								MP909A1637 ^a		
		7-13	34		25			MP909A1660 ^a		
3	2.38	3-8	11	8	36	50-140	No	MP909D1201		
								MP909D1300		
		5-10	18		29			MP909D1359		
								MP909D1227		
								MP909D1334		
		8-13	29		18			MP909D1219		
				MP909D1318						
	3	5-10	22	10	36			MP909D1441		
6.6	2.1 to 3.4	5-10	45	19	73	-20-160	No	MP909E1059		
			50	21	79			MP909E1067		
	3.1	2.5-6.5	26	22	118			MP909E1083		
								MP909E1372		
		9-13	92		51			MP909E1158		
								MP909E1174		
	MP909E1380									
	4	3-13	40	28	66			MP909E1398		
								MP909E1018		
								MP909E1026		
								MP909E1349		
		5-10	66		106			MP909E1356		
								MP909E1034		
								MP909E1364		
								MP909E1463		
								MP909E1471		
	10	40	66				Yes	MP909H1331		
								MP909H1368		
MP909H1392										

^a Recommended for direct replacement only. For new and retrofit, use MP909D.

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TABLE 12. PNEUMATIC DAMPER ACTUATORS (Continued).

Diaphragm (sq in.)	Stroke (in.)	Spring Range (psi)	Torque at 18 psi main pressure (lb-in.)			Temperature Limits (°F)	Positive Positioning	Damper Actuator OS Number			
			Shaft Position								
			Retracted	Midstroke	Extended						
11	2.25	3-12	41	26	138	-20-160	No	MP516A1087			
		4-8	55		138			MP516A1095			
		5-12	69		82			MP516A1103			
23.8	3.5	3-7	125	88	458	-40-158	No	MP918B1063			
									MP918B1071		
		3-13			208			MP918B1006			
								MP918B1014			
								MP918B1022			
					MP918B1030						
		5-10	208		333			MP918B1048			
		8-13	333		208			MP918B1089			
								MP918B1097			
								MP918B1105			
								MP918B1113			
								MP918B1196			
					208			208	-20-158	Yes	MP918A1024
								MP918A1057			
								MP918A1081			
24.8	6	7-13	520	158	372			MP920B1002			

TABLE 13. PNEUMATIC VALVE ACTUATORS.

Stem Travel (in.)	Positioner	Actuator Action	Diaphragm Diameter (in.)	Spring Range (psi)	OS Number	Comments	
3/4	No	DA	5	2-7	MP953C1000	—	
				4-11	MP953C1026		
				8-12	MP953C1018		
			8	2-7	MP953C1067		—
				4-11	MP953C1083		
				8-12	MP953C1075		
			13	2-7	MP953C1554		—
				4-11	MP953C1562		
				RA	7-1/8		
		4-11	MP953D1131				
		8-13	MP953D1107				
			MP953D1248				
	Yes	DA	5	4-11	MP953E1301	Positioner: 3 psi range	
					MP953E1319	Positioner: 5 psi range	
					MP953E1327	—	
			8		MP953E1368	Positioner: 3 psi range	
					MP953E1376	Positioner: 5 psi range	
					MP953E1384	Positioner: 10 psi range	
			13		MP953E1400	—	
					MP953E1418		
					MP953E1443		
		RA	7-1/8	8-13	MP953F1093	Positioner: 3 psi range	
					MP953F1101	Positioner: 5 psi range	
					MP953F1119	Positioner: 10 psi range	
1 1/2	No	DA	8	3-15	MP953C1547	—	
			13	4-11	MP953C1489		
	Yes		8		MP953E1285	Positioner: 5 psi range	
a	No			2-5	MP958A1009	—	
				3-10	MP958A1017		
				8-11	MP958A1025		

^a MP958 actuators for use with only V5852, V5853, V5862, V5863 Valves.

TABLE 14. PNEUMATIC ACTUATOR ACCESSORIES.

Part Description	Part Number	Use With Actuator
Balljoint, Actuator Shaft, 3/8-16 UNC, fits 5/16 in. diameter pushrod	315781	MP909A,D,E,H, MP918A,B
Balljoint, Crankarm, 1/4-28 UNC, stud fits 5/16 in. pushrod	27518	MP516A, MP909A,D,E,H
Bracket, 3 in. long, 3-3/4 in. wide, 2-3/4 in. high	14003640-001	MP909A,D
Bracket, 4-3/8 in. long, 5 in. wide, 4-3/8 in. high, external	14002850-001	
Bracket, mounting	14004368-002	MP920B
Clevis, long, bag assembly: actuator shaft coupling for 5/8 in. 11 rod	AK3559	
Clevis, short, bag assembly: 3/8 in. 16 rod	AK3557	
Coupling for 3/8 in. 16 rod, includes angle balljoint (3/8 in. 24)	AK3561	
Coupling for 5/8 in. 11 rod, includes angle balljoint (3/8 in. 24)	AK3560	
Crankarm Assembly: conversion from internal N.O. to external trunnion mount	14004107-001	MP918A
Crankarm, for 1/2 in. damper shaft, 1-1/8 to 4-5/8 in. long	312867C	MP516A, MP909A,E,H
Crankarm, for 3/8 in. damper shaft, 1-1/8 to 4-5/8 in. long	26025B	MP516A, MP909D,E,H
Crankarm, for 7/16 in. damper shaft, 1-1/8 to 2-1/2 in. long	314316A	MP516A, MP909D
Crankarm, for 7/16 in. damper shaft, 1-1/8 to 4-5/8 in. long	27174B	MP516A, MP909D,E,H
Feedback Spring Kit: 3 psi (orange), 5 psi (yellow), 10 psi (blue)	14004210-001	MP920B
Linkage Kit, external mount	312867H	MP909E,H
Linkage Kit, internal mount, N.C. dampers	14000716-001	
Linkage Kit, internal mount, N.O. dampers	14000693-003	
Manual or Minimum Position Switch	SP970A-D	All
Positive Positioner Kit; includes 10 psi feedback spring	14004345-001	MP920B
Pushrod, 5/16 in. diameter, 12 in. long	2752C	MP516A, MP909A,D,E,H
Pushrod, 5/16 in. diameter, 24 in. long	2752G	MP918A,B
Pushrod, 5/16 in. diameter, 36 in. long	2752K	
Pushrod, 5/16 in. diameter, 48 in. long	2752L	

APPENDIX A

DETERMINING DAMPER ACTUATOR TORQUE REQUIREMENTS

Use the following procedure to determine the required torque for your damper.

NOTE: Damper area is measured using the A and B dimensions as defined in Fig. A-1.

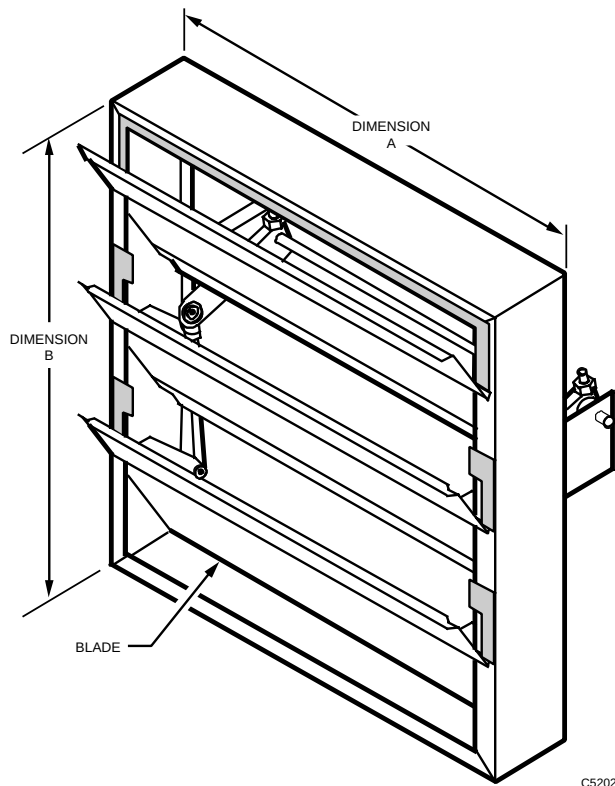


Fig. A-1. Measuring damper area.

1. Calculate the damper area in square feet by multiplying the A dimension by the B dimension.
2. Multiply the damper area by the lb-in. per square foot value from Table A-1, A-2, or B-1.

NOTE: The minimum lb-in. per square foot value that can accommodate tight closeoff and no leakage applications is 5, regardless of the value shown in the table.

3. Select the next highest actuator torque value than the calculated value.

IMPORTANT

12 lb-in. is the minimum torque required to operate Honeywell dampers.

EXAMPLE:

D640 Damper:

A dimension = 24 in.

B dimension = 48 in.

Static pressure (in. wc) = 1.5

Face velocity = 1000 fpm

$24 \text{ in.} \times 48 \text{ in.} \div 144 = 8 \text{ sq. ft}$

where: 144 = conversion factor (144 sq. in. per 1 sq. ft)

$8 \text{ sq. ft} \times 6.2 \text{ lb-in./sq. ft} = 49.6 \text{ lb-in.}$

where: 6.2 lb-in./sq. ft = value from Table A-1

In this case, you would need an actuator with a minimum torque of 49.6 lb-in. to open and close a D640 Damper with the given area.

NOTE: You may add an additional multiplier as a safety factor. (The safety factor covers estimated variations in temperature, voltage, velocity and pressure.)

EXAMPLE:

A safety factor of 20 percent would be a multiplier of 1.2:

$49.6 \text{ lb-in.} \times 1.2 = 59.5 \text{ lb-in. or } 60 \text{ lb-in.}$

This example formula applies for all dampers in Tables A-1, A-2 and B-1.

To obtain the lb-in. per sq ft value for Honeywell low leakage D640/D641 (parallel/opposed) blade moduflow dampers, use Table A-1:

TABLE A-1. HONEYWELL D640/D641 DAMPER LB-IN. PER SQ FT VALUE.

Static Pressure (in. wc)	Face Velocity (fpm)									
	500		1000		1500		2000		2500	
	parallel	opposed	parallel	opposed	parallel	opposed	parallel	opposed	parallel	opposed
1	4	1.5	5	2.5	6	3.5	7	4.5	8	5
2	4	2	7.5	3	8.5	5	9.5	6	10.5	7
3	5.5	2.5	10	4	11	5.5	11.5	6.5	12	7.5
4	6	3	11	5	11.5	6	12	7	12.5	8

NOTE: For shaded areas, tight closeoff and no leakage applications require a minimum lb-in. per sq ft value of 5.

To obtain the lb-in. per sq ft value for Honeywell ultra low leakage D642/643 (parallel/opposed blade) moduflow dampers, use Table A-2:

NOTE: Low static models of the D642 and D643 are also available.

TABLE A-2. HONEYWELL D642/643 DAMPER LB-IN. PER SQ FT VALUE.

Static Pressure (in. wc)	Face Velocity (fpm)									
	500		1000		1500		2000		2500	
	parallel	opposed	parallel	opposed	parallel	opposed	parallel	opposed	parallel	opposed
1	4.5	2	7	3.5	7	5	8	6	8.5	7
2	7.5	2.5	10	4	11	6.5	11.5	7.5	12	8.5
3	8	3	11	4.5	14	7	14.5	8.5	15	10
4	10	3.5	12	5	14.5	7.5	15	9	16	11

NOTE: For shaded areas, tight closeoff and no leakage applications require a minimum lb-in. per sq ft value of 5.

APPENDIX B

DETERMINING DAMPER ACTUATOR
TORQUE REQUIREMENTS WHEN USING
A NON-HONEYWELL DAMPER.

IMPORTANT

To obtain the lb-in. per sq ft value for non-Honeywell dampers, first consult the literature from the manufacturer.

Table B-1 provides values that may be used to estimate a lb-in. per sq ft value for an industry standard damper.

EXAMPLE:

Non-Honeywell, low leakage, parallel blade damper:

A dimension = 48 in.

B dimension = 96 in.

Static pressure (in. wc) = 2 in. wc

Face Velocity = 1000 fpm

48 in. x 96 in. ÷ 144 = 32 sq. ft

32 sq. ft x 7 lb-in./sq. ft = 224 lb-in.

In this case you would need an atuator with a minimum nominal torque of 224 lb-in.

TABLE B-1. APPROXIMATE INDUSTRY STANDARD DAMPER LB-IN. PER SQ FT VALUE.

Leakage	Damper Blades	Face Velocity (fpm)/Static Pressure (in. wc.)				
		500/1	1000/2	1500/3	2000/4	2500/4
Low	Parallel	4	7	10.5	12	14
Low	Opposed	3	5	7.5	8.5	10
Standard	Parallel	3	4.5	6.5	7	8
Standard	Opposed	2	3	4.5	5	6