M100 Series

LIT-1922020

Actuator Replacement Components

Description

The M100 Series Actuator positions dampers, valves, and related equipment in a variety of HVAC and industrial applications.

There are five basic actuator models: the M110, M120, M130, M140, and M150, with torques ranging from 25 to 150 lb·n, two spring return models, choice of control inputs, and a variety of accessories to cover any application. The return-to-normal function is standard on the M110 and M130 spring return models.

The M100 Series Actuator operates on 24 or 120 VAC power, and is available with on-off, floating, or proportional control inputs. The five basic actuators can be ordered as base units without the R81 Plug-in Electronic Interface Boards installed or with the input electronics factory installed. Changeable boards provide greater application versatility, easy conversion for changing requirements, and quick replacement.

Features

- output versatility allows both ends of the output shaft to be used for linkage connections for dampers
- load versatility available in torques of 25, 35, 50, 75, and 150 lb·in. (2.8, 4.0, 5.6, 8.5, and 16.9 N·m)
- travel adjustment located in top wiring compartment, allowing easy screwdriver adjustments
- M100X combines with multiple options to reduce service inventory
- M100 models available to match any control signal protocol including digital for application versatility
- R81 Plug-in Electronic Interface Boards provide faster replacement or conversions and shorter service times
- continuously lubricated gear train assures the longest life cycle cost/benefit in the industry

Applications

The M100 is used to position dampers, valves, and related equipmnet in a variety of HVAC and industrial applications. The actuator moves in response to input signals from a variety of electronic controllers, depending on the model selected.

Damper linkage kits include the Y20DAA-2 and Y20DAB-2 for commercial dampers and Y20DFC-1 for the CD1300 family of dampers.

M100 actuators can be field coupled or factory coupled to Johnson Controls VG and VB Series Valves. 1/2 inch VT Series Valves also require a Y20EBE-2 adapter kit. Specify factory coupling by listing the appropriate Q99 designations on the order. Y20 kits are also available for replacement or conversion of competitive valves.

M100 Series Actuator

The M110 and M130 come equipped with spring return to normal position for switched off conditions or on system power failure. The spring return is a heavy duty spring mechanism that returns the actuator shaft to its zero mechanical position against its rated torque. A brake mechanism will keep the return spring from driving the motor actuator towards its return position during normal reversible operations.

Selection Charts

M100 Replacement Components

Original Code Number	Action	Replacement Code Number	Description
M100A	On-Off / Floating	—	SPDT On-Off or floating control input. Mechanical limit switches on ends. Conversion of this unit to proportional control is not possible.
M100C	Proportional	**R81CAA-2**	Communicates on the Zone Bus of a Metasys AHU or UNT Controller. Digital protocol compatible with Level 1 Bus. Factory calibrated for direct acting, field selectable for reverse acting by switch settings.
M100E	Proportional	**R81EAA-2**	Thermistor sensor input economizer control with changeover relay, refrigeration programming relay, minimum position, mixed air set point and proportional band.
M100F	Incremental with Feedback	**R81FAA-1**	12 VDC incremental control input with position feedback. Used with Johnson Controls DSC-8500 using the FIC-101 Field Interface Card. This unit has no physical travel limits and will move as long as input command is provided.
M100G	Proportional	**R81GAA-2**	0 to 24 VDC, 0 to 24 mA input, adjustable zero and span, jumper selectable clockwise or counterclockwise action on signal increase. Factory set for 4 to 20 mA DC controller, clockwise action and signal increase.
M100J	Proportional	**R81JAA-1**	3-wire 135 to 1000 ohm input, 6 to 10 VDC, and 0 to -2 VDC, clockwise action on signal increase.
M100M	Proportional	**R81MAA-1**	Direct interface with Honeywell Series 90, W973, and W7100 controllers.
M100Q	Proportional	**R81QAA-1 R81QAA-2, or R81QAA-3**	Thermistor sensor input: R81QAA-1, 40 to 90°F (5 to 32°C) R81QAA-2, 15 to 50°F (-10 to 10°C) R81QAA-3, 60 to 120°F (15 to 50°C)
M110 Models	Motor Only	**M110XGA-1**	Field installation of R81 kit required. This unit is not UL listed for use as a new installation.
M120 Models		**M120XGA-1**	
M130 Models		**M130XGA-1**	
M140 Models		**M140XGA-1**	
M150 Models		**M150XGA-1**	

M100 Series Actuator Replacement Components (Continued)

M110 Actuator Selection Chart

Model	M110 = Actuator, 25 lb·in (2.8 N²m) with Spring Return
Control Input	**A** = SPDT On-Off or Floating **C** = Digital with DSC-1000 **E** = Mixed Air Economizer with changeover and refrigeration relay **G** = VDC/mA, clockwise action **J** = 3-wire 135 ohm, 6 to 10VDC, and 0 to -2 VDC **Q** = Thermister Sensor **X** = Base Model, no circuit board installed
Power Source	**A** = 120 VAC (use with On/Off or Floating control only) **G** = 24 VAC
Feedback	A = No Auxiliary Switch **B** = S91DJ-1 (use with control options A and J only)
M 1 1 0 - Ordering Code Number	

M120 Actuator Selection Chart

Model	M120 = Actuator, 35 lb·in (4.0 N²m) Non-Spring Return
Control Input	A = SPDT On-Off or Floating C = Digital with DSC-1000 G = VDC/mA, clockwise action J = 3-wire 135 ohm, 6 to 10VDC, and 0 to -2 VDC M = Honeywell Series 90, W973, and W7100 Q = Thermister Sensor X = Base Model, no circuit board installed
Power Source	A = 120 VAC (use with control options A and J only) G = 24 VAC
Feedback	A = No Auxiliary Switch C = S91EJ-1 (use with control options A and J)
M 1 2 0 - Ordering Code Number	

M130 Actuator Selection Chart

Product	M130 = Actuator, 50 lb·in (5.6 N²m) with Spring Return
Control Input	**A** = SPDT On-Off or Floating **C** = Digital with DSC-1000 **E** = Mixed Air Economizer with changeover and refrigeration relay **F** = DSC-8500 Incrermental **G** = VDC/mA, clockwise action **J** = 3-wire 135 ohm, 6 to 10VDC, and 0 to -2 VDC **M** = Honeywell Series 90, W973, and W7100 **Q** = Thermister Sensor **X** = Base Model, no circuit board installed
Power Source	**A** = 120 VAC (use with On/Off or Floating control only) **G** = 24 VAC
Feedback	**A** = No Auxiliary Switch **B** = S91DJ-1 (use with control options A and J only) **C** = S91EJ-1 (use with control option J only)
M 1 3 0 - Ordering Code Number	

Example: M130AGA is a 50 in·lb, on/off-floating control, with 24 VAC input and no auxiliary switches.

M140 Actuator Selection Chart

Product	M140 = Actuator, 75 lb·in (8.5 N²m) Non-Spring Return
Control Input	**A** = SPDT On-Off or Floating **C** = Digital with DSC-1000 **G** = VDC/mA, clockwise action **J** = 3-wire 135 ohm, 6 to 10VDC, and 0 to -2 VDC **X** = Base Model, no circuit board installed
Power Source	**A** = 120 VAC (use with control options A and J) **G** = 24 VAC
Feedback	**A** = No Auxiliary Switch **C** = S91EJ-1 (use with On/Off or Floating control only)
M 1 4 0 - Ordering Code Number	

M150 Actuator Selection Chart

Product	M150 = Actuator, 150 lb·in (17 N²m) Non-Spring Return
Control Input	**A** = SPDT On-Off or Floating **C** = Digital with DSC-1000 **F** = DSC-8500 Incrermental **G** = VDC/mA, clockwise action **J** = 3-wire 135 ohm, 6 to 10VDC, and 0 to -2 VDC **M** = Honeywell Series 90, W973, and W7100 **Q** = Thermister Sensor **X** = Base Model, no circuit board installed
Power Source	**G** = 24 VAC
Feedback	**A** = No Auxiliary Switch **B** = S91DJ-1 (use with control options A, J, and Q) **C** = S91EJ-1 (use with control option J only)
M 1 5 0 G - Ordering Code Number	

M100 Series Actuator Replacement Components (Continued)

Accessories for use with M100 Series Actuators

Code Number	Description
Transformers	
Y65T42-0	120/208/240 VAC Primary, 40 VA, 1/2 in. -14 NPS male hub
Y65F42-0	480VAC Primary, 40 VA, 1/2 in. -14 NPS male hub
Y68AA-1[1]	Cover mounted transformer, 120/24 VAC, 40 VA. For M100A, F, G, J, M, and Q
Y68DA-1[1]	Cover mounted transformer, 240/24 VAC, 40 VA. For M100A, F, G, J, M, and Q
Y68HA-1[1]	Cover mounted isolation transformer, 24 VAC/24 VAC, 40 VA. For M100A, F, G, J, M, and Q
General	
S91DJ-1	Auxiliary switch kit with one SPDT switch
S91EJ-1	Auxiliary switch kit with two SPDT switches
S91PT-1	Auxiliary potentiometer switch kit, 1000 ohms, 1/3 watt
CVR83A-600R	Weather resistant cover
Damper Linkage	
Y20DAA-2	Mounts actuator to top of duct or any flat surface. Contains LVR27A-602, LVR27A-600R, SWL10A-601 and ROD16-3
Y20DAB-2	Mounts actuator to side of duct or wall. Contains LVR27A-602, LVR27A-600R, SWL10A-601 (2 each), ROD16-3, and BKT22A-602
LVR27A-602	Crank arm for use with 3/8 inch (9.5 mm) square drive crank arm for use on all actuators with adjustable radius from 1-11/16 to 2-7/8 inch (37.5 to 78 mm) (Furnished with spring return actuators)
BKT19A-600	Blade arm to connect linkage to damper blade (other than D-1300)
DMPR-KC300	Swivel ball joint, 1/4 - 28 inch UNF stud with hex nut and washer (sold individually)
D-3073-604	Ball joint connector for Y20DFC-1 kit
DMPR-KC102	Push rod, 5/16 inch (8 mm) diameter x 48 inch long plated steel shaft
ROD16-3	Push rod, 5/16 inch (8 mm) diameter x 24 inch long plated steel shaft, 10 per kit
BKT22A-602	Mounting bracket, right angle
Valve Linkage	
Y20EBA-1	Used with selected Honeywell valves and M130/M120 actuators, produces 75 lb (334 N) seating force
Y20EBA-2	Used with selected Honeywell valves and M150 actuators, produces 270 lb (1202 N) seating force
Y20EBA-3[2]	Used with Barber-Coleman valves between 1/2 and 1-1/4 inch and M130/M120 actuator, produces 75 lb (334 N) seating force
Y20EBA-4[2]	Used with Barber-Coleman valves between 1/2 and 1-1/4 inch and M150 actuators, produces 270 lb (1202 N) seating force
Y20EBD-1	Used with M130/M120 actuators, produces 75 lb (334 N) seating force
Y20EBD-2	Used with M140 actuators, produces 150 lb (607 N) seating force
Y20EBD-3	Used with M150 actuators, produces 270 lb (1202 N) seating force
Y20EBD-5	Used with M110 actuators, produces 40 lb (178 N) seating force
Y20EBD-6	Used with M130/M120 actuators, produces 100 lb (449 N) seating force
Y20EBE-1	Stem adaptor used to convert valves with 5/16 inch stems (older Johnson 1/2 to 3 inch)
Y20EBE-2	Mounting kit for VT valves in addition to Y20EBD-5
Y20EBE-3	Hold Down Nut for Barber-Coleman 1/2 and 2 inch valves.
Y20EBE-4	Valve Stem Connector for Barber-Coleman 2-1/2 to 4 inch valves, 5 per pkg
Y20EBE-11	Valve Linkage Adaptor Kit for VG7000 Valves Used with Y20EBD serves linkage kits

1. Y68 transformers cannot be used on M100 models with E, C, and Q interface boards.
2. Larger Barber-Coleman valves should use Y20EBD linkage kits.
   Lock Nut Y20EBE-4 can be used in the place of Barber-Coleman nut No. OYBB-227 and as a replacement for the nut furnished with 2-1/2 inch and larger [VB valves].

M100 Series Actuator Replacement Components (Continued)

Technical Specifications

M100 Series Actuator		
Power Requirements		24 VAC (20 to 30 VAC) at 50/60 Hz, 25 VA spring return, 20 VA non-spring return
Ambient Conditions	**Operating**	-40° to 125°F (-40° to 52°C), 90% RH non-spring return -35° to 125°F (-37° to 52°C), 90% RH spring return
	Storage	-40° to 125°F (-40° to 52°C), 90% RH
Mechanical Connection		3/8 inch (9.5 mm) square shaft (both ends) Maximum dead weight on output shaft is 200 lb (91 kg) on load end and 10 lb (4.5 kg) on auxiliary end
Mechanical Output		Running Torque, breakaway and stall (minimum):
	M110	25 lb-in (2.8 Nm) Spring Return 100 lb-in (11 Nm)
	M120	35 lb-in (4.0 Nm) 70 lb-in (7.9 Nm)
	M130	50 lb-in (5.6 Nm) Spring Return 200 lb-in (23 Nm)
	M140	75 lb-in (8.5 Nm) 150 lb-inb (17 Nm)
	M150	150 lb-in. (17 Nm) 200 lb-in (34 Nm)
Rotation Range	**M100A**	Fixed zero, adjustable full travel, 45 to 270°, factory set at 90°
	M100F	0 to 270°, no internal limits - requires controller limiting
	M100X	Requires R81 electronic kit
	M100C, E, G, J, M, and Q	Fixed zero, adjustable full travel 65 to 270°, factory set at 90°
Rotation Timing		60 seconds for 160° travel nominal 38 seconds for 90° travel nominal 40 seconds for 90° spring return nominal
Cycle Life		200,000 cycles at rated load, non-spring return 150,000 cycles at rated load, spring return
Electrical Connection		1/4 inch spade terminals
Enclosure		NEMA 2, IP52
Agency Compliance **EU Directive Compliance**	**UL**	All models with 24 VAC input, without auxiliary switch kit or potentiometer kit UL 916 Listed, File EE107041, Guide PAZX 24/120 VAC input, including auxiliary switch kit; UL 873 Recognized, File E27734, Guide XAPX2, M100X and R81: No UL Listing
	CSA	24/120 VAC input, including auxiliary switch kit and potentiometer kit C22.2 No. 24 Certified, File LR948, Class 4813 02 M100X and R81: No CSA Certification (CE Mark)

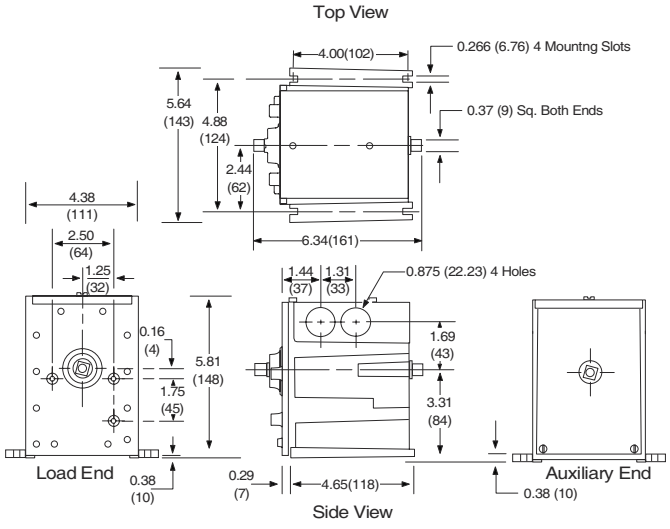
Input Signal Data for M100 Series Actuators (Part 1 of 2)

Actuator	Input Signal
M100A	**On/Off Floating Control** **Input Signal:** SPDT On/Off/Floating or 24 VAC Floating Control **Input Signal Adjustments:**None
M100C / R81C	**Digital actuator for use with DSC-1000** **Input Signal:** Digital control input through DSC-1000 Level 1 Bus **Input Signal Adjustments (Switch Selectable):** Master or slave actuator Linear or S-curve flow characteristics Level 1 or Zone Bus communications Address selection **Action (Switch Selectable):** Direct or reverse rotation **Factory Settings:** Master actuator, S-curve flow, L1 bus, L1 address 27, CW rotation on command increase (Direct Action)
M100E / R81E	**Mixed-Air Economizer with outdoor air changeover relay and SPDT refrigeration programming relay** **Input Signal:** Proportional control, thermistor sensor input (use A91 or T91 sensors) **Input Signal Adjustments:** Mixed air setpoint 40 to 90°F (5 to 32°C) Adjustable proportional band 2 to 20°F (1.1 to 11°C) Adjustable minimum position 0 to 70% **Action:** CW rotation on temperature increase (fixed) **Factory Settings:** Setpoint 65°F (32°C) Proportional band 2°F (1.1°C) Minimum position 0% **Programming Relay:** 5 amp resistive, 30 VDC, 120 VAC **Contact Rating:** 3 amp inductive, 1/8 HP at 120 VAC
M100F / R81F	**Incremental actuator with position feedback for use with DSC-8500 system through FIC-101 interface.** No internal travel limits, external control of travel required **Input Signal:** ±12 to 16 VDC incremental input **Input Signal Adjustments:** None **Action:** Positive signal CCW travel; negative signal CW travel **Feedback Signal:** Feedback signal proportional to 300° of actuator rotation (fixed) Separate supply 12 VDC maximum

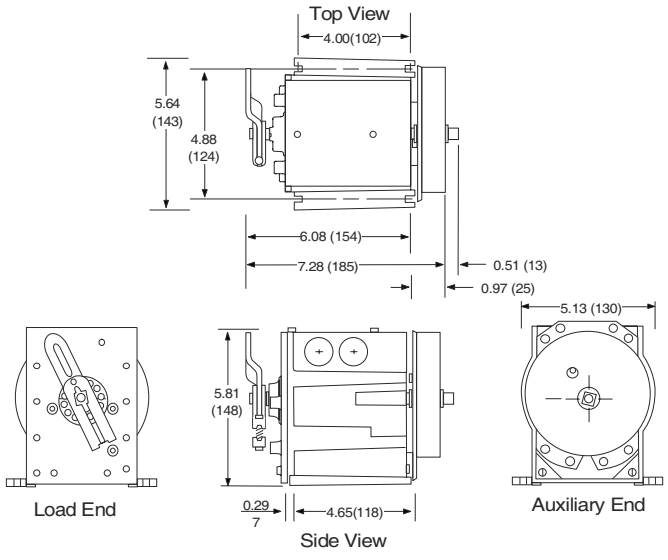
M100 Series Actuator Replacement Components (Continued)

Input Signal Data for M100 Series Actuators (Part 2 of 2)

Actuator	Input Signal	
M100G / R81G	**Proportional Control**	
	Input Signal:	0 to 24 VDC input; 0 to 20 mA input with 500 ohm resistor (included) or 0 to 24 mA DC input with 750 ohm resistor (optional)
	Input Signal Adjustments:	Adjustable zero: 0.25 to 24 VDC Adjustable span: 2 to 18 VDC
	Action:	Direct or reverse (jumper selectable)
	Factory Settings:	4 to 20 mA controller input CW rotation on signal increase (direct action)
	Input Impedance:	44K ohms (VDC input)
M100J / R81J	**Proportional or 3-wire potentiometer control**	
	Input Signal:	Proportional control, 3-wire 135 to 1000 ohm potentiometer input, 0 to -2 VDC input or 0 to 24 VDC with fixed 6V zero and 4V span for 6 to 10 VDC operation
	Input Signal Adjustments:	None
	Action:	0 to 24 VDC (CW rotation on signal increase) 0 to -2 VDC (CCW rotation on signal increase)
M100M / R81M	**Direct interface to Honeywell Series 90 135 ohm slidewire controllers and W973 and W7100 Series Controllers**	
	Input Signal:	Proportional Control, 3-wire 135 to 1000 ohm potentiometer input or 0.5 to 1.4 VDC input
	Input Signal Adjustments:	None
	Action:	0.5 to 1.4 VDC (CCW rotation on signal increase)
M100Q / R81Q	**Proportional with thermistor input**	
	Input Signal:	Proportional control, thermistor sensor input (use A91 or T91 sensors)
	Input Signal Adjustments:	Adjustable proportional band 2 to 30°F (0.1 to 17°C)
	Set point Range (by model):	R81QAA-1 40 to 90°F (5 to 32°C) R81QAA-2 15 to 50°F (-9 to 10°C) R81QAA-3 60 to 120°F (15 to 50°C)
	Action:	Direct or reverse (jumper selectable)
	Factory Settings: Set point (by model):	R81QAA-1 65°F (18°C) R81QAA-2 30°F (-1°C) R81QAA-3 90°F (32°C)
	Proportional Band:	30°F (17°C), CW rotation on temperature increase (direct action)



M120, M140, and M150 Dimensions, in. (mm)



M110 and M130 Dimensions, in. (mm)