

M100E Economizer Series Actuator with R81EAA-2 Interface Board for Thermistor Sensor Applications

The M100E Economizer Series Actuators are used to control outdoor air, return air, and exhaust air dampers to maintain the M100E mixed air temperature setpoint. The R81EAA-2 electronics in the actuator allow economical use of outdoor air for natural or free cooling and reduce energy consumption by minimizing compressor run time.

The M100E economizer actuator has changeover and refrigeration programming relays, minimum position, mixed air setpoint, mixed air proportional band, and actuator travel adjustments.

The internal changeover relay and refrigeration programming relay can be wired in various ways that provide control sequences utilizing available natural cooling. For these cooling options, use the M100E with A19, A319, or A419 Temperature Controls (sensible changeover) or an enthalpy changeover control.

The R81EAA-2 is compatible with Johnson Controls thermistor-type sensors. Use A91 Thermistor Sensors for direct mixed air control or T91 Thermistor Room Thermostats for ventilation only systems.

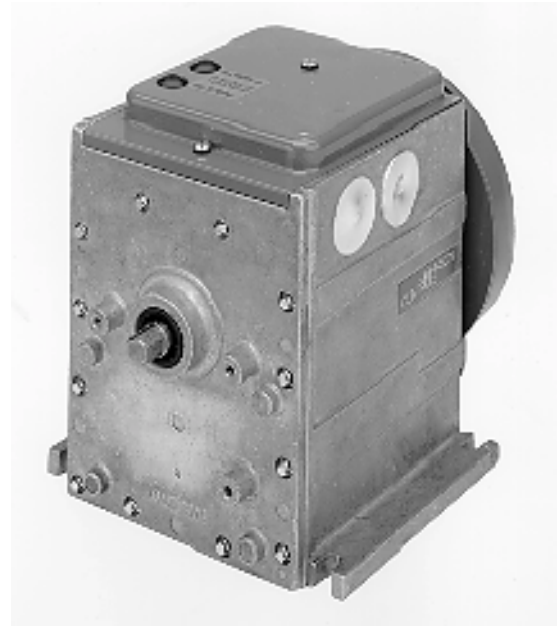


Figure 1: M100E Series Actuator

Features and Benefits	
☐ Output Versatility	Allows linkage connections on both ends of output shaft for dampers and full power in both directions
☐ Load Versatility	Available in torques of 25, 35, 50, 75, and 150 lb·in (2.8, 4.0, 5.6, 8.5, and 17.0 N·m)
☐ Top Cover Mounted Circuit Board	Provides adjustment of proportional band and minimum position potentiometers without removing the cover
☐ R81 Plug-in Electronics Interface Board	Allows faster installation or conversions and when necessary, shorter service times; reduces inventory
☐ Special Oil Mixture in Gear Case	Provides the longest life cycle cost/benefits in the industry

Operation

IMPORTANT: M100E actuators are intended to control equipment under normal operating conditions. Where failure or malfunction of M100E actuators could lead to an abnormal operating condition that could cause personal injury or damage to the equipment or other property, other devices (limit or safety controls) or systems (alarm or supervisory) intended to warn of, or protect against, failure or malfunction of M100E actuators must be incorporated into and maintained as part of the control system.

Refer to Figure 2 and the following description to find out how the M100E accomplishes greater energy savings than a non-economizer actuator.

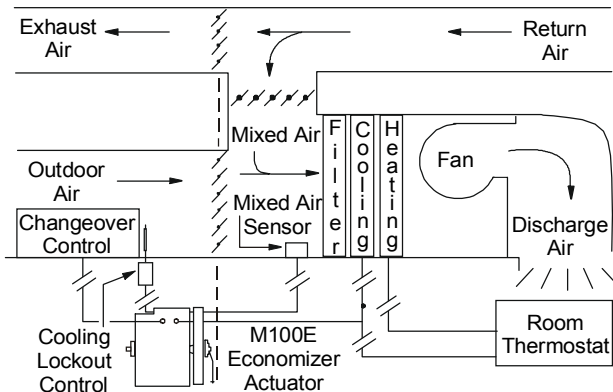


Figure 2: Typical Installation Flow Diagram

When outdoor air can provide natural or free cooling, the first stage of cooling enables control of outdoor air dampers. When outdoor air is not available for cooling (as determined by changeover status), the mechanical cooling stages are enabled.

When the outdoor air parameters are below the changeover setpoint, the changeover control contacts close, energizing the changeover relay. On a signal for cooling from the room thermostat, the actuator is modulated to maintain the mixed air setpoint.

Should the outdoor air parameters rise too high for natural cooling, the contacts of the changeover control open. The changeover relay de-energizes, and the actuator returns to its minimum position, which positions the outdoor air dampers for minimum ventilation.

The refrigeration programming relay is used when two stages of cooling are needed. When outside conditions are low enough for natural cooling, the outside air changeover control energizes the refrigeration programming relay, which switches the first stage of cooling to outside air. The second stage of cooling becomes the first stage of mechanical cooling.

Refer to the *M100E Economizer Series Actuator with R81EAA-2 Interface Board for Thermistor Sensor Applications Application Note (LIT-2681130 in FAN 268.1 or 1628.3)* for wiring configurations.

Dimensions

Figure 3 shows the dimensions for an M100E actuator with a switch kit. Figure 4 shows the dimensions for a CVR83A-600R Weather Cover Kit. Figure 5 shows the dimensions for a standard M100E spring return actuator.

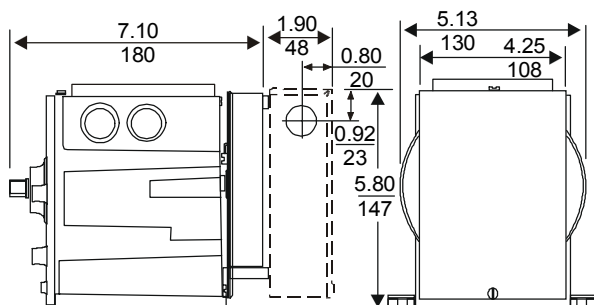


Figure 3: M100E Spring Return with Switch Kit, in. (mm)

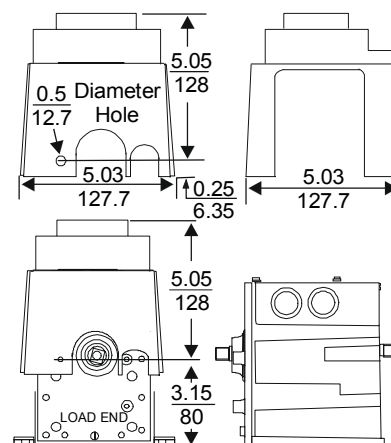


Figure 4: CVR83A-600R Weather Cover Kit, in. (mm)

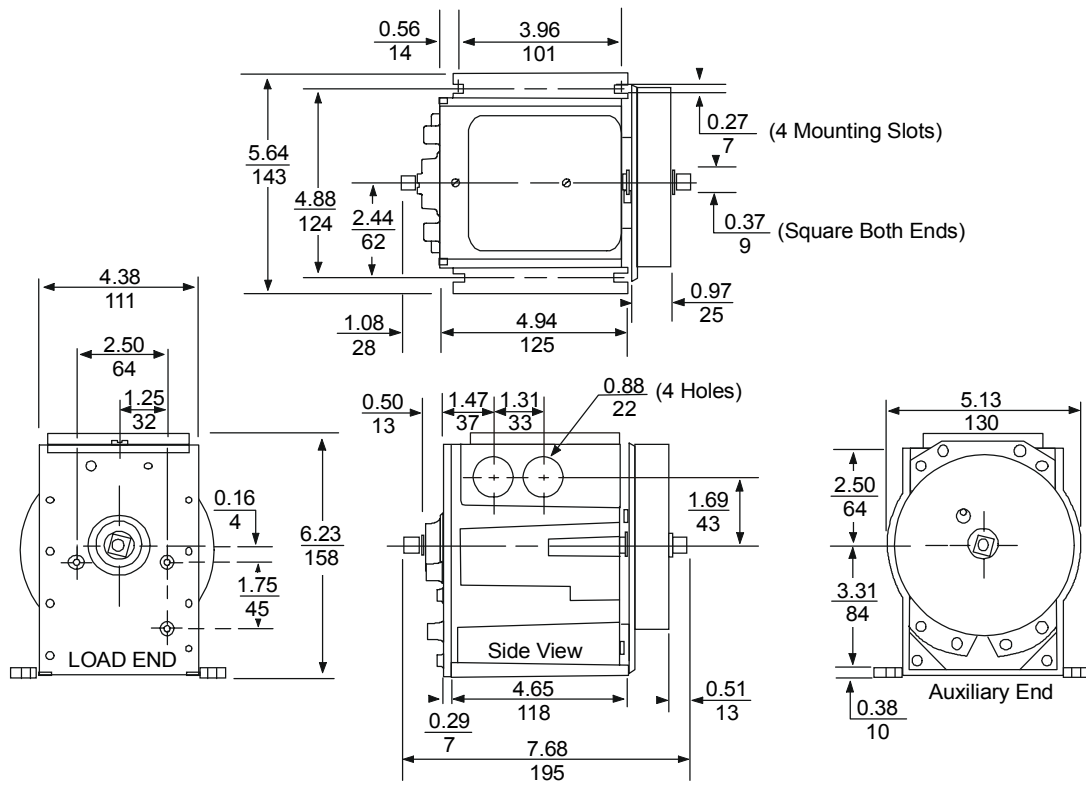


Figure 5: M100E Spring Return Actuator Dimensions, in. (mm)

Repair and Replacement

The drive motor and gear train are immersed in oil and sealed in a die cast case, so maintenance is not necessary.

Make no field repairs, except for replacement of the R81E electronics kit. Refer to the *Ordering Information* section for the desired product code number, and contact the nearest Johnson Controls representative.

Ordering Information

Table 1: Actuators and Electronics Kits

Product Code Number	Description
M110EGA-1	25 lb·in (2.8 N·m) Torque, Spring Return Economizer Actuator
M130EGA-1	50 lb·in (5.6 N·m) Torque, Spring Return Economizer Actuator
R81EAA-2	Thermistor Sensor Input Economizer Control Electronics Kit
M110XGA-1*	25 lb·in (2.8 N·m) Torque, Spring Return Actuator
M120XGA-1*	35 lb·in (4.0 N·m) Torque, Non-spring Return Actuator
M130XGA-1*	50 lb·in (5.6 N·m) Torque, Spring Return Actuator
M140XGA-1*	75 lb·in (8.5 N·m) Torque, Non-spring Return Actuator
M150XGA-1*	150 lb·in (17 N·m) Torque, Non-spring Return Actuator

* Requires R81 Electronics Kit

Table 2: Accessories

Product Code Number	Description
Y68AA-1	Transformer, 120/24 VAC, 40 VA, 60 Hz, Class 2
Y68DA-1	Transformer, 240/24 VAC, 40 VA, 60 Hz, Class 2
Y68HA-1	Transformer, 24/24 VAC, 40 VA, 60 Hz, Class 2
S91DJ-1	Auxiliary switch kit with one Single-Pole, Double-Throw (SPDT) switch
S91EJ-1	Auxiliary switch kit with two SPDT switches
S91PT-1	Auxiliary potentiometer kit, 1000 ohm, 1/3 watt
CVR83A-600R	Weather cover kit
Y20DAA-2	Mounts the actuator to the top of a duct or any flat surface. Contains the LVR27A-602, LVR27A-600, ROD16-3, and SWL10A-603Y (2).
Y20DAB-2	Mounts the actuator to the side of a duct or wall. Contains all items in the Y20DAA-2 plus one BKT22A-602.
Y20EBA-1	Valve linkage kit for mounting Honeywell® valves with 1/4-28 stem connection to M120 or M130 actuators
Y20EBA-2	Valve linkage kit for mounting Honeywell valves with 1/4-28 stem connection to M150 actuators
Y20EBA-3	Valve linkage kit for mounting Barber-Colman® valves with 1/4-28 stem connection to M120 or M130 actuators
Y20EBA-4	Valve linkage kit for mounting Barber-Colman valves with 1/4-28 stem connection to M150 actuators
Y20EBD-1	Linkage kit for M120 or M130 actuators and 1-1/4 in. (DN 32) valves, produces 75 lb (334 N) seating force
Y20EBD-2	Linkage kit for M140 actuators and 1-1/4 in. (DN 32) valves, produces 150 lb (607 N) seating force
Y20EBD-3	Linkage kit for M150 actuators and 1-1/4 in. (DN 32) valves, produces 270 lb (1202 N) seating force
Y20EBD-5	Linkage kit for M110 actuators and 1-1/4 in. (DN 32) valves, produces 40 lb (178 N) seating force
Y20EBD-6	Linkage kit for M120 or M130 actuators and 1-1/4 in. (DN 32) valves, produces 100 lb (449 N) seating force
Y20EBE-1	Coupling adaptor to convert valves with a 5/16 in. stem and a hold down nut for Johnson Controls 1/2 to 3 in. valves manufactured prior to March 1969
Y20EBE-2	Stem adaptor and centerpiece collar to adapt VT Series valves with slotted stems. (Y20EBD-5 also required.)
Y20EBE-3	Hold down nut for cast iron and VB Series 2-1/2 to 4 in. valves and yoke nut for Barber-Colman 1/2 to 2 in. valves
Y20EBE-4*	Stem connector for Barber-Colman 2-1/2 to 4 in. valves, 5 per package. (Use with Y20EBD-3 or -6.)
Y20EBE-11	Valve Linkage Adaptor Kit for VG7000 valves. (Y20EBD Series kit also required.)
VG7000-M110	Mounting Kit for M110 actuator and 1/2 through 2 in. (DN15 through DN50) valves
VG7000-M130	Mounting Kit for M130 actuator and 1/2 through 2 in. (DN15 through DN50) valves
VG7000-M140	Mounting Kit for M140 actuator and 1/2 through 2 in. (DN15 through DN50) valves
VG7000-M150	Mounting Kit for M150 actuator and 1/2 through 2 in. (DN15 through DN50) valves
Y20DFC-1	Damper linkage kit for mounting the actuator to CD-1300 dampers only (includes a universal mounting bracket for inside or outside damper frame mounting)

Notes

Specifications

Product	M100E Economizer Series Actuator with R81EAA-2 Interface Board	
Power Requirements	24 VAC, Class 2, (20 to 30 VAC) at 50/60 Hz, 25 VA spring return, 20 VA non-spring return	
Input Signal	Proportional control, thermistor sensor input using A91 or T91 sensors	
Input Signal Adjustments	Mixed air setpoint 40 to 90°F (5 to 32°C) Adjustable proportional band 2 to 20F° (1.1 to 11C°) Adjustable minimum position 0 to 70% of full travel	
Mechanical Connection	3/8 in. (9.5 mm) square shaft (both ends) Maximum dead weight on output shaft: 200 lb (91 kg) on load end; 10 lb (4.5 kg) on auxiliary end	
Mechanical Output	Running Torque	Breakaway and Stall (minimum)
	M110 25 lb-in (2.8 N·m) spring return	100 lb-in (11 N·m)
	M120 35 lb-in (4.0 N·m)	70 lb-in (7.9 N·m)
	M130 50 lb-in (5.6 N·m) spring return	200 lb-in (23 N·m)
	M140 75 lb-in (8.5 N·m)	150 lb-in (17 N·m)
	M150 150 lb-in (17 N·m)	300 lb-in (34 N·m)
Rotation Range	Fixed zero, adjustable full travel 65 to 270°, factory set at 90°	
Rotation Timing (at Rated Load)	60 seconds for 160° travel nominal, 60 Hz 38 seconds for 90° travel nominal, 60 Hz 75 seconds for 90° spring return	
Cycle Life	M110EGA-1, M130EGA-1: 150,000 cycles at rated load. Duty cycle, 25%	
Electrical Connection	1/4 in. spade terminals	
Action	CW rotation on temperature increase (fixed)	
Factory Settings	Setpoint 65°F (18°C); Proportional band 2F° (1.1C°); Minimum position 0%	
Programming Relay	Contacts: SPDT, Class 2 circuit Coil: 24 VAC, 1 VA, Class 2 circuit	
Changeover Relay	24 VAC, 1 VA, Class 2 circuit (contacts connected internally)	
Ambient Operating Conditions	Non-spring Return: -40 to 125°F (-40 to 52°C), 90% RH Spring Return: -35 to 125°F (-37 to 52°C), 90% RH	
Ambient Storage Conditions	-40 to 140°F (-40 to 60°C), 90% RH	
Enclosure	NEMA 2, IP32	
Dimensions (H x W x D)	Spring Return: 6.23 x 5.64 x 7.68 in. (158 x 143 x 195 mm) Non-spring Return: 6.23 x 5.64 x 4.94 in. (158 x 143 x 125 mm)	
Shipping Weight	Spring Return: 9 lb (4.1 kg) Non-spring Return: 6.5 lb (2.9 kg)	
Agency Compliance	UL: M110EGA-1, M130EGA-1: UL 916 Listed, File 107041, CCN PAZX UL 873 Recognized, File E27734, CCN XAPX2 M100X and R81: No UL Listing CSA: M110EGA-1, M130EGA-1: C22.2 No. 24 Certified, File LR948, Class 4813 02 M100X and R81: No CSA Certification	
EU Directive Compliance	89/336/EEC (CE Mark)	

The performance specifications are nominal and conform to acceptable industry standards. For application at conditions beyond these specifications, consult the local Johnson Controls office. Johnson Controls, Inc. shall not be liable for damages resulting from misapplication or misuse of its products.



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