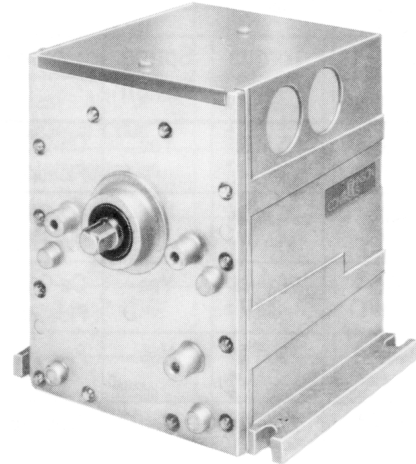


M100 Series Motor Actuator

Use M100 Series Motor Actuators to position dampers, valves, and related equipment in HVAC and industrial applications.

The M100 actuator family includes five torque ratings, two spring return models, choice of control inputs, and a variety of accessories to cover any application.

Control inputs include On-Off/Floating control action or proportional control action. The proportional units feature interchangeable R81 electronic interface boards enabling a variety of different proportional inputs.



Features and Benefits	
<input type="checkbox"/> Output Versatility	Both ends of output shaft can be used for linkage connections for dampers
<input type="checkbox"/> Load Versatility	Available torque's of 25, 35, 50, 75, and 150 in-lbs
<input type="checkbox"/> Travel Adjustment Located in Top Wiring Compartment	Easy field screwdriver adjustment
<input type="checkbox"/> Reduces Service Inventory	M100X combines with multiple options
<input type="checkbox"/> Application Versatility	Models to match any control signal protocol including digital
<input type="checkbox"/> R81 Plug-in Electronic Interface Boards	Faster installations or conversions and when necessary, shorter service times
<input type="checkbox"/> Quick Connect Terminals	Interfaces with packaged AC units
<input type="checkbox"/> New Rotor And Stator	Each are state-of-the-art one piece components for efficiency and reliability
<input type="checkbox"/> Special Oil Mixture in Gear Case	Provides the longest life cycle cost/benefit in the industry
<input type="checkbox"/> Reversible Motor	Ability to drive both ways that allows control back to zero position rather than requiring spring return to zero

Models

The following table lists typical models ordered and their descriptions.

For other model options, refer to Tables 3 to 6 in the *Model Selections* section.

Table 1: Models

Model	Torque	Spring Return	Action	Control Input	Power Source	Auxiliary Switch
M110AAB-1	25 in-lb	Yes	On-Off/ Floating	Three wire SPDT snap acting or floating switch*	120 VAC***	One SPDT
M110AGA-1	25 in-lb	Yes	On-Off/ Floating	Three wire SPDT snap acting or floating switch*	24 VAC	None
M110AGB-1	25 in-lb	Yes	On-Off/ Floating	Three wire SPDT snap acting or floating switch*	24 VAC	One SPDT
M110GGA-1	25 in-lb	Yes	Proportional	VDC/mA, adjustable zero and span, clockwise on signal increase	24 VAC	None
M110JGA-1	25 in-lb	Yes	Proportional	Three wire 135 ohm, 6 to 10 VDC, or 0 to -2 VDC, clockwise on signal increase	24 VAC	None
M110JGB-1	25 in-lb	Yes	Proportional	Three wire 135 ohm, 6 to 10 VDC, or 0 to -2 VDC, clockwise on signal increase	24 VAC	One SPDT
M110XGA-1	25 in-lb	Yes	Proportional	Field installation of R81 kit required**	24 VAC	None
M120AAA-1	35 in-lb	No	On-Off/ Floating	Three wire SPDT snap acting or floating switch*	120 VAC***	None
M120AAC-1	35 in-lb	No	On-Off/ Floating	Three wire SPDT snap acting or floating switch*	120 VAC***	Two SPDT
M120AGA-1	35 in-lb	No	On-Off/ Floating	Three wire SPDT snap acting or floating switch*	24 VAC	None
M120CGA-2	35 in-lb	No	Proportional	Digital protocol compatible with Metasys® AHU or UNT zone bus, or DSC-1000 system level 1 bus	24 VAC	None
M120GGA-1	35 in-lb	No	Proportional	VDC/mA, adjustable zero and span, clockwise on signal increase	24 VAC	None
M120JAA-1	35 in-lb	No	Proportional	Three wire 135 ohm, 6 to 10 VDC, or 0 to -2 VDC, clockwise on signal increase	120 VAC***	None
M120JGA-1	35 in-lb	No	Proportional	Three wire 135 ohm, 6 to 10 VDC, or 0 to -2 VDC, clockwise on signal increase	24 VAC	None
M120XGA-1	35 in-lb	No	Proportional	Field installation of R81 kit required**	24 VAC	None

* Conversion of these units to proportional control is not possible.

** These units are not UL Listed for use as a new installation.

*** Includes factory installed cover mounted transformer on models M100A, F, G, H, J, M, and Q only.

Model (Cont.)	Torque	Spring Return	Action	Control Input	Power Source	Auxiliary Switch
M130AAB-1	50 in-lb	Yes	On-Off/ Floating	Three wire SPDT snap acting or floating switch*	120 VAC***	One SPDT
M130AGA-1	50 in-lb	Yes	On-Off/ Floating	Three wire SPDT snap acting or floating switch*	24 VAC	None
M130AGB-1	50 in-lb	Yes	On-Off/ Floating	Three wire SPDT snap acting or floating switch*	24 VAC	One SPDT
M130CGA-2	50 in-lb	Yes	Proportional	Digital protocol compatible with Metasys AHU or UNT zone bus, or DSC-1000 system level 1 bus	24 VAC	None
M130GGA-1	50 in-lb	Yes	Proportional	VDC/mA, adjustable zero and span, clockwise on signal increase	24 VAC	None
M130JGA-1	50 in-lb	Yes	Proportional	Three wire 135 ohm, 6 to 10 VDC, or 0 to -2 VDC, clockwise on signal increase	24 VAC	None
M130JGB-1	50 in-lb	Yes	Proportional	Three wire 135 ohm, 6 to 10 VDC, or 0 to -2 VDC, clockwise on signal increase	24 VAC	One SPDT
M130XGA-1	50 in-lb	Yes	Proportional	Field installation of R81 kit required**	24 VAC	None
M140AAA-1	75 in-lb	No	On-Off/ Floating	Three wire SPDT snap acting or floating switch*	120 VAC***	None
M140AGA-1	75 in-lb	No	On-Off/ Floating	Three wire SPDT snap acting or floating switch*	24 VAC	None
M140GGA	75 in-lb	No	Proportional	VDC/mA, adjustable zero and span, clockwise on signal increase	24 VAC	None
M140JAA-1	75 in-lb	No	Proportional	Three wire 135 ohm, 6 to 10 VDC, or 0 to -2 VDC, clockwise on signal increase	120 VAC***	None
M140JGA-1	75 in-lb	No	Proportional	Three wire 135 ohm, 6 to 10 VDC, or 0 to -2 VDC, clockwise on signal increase	24 VAC	None
M140XGA-1	75 in-lb	No	Proportional	Field installation of R81 kit required**	24 VAC	None
M150AGA	150 in-lb	No	On-Off/ Floating	Three wire SPDT snap acting or floating switch*	24 VAC	None
M150AGB	150 in-lb	No	On-Off/ Floating	Three wire SPDT snap acting or floating switch*	24 VAC	One SPDT
M150CGA-2	150 in-lb	No	Proportional	Digital protocol compatible with Metasys AHU or UNT zone bus, or DSC-1000 system level 1 bus	24 VAC	None
M150GGA-1	150 in-lb	No	Proportional	VDC/mA, adjustable zero and span, clockwise on signal increase	24 VAC	None
M150JGA-1	150 in-lb	No	Proportional	Three wire 135 ohm, 6 to 10 VDC, or 0 to -2 VDC, clockwise on signal increase	24 VAC	None
M150JGB-1	150 in-lb	No	Proportional	Three wire 135 ohm, 6 to 10 VDC, or 0 to -2 VDC, clockwise on signal increase	24 VAC	One SPDT
M150JGC-1	150 in-lb	No	Proportional	Three wire 135 ohm, 6 to 10 VDC, or 0 to -2 VDC, clockwise on signal increase	24 VAC	Two SPDT
M150XGA-1	150 in-lb	No	Proportional	Field installation of R81 kit required**	24 VAC	None

* Conversion of these units to proportional control is not possible.

** These units are not UL Listed for use as a new installation.

*** Includes factory installed cover mounted transformer on models M100A, F, G, H, J, M, and Q only.

Application

The M100 provides the appropriate interface for a variety of electronic controllers depending on the model selected.

The M100 Series Motor Actuators are available in five basic torque ratings:

- M110 25 in-lb (2.8 N·m)
- M120 35 in-lb (4.0 N·m)
- M130 55 in-lb (5.6 N·m)
- M140 75 in-lb (8.5 N·m)
- M150 150 in-lb (17 N·m)

Other than M100A and M100X, all models include a solid-state drive. Order the M100 series proportional base motor with the interface board factory installed as shown in the *Model Selection* section. For easy conversion should requirements change or quick replacement be required, changeable interface boards provide greater application versatility. Order the basic proportional actuators as M100X units less the R81 interface board.

Other M100 features include: a single size housing for all units, linkage connection to either end of the output shaft, and a die-cast aluminum housing with a corrosion-resistant steel cover.

CVR83A-600R weather resistant covers with a NEMA 3 rating are available to fit all M100 motor actuators. The weather resistant cover is to be used only on motor actuators mounted in a upright position

Damper linkage kits include the Y20DAA-2 and Y20DAB-2 for commercial dampers and Y20DFC-2 (replaces Y20DFC-1) for the D1300 family of dampers.

M100 actuators can be field coupled or are available factory coupled to Johnson Controls VB Series Valves. 1/2 inch VT Series Valves also require a Y20EBE-2 adapter kit. Refer to Tables 8 through 11 and Y20 ordering data for the required coupling kits. Specify factory coupling by listing the appropriate Q99 designations on the order as shown in the specifications table. Y20 kits are also available for replacement or conversion of competitive valves as shown in Table 8 in the *Valve Linkage* section.

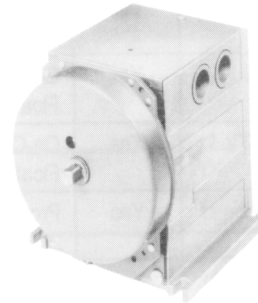


Figure 2: Auxiliary End of Spring Return Model

The M110 and M130 come equipped with spring return to normal position for switched off conditions or on system power failure. The spring return, as shown in Figure 2, is a heavy duty spring mechanism that returns the motor 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.

Note: All series M100 motor actuators are for use only as operating controls. Where an operating control failure would result in personal injury and/or loss of property, it is the responsibility of the installer to add devices (safety, limit controls) or systems (alarm, supervisory systems) that protect against and/or warn of control failure.

Operation

All M100 models are reversible and available with on-off/floating control action or proportional control action.

The M100A Series Actuators operate from SPDT on-off or floating control switches with a minimum rating of one amp at 24 VAC. The travel is adjustable from 45 to 270 degrees.

Proportional controlled motor actuators accept various types of control signal inputs and operate from various selected electronic controllers or sensors. The travel is adjustable from 65 to 270 degrees.

Upright mounting of the motor actuator is required.

An adjustable crank arm with a square drive is available for damper applications. The slotted damper crank arm allows an adjustable radius from 1-11/16 inch to 2-7/8 inch. The crank arm is secured to the motor actuator shaft in position increments of 22-1/2 angular degrees. Spring return models include the crank arm and it is optional on others as shown in Table 5.

All reference to direction of rotation is when viewing the load end as stamped on the actuator housing. The spring return can only drive CCW. Travel to angle position is CW.

M100A

The M100A Series Motor Actuator is used in applications where dampers or valves are to be driven fully open or closed. Its applications range from opening and closing a diverting valve, tow positioning a hot water, chilled water, or steam valve, controlling an inlet vane damper on a fan, opening and closing combustion air dampers and exhaust dampers, face and bypass damper applications to open and close the heating or cooling valve, etc.

The M100A Series Motor Actuator can be operated with electro-mechanical, electronic, or DDC controllers. It can be operated by Power Opening and Power Closing (PO/PC) or floated by a tri-state output (Johnson P74J).

Floating controllers (single-pole double throw with center off) and tri-state controllers (two SPST relays one connected to CW and one connected to CCW) operate basically the same way. When the sensed temperature is within the setpoint deadband, neither winding is powered and the motor remains in the existing position. If the sensed condition (temperature, pressure, etc) rises above the setpoint deadband, the motor will open or close the valve or damper to bring the sensed condition back into the setpoint deadband. The same sequence occurs on a fall in the sensed condition below the setpoint deadband.

Power open and power close controllers use snap acting single-pole, double-throw contacts to control the M100A Motor Actuator. One stationary contact is wired to CW and the other to CCW.

A change in sensed condition shall flip the movable contact to one or the other stationary contact driving the M100A Motor Actuator CW or CCW so that the valve or damper controlled by the M100A can bring the sensed condition back to the setpoint.

M100C

The M100C Series Motor Actuator is used in damper and valve applications where proportional control from a digital controller is required.

The M100C has the capability of communicating with Metasys AHU/UNT or DSC-1000 controllers depending on the position of the 8-pin DIP switch. Other functions that are user programmable include master or slave configuration, direct or reverse acting mode, the address to which the actuator will respond and the linear or S-curve response characteristic.

The M100C is factory calibrated for direct acting where a 0 to 100% command input will provide a CW shaft output (0% = full CCW and 100% = full CW) as viewed from the load end. Field selection is possible for reverse acting where a 0 to 100% command input will provide a CCW shaft output (100% = full CCW and 0% = full CW) as viewed from the load end.

The Low/High Sequence feature is used when proportional sequencing multiple dampers or valves. The low sequence actuator rotates proportionally through its full travel during the first 50% of the output command. If the demand increases, the high sequence actuator rotates proportionally through its full travel as the input command increases from 50% to 100%.

Configure multiple actuators with a separate address when each one performs a different function. When they all perform the same function, set one unit as the master, with the remaining units on that address set as slaves.

M100E

The M100E Economizer Actuator has a changeover relay, refrigeration programming relay, minimum position, mixed air setpoint, mixed air proportional band and actuator travel adjustment.

M100E Motor Actuators control outdoor air, return air, and exhaust air dampers to maintain the proper air mix. The motor actuator allows economical use of outdoor air for natural cooling and reduces energy consumption by minimizing the compressor runtime.

The internal changeover relay and refrigeration programming relay have various ways of wiring that provide control sequences utilizing available natural cooling. Wire these cooling options with A19 Temperature Controls (sensible

changeover) or an EQ-6001 (economizer logic network controller).

Use A91 Thermistor Sensors for direct mixed air control and T91 Thermistor Room Thermostats for ventilation only systems.

M100F

The M100F Series Motor Actuator is used in damper and valve applications where proportional control from a DDC controller such as the Johnson DSC-8500 with FIC-101 interface is required.

All travel adjustments are from the remote controller. There are no travel limits (electronic or mechanical) on this device.

M100G and M100H

The M100G (direct acting) and M100H (reverse acting) may accept VDC or mA inputs with “Zero” and “Span” adjustments. The boards are factory set for 0 to 10 VDC (0 to 20 mA). The M100G Motor Actuator provides Clockwise (CW) action on signal increase. The M100H provides Counterclockwise (CCW) action on a signal increase. Spring return is always CCW.

A 500 ohm resistor with quick-connect terminals is factory installed between terminal T1 and the DC input terminal for 0 to 20 mA. Use the resistor for applications with a DC mA controller. Remove the resistor for applications with a DC voltage controller. An optional 750 ohm resistor (RES22A-600) is available for 0 to 24 mA control or use with an N500A interface.

The input impedance in voltage mode of the M100G and M100H Motor Actuators is 44,000 ohms.

M100J

The M100J accepts a Johnson Controls 3-wire 135 to 1000 ohm potentiometer input, a 6 to 10 VDC input or a 0 to -2 VDC electronic controller input.

A maximum of nine additional M100J Motor Actuators may be precision slaved with M100E, G, H, J, and Q models. Each motor will require a separate transformer.

M100M

The M100M provides direct interface with the following Honeywell® controllers:

1. All Series 90™ 135 ohm slidewire controllers
2. W973 and W7100 Series Controllers for modulating valves in heating, cooling, and water source economizer applications

In addition, W973 and W7100 Series Controllers can be accommodated in air-to-air economizer damper applications when using a diode (1N4002) and resistor (620 ohm, 1/2 watt) not included in the kit.

Note: The M100M is not a direct replacement for air side economizers with minimum position and outside air changeover logic as Honeywell wiring diagrams indicate. Refer to the *M100M Proportional Motor Actuator, R81M Interface Board Technical Bulletin* for logic connections.

M100Q

The M100Q Series Motor Actuator is used in damper and valve applications where proportional control from an A91/T91 Thermistor Sensor input for direct or reverse acting is required. It is available with adjustable setpoint ranges of 40 to 90°F (5 to 30°C), 15 to 50°F (-9.5 to 18°C), and 60 to 120°F (15.5 to 49°C), with an adjustable proportional band of 2 to 30°F (1.1 to 16.7°C) minimum. When using a remote setpoint, turn the integral setpoint knob to the low temperature limit. Wire a Y45BA-1 remote setpoint adjuster in series with the A91. When using a T91, use a T91 with integral setpoint.

The M100Q is factory assembled with a jumper installed for direct acting output. Moving the jumper to different terminals will configure the unit for reverse acting output.

M100X

The M100X Motor Actuator is provided without a factory installed R81 Series Interface Board and is not approved for new installations. By adding the appropriate R81 interface board, it becomes a replacement unit for an existing motor actuator.

Interface Board

Table 2: Electronic Interface Selection Chart for M100X

Product Code Series	Description
R81CAA-2	Digital circuit board for multiplex Metasys and DSC-1000 wiring installations
R81EAA-2	Economizer control with changeover relay, refrigeration programming relay, minimum position, and mixed air setpoint
R81FAA-1	Incremental control with position feedback for DDC controllers
R81GAA-1 (CW) or R81HAA-1 (CCW)	0 to 24 VDC/mA input, adjustable zero (0.25 to 22 VDC) and span (2 to 18 VDC), clockwise (G) or counterclockwise (H) models
R81JAA-1	Zero to -2 VDC, 0 to 24 V with fixed zero and span or 3-wire 135 to 1000 ohm potentiometer input, clockwise action on signal input
R81MAA-1	Direct interface with Honeywell Series 90, W973 and W7100 controllers
R81QAA-1, R81QAA-2 or R81QAA-3	Control board for thermistor sensor with ranges of 40 to 90°F (5 to 30°C), 15 to 50°F (-9.5 to 18°C), and 60 to 120°F (15.5 to 49°C)

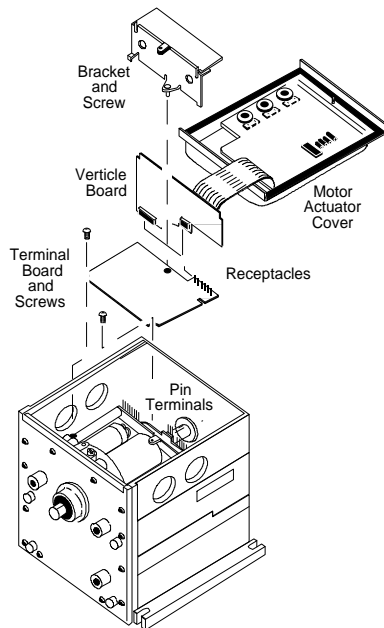


Figure 3: Typical R81 Boards

The R81 Series Interface Boards are field replacements for factory built units. All R81 interface boards are compatible with all M100 Actuators except the M100A, and are easy to install in the field.

R81 interface kits include an electronic control board, a terminal board with male quick connects for wiring and potentiometers for field adjustments, and an identification label. The electrical connections between boards are pin terminals and receptacles. The interface boards are plugged onto the pin terminals on the base model motor actuator and are secured in place with the screws and bracket provided.

Wiring

Runs less than 50 feet (15 m) long should require no shielded cables for the VDC/mA control wiring.

All other wiring will be in accordance with NEC and local regulations.

Do not run low voltage control wiring in the same conduit as line voltage wiring or other conductors that supply highly inductive loads (contactors, coils, motors, generators, etc.).

If the control wiring is over 50 feet (15 m) long, run in a common conduit or near inductive loads, the recommendation is to use shielded cable. Use 22 AWG, Beldfoil 8761 or equivalent for runs up to 250 feet (76 m).

For 250 (76 m) to 500 foot (152 m) runs, use 18 AWG Beldfoil 8760 or equivalent.

All shields are to be connected to earth ground at the controller. At the motor actuator, tape back all shields to prevent any contact with the unit.

Note: To avoid potential miswiring, the recommendation is to use separate transformers on all M100 Motor Actuators.

Model Selections

Use the following example and selection tables to select the desired motor actuator with the required input control.

Note: All combinations of letters or types are not necessarily available. Not all models are factory assembled. Contact Customer Service for details.

Note: All reference to direction of rotation is when viewing the load end. The spring return position is always fully CCW. Travel to angle position is CW.

Example: M130AGA is a 50 in-lb (from Table 3), on/off-floating control (from Table 4), with 24 VAC input (from Table 5) and no auxiliary switches (from Table 6).

Table 3: Base Models

Model	Description
M110	25 in-lb (2.8 N·m) Torque with Spring Return
M120	35 in-lb (4.0 N·m) Torque, Non-Spring Return
M130	50 in-lb (5.6 N·m) Torque with Spring Return
M140	75 in-lb (8.5 N·m) Torque, Non-Spring Return
M150	150 in-lb (17 N·m) Torque, Non-Spring Return

Table 4: Control Options

	Action	Description
A	On-Off/ Floating Action	SPDT On-Off or Floating control input. Mechanical limit switches on ends. Conversion of this unit to proportional control is not possible.
C	Proportional	Communicates on the zone bus of a Metasys AHU or UNT Controller. Digital protocol compatible with DSC-1000 system level 1 bus. Factory calibrated for direct acting (positive signal increase equals positive shaft output) field selectable for reverse acting by switch settings.
E	Proportional	Economizer with changeover relay, refrigeration programming relay, minimum position, mixed air setpoint and proportional band.
F	Incremental	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.
G	Proportional	VDC/mA input (factory calibrated for 0 to 10 VDC), adjustable zero and span, clockwise action on signal increase. 500 ohm resistor factory installed for mA signal.
H	Proportional	VDC/mA input (factory calibrated for 0 to 10 VDC), adjustable zero and span, counterclockwise action on signal increase. 500 ohm resistor factory installed for mA signal.
J	Proportional	Three wire 135 ohm input, 6 to 10 VDC, and 0 to -2 VDC, clockwise action on signal increase
M	Proportional	Direct interface with Honeywell Series 90, W973 and W7100 controllers
Q	Proportional	Thermistor sensor input, jumper selectable for direct or reverse action
X	Proportional*	Field installation of R81 kit required

*This unit is not UL Listed for use as a new installation.

Table 5a: Power Source

Option	Description
A	120 VAC*
D	240 VAC*

Table 5b: Power Source

Option	Description
G	24 VAC
H	24 VAC 1:1 Isolation*

*Includes factory installed cover mounted transformer on models M100A, F, G, H, J, M and Q only.

Table 6: Factory Mounted Accessories

	Description
A	No auxiliary switch
B	One SPDT switch S91DJ-1 installed on auxiliary end of M100
C	Two SPDT switches S91EJ-1 installed on auxiliary end of M100
D	S91 Potentiometer (1000 ohm) installed on auxiliary end of M100

*T*ransformers

Table 7: 24 VAC Transformers

Transformer Number	Primary Power Supply (VAC)	Type of Mounting	Transformer Capacity
Y65AR-1	120	Plate, Foot or 1/2 in. -14 NPS male hub	40 VA
Y65BR-1	240	Plate, Foot or 1/2 in. -14 NPS male hub	40 VA
Y65SR-1	208/240	Plate, Foot or 1/2 in. -14 NPS male hub	40 VA
Y65AP-1	120	1/2 in. -14 NPS male hub	40 VA
Y65KP-1	480	1/2 in. -14 NPS male hub	40 VA
Y65SP-1	208/240	1/2 in. -14 NPS male hub	40 VA
Y68AA-1	120	Cover Mounted	40 VA
Y68DA-1	240	Cover Mounted	40 VA
Y68HA-1	24	Cover Mounted	40 VA
Y63AJB-1	120	Plate	50 VA
Y63KJB-1	480	Plate	50 VA
Y63SJB-1	208/240	Plate	50 VA
Y63ALB-2	120	Foot	50 VA
Y63SLB-2	208/240	Foot	50 VA

An NEC Class 2 transformer is required to provide 24 VAC isolated power supply to the motor actuator with a minimum of 25 VA. A separate isolation transformer (24 VAC to 24 VAC) is also available. Specify Y69GP-1 if required.

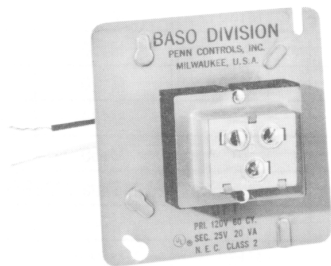


Figure 4: Plate Mounted Transformer

Plate mounted transformers mount on a four inch electrical box within the conduit run.

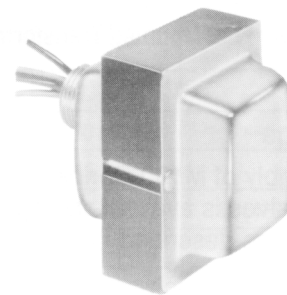


Figure 5: Conduit Hub Mounted Transformer

Transformers No. Y65AP-1, Y65KP-1, and Y65SP-1 have a one-half inch conduit fitting that permits direct mounting into the conduit opening of the motor actuator's wiring compartment.

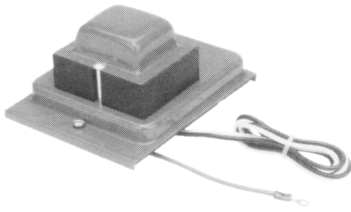


Figure 6: Cover Mounted Transformer

The Y68 cover mounted transformer is available for mounting to the top of motor actuators.

Note: The Y68 cannot be used on M100 models using E, C, and Q interface boards.

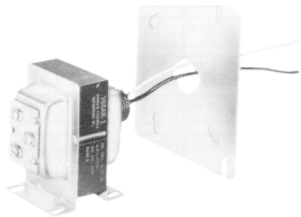


Figure 7: Multi-mounted Transformer

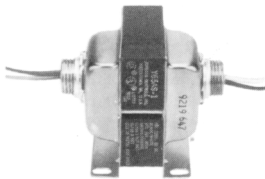


Figure 8: Foot Mounted Transformer

Valve Linkage

Factory assembly of M100 Series Motor Actuators to valves is available using Q99 ordering codes as described next.

Valves or switches, which are to be factory assembled with M100 motors, must be ordered as consecutive line items with the valve code number listed first, M100 Series motor, Y20 linkage and (ending) with the Q99 assembly charge code number. If any of these items are omitted or out of sequence, the remaining items will be shipped as separate components.

Table 8 provides a list of available linkage kits, the related M100 Series Motor Actuator and the rated valve seating for those actuators.

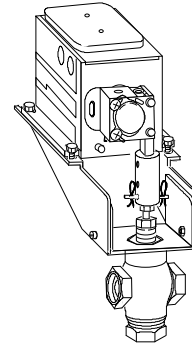


Figure 9: M100, Valve, and Linkage

An example of factory ordering procedure is as follows:

Item	Description	Code Number
1.	Valve Body	VTM-TN019
2.	M100 Actuator	M110AAB-1
3.	Linkage	Y20EBD-5
4.	Mounting Kit	Y20EBE-2
5.	Assembly Code	Q99AUP-1

Code	Valve	Valve Type
Q99ADN-1	1/2 through 2 in.	2-Way valves, stem down
Q99ADN-2	2-1/2 in. and up	down
Q99ADN-3	1/2 through 2 in.	3-Way valves, stem down
Q99ADN-4	2-1/2 in. and up	down
Q99AUP-1	1/2 through 2 in.	2-Way valves, stem up
Q99AUP-2	2-1/2 in. and up	up
Q99AUP-3	1/2 through 2 in.	3-Way valves, stem up
Q99AUP-4	2-1/2 in. and up	up

Table 8: Selections—Actuators and Linkages

Linkage Number	Spring Return Actuator	Non-Spring Return Actuator	Valve Seating Load, lb. (N)
Y20EBA-1 *	M130	M120	75 (334)
Y20EBA-2 *	---	M150	270 (1201)
Y20EBA-3 **	M130	M120	75 (334)
Y20EBA-4 **	---	M150	270 (1201)
Y20EBD-1	M130	M120	75 (334)
Y20EBD-2	---	M140	150 (607)
Y20EBD-3	---	M150	270 (1201)
Y20EBD-4	See Product Data Y20EBD-4		
Y20EBD-5	M110	---	40 (178)
Y20EBD-6	M130	M120	100 (449)

* Used with selected Honeywell valves.

** Used with Barber-Colman valves between 1/2 and 1-1/4 inch. Larger Barber-Colman valves should use Y20EBD linkage kits.

Table 9: Two Way Valve Close Off Pressure Push Down to Close

Valve	Size in.	Stem	Lift in. (mm)	Y20EBD-1 M120/M130	Y20EBD-2 M140	Y20EBD-3 M150	Y20EBD-5 M110	Y20EBD-6 M120/M130
VB-3752-19	2-1/2	3/8-24	3/4 (19)	5 (35)	21 (145)	46 (317)	---	11 (76)
VB-3752-22	3	3/8-24	1-1/8 (29)	---	13 (90)	30 (207)	---	7 (40)
VB-3752-25	4	3/8-24	1-1/8 (29)	---	5 (35)	15 (103)	---	---
VB-3754-4	3/4	1/4-28	1/2 (13)	124 (855)	150 (1034)	150 (1034)	60 (414)	150 (1034)
VB-3754-5	1	1/4-28	3/4 (19)	72 (496)	150 (1034)	150 (1034)	35 (241)	97 (669)
VB-3754-6	1-1/2	1/4-28	3/4 (19)	32 (221)	70 (483)	130 (896)	15 (103)	44 (303)
VB-3754-7	2	1/4-28	3/4 (19)	17 (117)	40 (276)	75 (517)	7 (48)	25 (172)
VTM-_N007 *	1/2	1/4-28	5/16 (8)	---	---	---	205 (1413)	---
VTM-_N019 *	1/2	1/4-28	5/16 (8)	---	---	---	80 (552)	---
VTM-_N047 *	1/2	1/4-28	5/16 (8)	---	---	---	80 (552)	---
V90AA-7	2-1/2	3/8-24	3/4 (19)	5 (35)	21 (145)	46 (317)	---	11 (76)
V90AA-8	3	3/8-24	1-1/8 (29)	---	13 (90)	30 (207)	---	7 (48)
V90AA-9	4	3/8-24	1-1/8 (29)	---	6 (41)	15 (103)	---	---
V90AD-4	3/4	1/4-28	1/2 (13)	124 (855)	150 (1034)	150 (1034)	60 (414)	150 (1034)
V90AD-5	1	1/4-28	1/2 (13)	72 (496)	150 (1034)	150 (1034)	35 (241)	97 (669)
V90AD-6	1-1/2	1/4-28	3/4 (19)	32 (221)	70 (483)	130 (896)	15 (103)	44 (303)
V90AD-7	2	1/4-28	3/4 (19)	17 (117)	40 (276)	75 (517)	7 (48)	25 (172)
V90BA-1	1-1/2	3/8-24	5/8 (16)	28 (193)	250 (1724)	250 (1724)	---	115 (793)
V90BA-2	2	3/8-24	3/4 (19)	28 (193)	250 (1724)	250 (1724)	---	116 (800)
V90BA-3	2-1/2	3/8-24	1 (25)	---	125 (862)	125 (862)	---	59 (407)
V90BA-4	3	3/8-24	1-1/8 (29)	---	125 (862)	125 (862)	---	22 (152)

* Requires Y20EBE-2 adapter kit to couple linkage to valve stem.

Table 10: Two Way Valve Close Off Pressure Push Down to Open

Valve	Size in.	Stem	Lift in. (mm)	Y20EBD-1 M120/M130	Y20EBD-2 M140	Y20EBD-3 M150	Y20EBD-5 M110	Y20EBD-6 M120/M130
VB-3970-11	2-1/2	3/8-24	3/4 (19)	5 (35)	21 (145)	46 (317)	---	11 (76)
VB-3970-14	3	3/8-24	1-1/8 (29)	---	13 (90)	30 (207)	---	7 (48)
VB-3970-17	4	3/8-24	1-1/8 (29)	---	6 (41)	15 (103)	---	---
VB-3974-4	3/4	1/4-28	1/2 (13)	132 (910)	150 (1034)	150 (1034)	62 (427)	150 (1034)
VB-3974-5	1	1/4-28	3/4 (19)	74 (510)	150 (1034)	150 (1034)	35 (241)	102 (703)
VB-3974-6	1-1/2	1/4-28	3/4 (19)	32 (221)	72 (496)	132 (910)	15 (103)	45 (310)
VB-3974-7	2	1/4-28	3/4 (19)	17 (117)	40 (276)	76 524)	7 (48)	25 (172)
VTM-C 007 *	1/2	1/4-28	5/16 (8)	---	---	---	205(1413)	---
VTM-C 019 *	1/2	1/4-28	5/16 (8)	---	---	---	80 (552)	---
VTM-C 047 *	1/2	1/4-28	5/16 (8)	---	---	---	80 (552)	---

* Requires Y20EBE-2 adapter kit to couple linkage to valve stem.

Table 11: Three Way Mixing Valve Close Off Pressure

Valve	Size in.	Stem	Lift in. (mm)	Y20EBD-1 M120/M130	Y20EBD-2 M140	Y20EBD-3 M150	Y20EBD-5 M110	Y20EBD-6 M120/M130
VB-4322-9	2-1/2	3/8-24	3/4 (19)	5 (35)	21 (145)	46 (317)	---	11 (76)
VB-4322-11	3	3/8-24	1-1/8 (29)	---	13 (90)	30 (207)	---	7 (48)
VB-4322-13	4	3/8-24	1-1/8 (29)	---	5 (35)	15 (103)	---	---
VB-4324-4	3/4	1/4-28	1/2 (13)	124 (855)	150 (1034)	150 (1034)	60 (414)	150 (1034)
VB-4324-5	1	1/4-28	3/4 (19)	72 (496)	150 (1034)	150 (1034)	35 (241)	97 (669)
VB-4324-6	1-1/2	1/4-28	3/4 (19)	32 (221)	70 (483)	130 (896)	15 (103)	44 (303)
VB-4324-7	2	1/4-28	3/4 (19)	17 (117)	40 (276)	75 (517)	7 (48)	25 (172)
VTM-_M007 *	1/2	1/4-28	5/16 (8)	---	---	---	205(1413)	---
VTM-_M019 *	1/2	1/4-28	5/16 (8)	---	---	---	80 (552)	---
VTM-_M047 *	1/2	1/4-28	5/16 (8)	---	---	---	80 (552)	---
V90DB-7	2-1/2	3/8-24	3/4 (19)	5 (35)	21 (145)	46 (317)	---	11 (76)
V90DB-8	3	3/8-24	1-1/8 (29)	---	13 (90)	30 (207)	---	7 (48)
V90DB-9	4	3/8-24	1-1/8 (29)	---	5 (35)	15 (103)	---	---
V90DD-4	3/4	1/4-28	1/2 (13)	124 (855)	150 (1034)	150 (1034)	60 (414)	150 (1034)
V90DD-5	1	1/4-28	3/4 (19)	72 (496)	150 (1034)	150 (1034)	35 (241)	97 (669)
V90DD-6	1-1/2	1/4-28	3/4 (19)	32 (221)	70 (483)	130 (896)	15 (103)	44 (303)
V90DD-7	2	1/4-28	3/4 (19)	17 (117)	40 (276)	75 (517)	7 (48)	25 (172)

*Requires Y20EBE-2 adapter kit to couple linkage to valve stem.

Table 12: Three Way Diverting Valve Linkage

Valve	Size in.	Stem	Lift in. (mm)	Y20EBD-1 M120/M130	Y20EBD-2 M140	Y20EBD-3 M150	Y20EBD-5 M110	Y20EBD-6 M120/M130
V90CA-1	1/2	1/4-28	5/8 (16)	250 (1724)	250 (1724)	250 (1724)	250 (1724)	250 (1724)
V90CA-2	3/4	1/4-28	9/16 (14)	250 (1724)	250 (1724)	250 (1724)	250 (1724)	250 (1724)
V90CA-3	1	1/4-28	5/8 (16)	250 (1724)	250 (1724)	250 (1724)	250 (1724)	250 (1724)
V90CA-4	1-1/4	1/4-28	5/8 (16)	150 (1034)	250 (1724)	250 (1724)	175 (1207)	250 (1724)
V90CA-5	1-1/2	1/4-28	5/8 (16)	200 (1379)	250 (1724)	250 (1724)	150 (1034)	250 (1724)
V90CA-6	2	1/4-28	5/8 (16)	175 (1207)	250 (1724)	250 (1724)	125 (862)	250 (1724)
V90CA-7	2-1/2	3/8-24	5/8 (16)	---	84 (579)	175 (1207)	---	---
V90CA-8	3	3/8-24	3/4 (19)	---	38 (262)	175 (1207)	---	---
V90CA-9	4	3/8-24	1 (25)	---	---	175 (1207)	---	---
V90CA-10	5	3/8-24	1-1/16 (27)	---	---	119 (820)	---	---
V90CA-11	6	3/8-24	1-1/16 (27)	---	---	34 (234)	---	---

Table 13: Honeywell Cross Reference

Honeywell Actuator	Johnson Wholesale Replacement Actuator	Johnson Plug In Interface Board	Johnson Auxiliary Switch Kit	Johnson Cover Mounted Transformer
M445A1000	M130AGA-1		S91DJ-1	Y68AA-1
M445A1042	M130AGA-1		S91DJ-1	Y68DA-1
M445A1067	M130AGA-1		S91DJ-1	Y68DA-1
M445D1007	M130AGA-1			Y68AA-1
M644A1016	M150AGA-1			
M644A1024	M150AGA-1			
M644C1006	M140AGA-1			
M644C1014	M150AGA-1			
M644D1005	M150AGA-1		S91EJ-1	
M644E1012	M150AGA-1		S91DJ-1	
M745G1007	M130XGA-1	R81GAA-1		
M845A1001	M130AGA-1		S91DJ-1	
M845A1027	M130AGA-1		S91DJ-1	
M845C1009	M130AGA-1			
M845E1007	M130AGA-1		S91DJ-1	Y68AA-1
M9164A1054	M120XGA-1	R81MAA-1		Y68AA-1
M9164A1062	M120XGA-1	R81MAA-1		
M9164C1035	M120XGA-1	R81MAA-1	S91EJ-1	Y68AA-1
M9164D1009	M120XGA-1	R81MAA-1	S91EJ-1	Y68AA-1
M9174B1001	M140XGA-1	R81MAA-1	S91DJ-1	Y68AA-1
M9174B1019	M140XGA-1	R81MAA-1	S91DJ-1	Y68AA-1
M9174C1009	M140XGA-1	R81MAA-1	S91EJ-1	Y68AA-1
M9174C1017	M140XGA-1	R81MAA-1	S91EJ-1	Y68AA-1
M9175D1006	M110XGA-1	R81MAA-1		Y68AA-1
M9175D1014	M110XGA-1	R81MAA-1		
M9184A1019	M150XGA-1	R81MAA-1		
M9184A1027	M150XGA-1	R81MAA-1		
M9184C1007	M140XGA-1	R81MAA-1	S91EJ-1	
M9184D1003	M150XGA-1	R81MAA-1		
M9184D1005	M140XGA-1	R81MAA-1		
M9184D1013	M150XGA-1	R81MAA-1		
M9184D1021	M140XGA-1	R81MAA-1		
M9184F1000	M150XGA-1	R81MAA-1	S91EJ-1	
M9184F1018	M150XGA-1	R81MAA-1	S91EJ-1	
M9185A1018	M130XGA-1	R81MAA-1		
M9185A1026	M130XGA-1	R81MAA-1		
M9185C1006	M130XGA-1	R81MAA-1	S91EJ-1	
M9185D1004	M130XGA-1	R81MAA-1		
M9185E1001	M130XGA-1	R81MAA-1	S91DJ-1	
M934A1219	M120XGA-1	R81MAA-1		
M934A1227	M120XGA-1	R81MAA-1		Y68DA-1
M934A1235	M120XGA-1	R81MAA-1		
M934A1243	M120XGA-1	R81MAA-1	S91EJ-1	Y68DA-1
M934A1268	M120XGA-1	R81MAA-1	S91EJ-1	Y68AA-1

Continued on next page. . .

Honeywell Actuator (Cont.)	Johnson Wholesale Replacement Actuator	Johnson Plug In Interface Board	Johnson Auxiliary Switch Kit	Johnson Cover Mounted Transformer
M934A1284	M120XGA-1	R81MAA-1		Y68AA-1
M934A1292	M120XGA-1	R81MAA-1	S91EJ-1	Y68AA-1
M934A1318	M120XGA-1	R81MAA-1	S91EJ-1	Y68AA-1
M934A1326	M120XGA-1	R81MAA-1		Y68AA-1
M934A1334	M120XGA-1	R81MAA-1		
M934A1342	M120XGA-1	R81MAA-1		
M934D1000	M140XGA-1	R81MAA-1	S91DJ-1	Y68AA-1
M934D1018	M140XGA-1	R81MAA-1	S91EJ-1	Y68AA-1
M934D1026	M140XGA-1	R81MAA-1	S91DJ-1	Y68AA-1
M934D1034	M140XGA-1*	R81MAA-1	S91EJ-1	Y68AA-1
M941C1014	M150XGA-1*	R81MAA-1	S91DJ-1	
M941C1022	M150XGA-1*	R81MAA-1	S91DJ-1	
M941C1030	M150XGA-1*	R81MAA-1	S91DJ-1	
M941C1063	M150XGA-1*	R81MAA-1	S91DJ-1	
M941D1005	M150XGA-1*	R81MAA-1	S91EJ-1	
M941D1039	M150XGA-1*	R81MAA-1	S91EJ-1	
M941D1047	M150XGA-1*	R81MAA-1	S91EJ-1	
M944A1010	M150XGA-1	R81MAA-1		
M944A1028	M150XGA-1	R81MAA-1		
M944C1000	M140XGA-1	R81MAA-1		
M944C1018	M150XGA-1	R81MAA-1		
M944C1042	M150XGA-1	R81MAA-1		
M944D1017	M150XGA-1	R81MAA-1	S91EJ-1	
M945A1017	M130XGA-1	R81MAA-1		
M945A1082	M130XGA-1	R81MAA-1		
M945A1157	M130XGA-1	R81MAA-1		
M945D1006	M130XGA-1	R81MAA-1	S91EJ-1	
M945F1004	M130XGA-1	R81MAA-1		
M9484E1017	M150XGA-1*	R81MAA-1	S91DJ-1	
M9484E1025	M150XGA-1*	R81MAA-1	S91DJ-1	
M9484E1033	M150XGA-1*	R81MAA-1	S91DJ-1	
M9484E1058	M150XGA-1*	R81MAA-1	S91DJ-1	
M9484F1007	M150XGA-1*	R81MAA-1	S91EJ-1	
M9484F1031	M150XGA-1*	R81MAA-1	S91EJ-1	
M9484F1049	M150XGA-1*	R81MAA-1	S91EJ-1	
M954A1035	M140XGA-1	R81MAA-1		
M954B1034	M140XGA-1	R81MAA-1	S91EJ-1	
M954D1016	M150XGA-1	R81MAA-1	S91EJ-1	
M955A1024	M130XGA-1	R81MAA-1		
M955C1014	M130XGA-1	R81MAA-1	S91EJ-1	
M975A1089	M110XGA-1	R81MAA-1		
M975A1097	M110XGA-1	R81MAA-1		Y68AA-1

* Not Industrial Risk Insurers (IRI) approved.

Damper Linkage

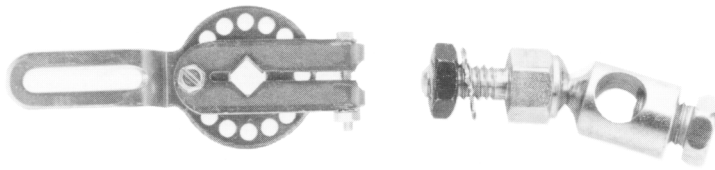


Figure 10: Crank Arm and Swivel Ball Joint Mounting Accessories

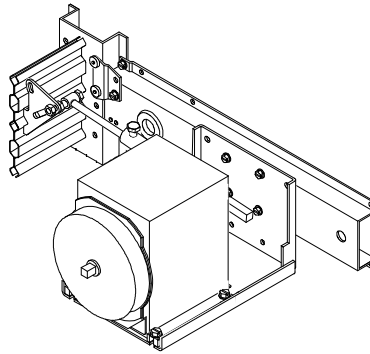


Figure 11: Damper Linkage (Y20DFC-2 shown)

Table 14: Damper Linkage

Catalog Number	Item	Application/Description
Y20DAA-2	Linkage Set	Mounts actuator to top of duct or any flat surface. Contains LVR27A-602, LVR27A-600R, SWL10A-601 and ROD16-3.
Y20DAB-2	Linkage Set	Mounts actuator to side of duct or wall. Contains LVR27A-602, LVR27A-600R, SWL10A-601 (2 ea.), ROD16-3 and BKT22A-602.
Y20DFC-2	Linkage Set	Mounts actuator to D-1100, 1200 and 1300 Dampers only. Rack and pinion damper linkage includes a universal mounting bracket for inside or outside damper frame mounting. Using this kit increases the rated output torque by a factor of 2.3. Available in June 1993.
LVR27A-600R	Crank Arm	For use on 1/2 in. or 7/16 in. diameter damper shafts with adjustable radius from 3/4 in. to 4-1/2 in.
LVR27A-602	Crank Arm	3/8 in. square drive for use on all motor actuators with adjustable radius from 1-11/16 in. to 2-7/8 in. (furnished with spring return motor actuators).
BKT19A-600	Blade Arm	Connect linkage to damper blade.
SWL10A-601	Ball Joint Connector	Connector with 1/4 in. -28 diameter stud to be used with LVR27A-602, LVR27A-600R and BKT19A-600 crank arms. Bag of 10.
SWL10A-603Y	Ball Joint	1/4 in.-28 diameter stud with hex nut and washer. Bag of 1.
SWL10A-604	Ball Joint	7/16 in. stud with hex nut and washer
D-3073-64	Ball Joint Connector	Connector with 1/4 in. -28 diameter stud to be used with LVR27A-602, LVR27A-600R and BKT19A-600 crank arms. Bag of 1.
ROD16-2	Push Rod	5/16 in. diameter x 48 in. long plated steel shaft
ROD16-3	Push Rod	5/16 in. diameter x 24 in. long plated steel shaft
BKT22A-602	Bracket	Mounting Bracket, right angle

Dimensions

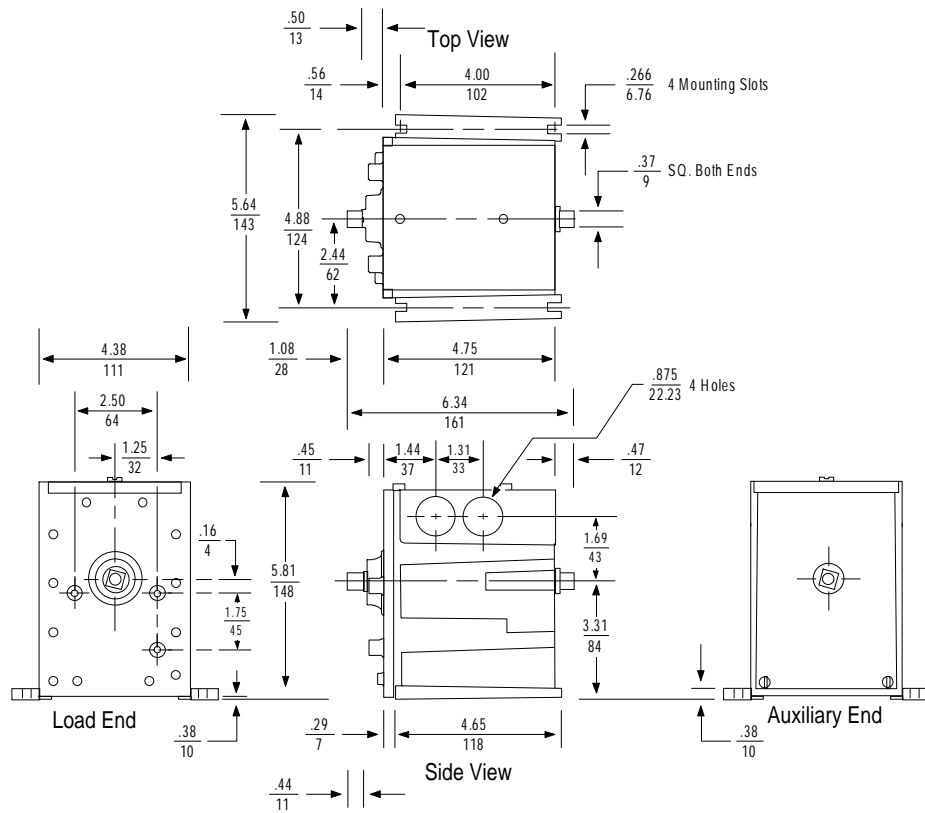


Figure 12: Non-spring Return Dimensions inches/mm

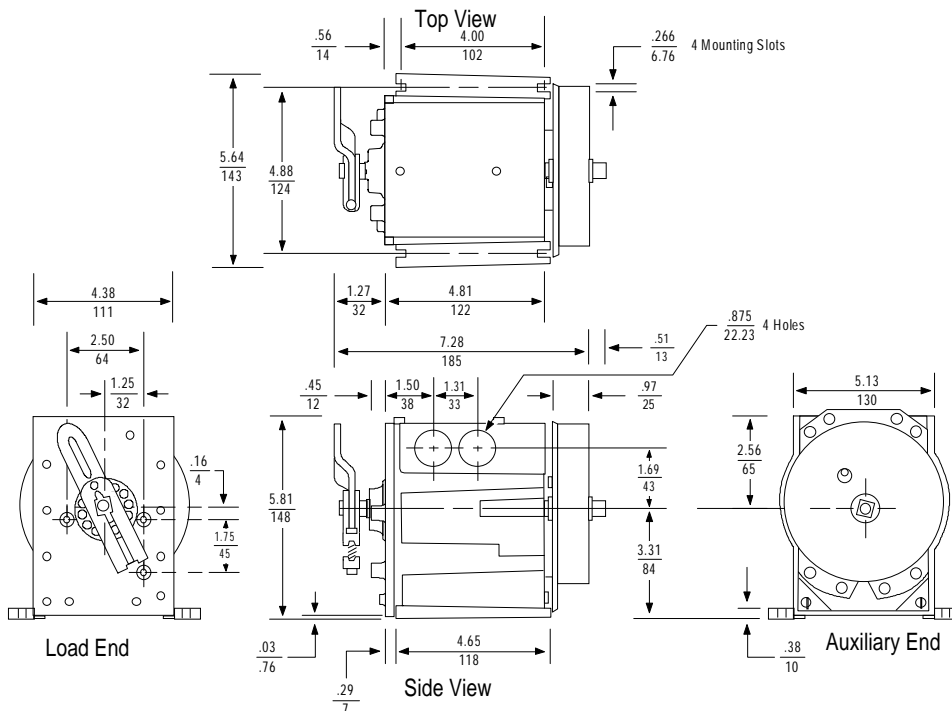


Figure 13: Spring Return Dimensions inches/mm

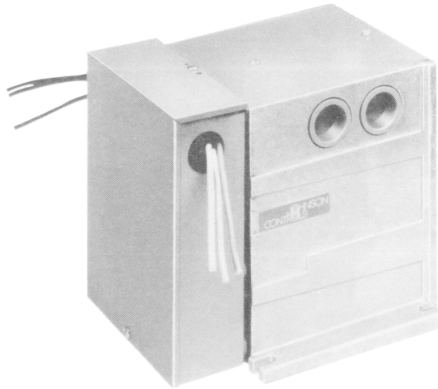


Figure 14: Spring Return M100 with Switch Kit

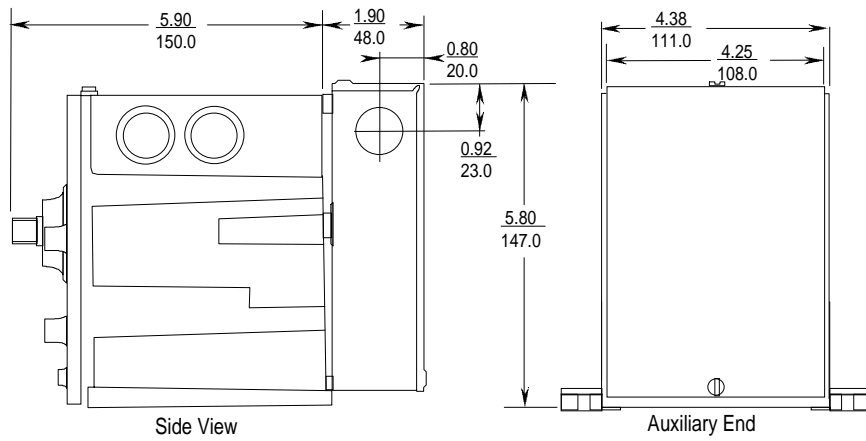


Figure 15: Switch Kit Dimensions inches/mm

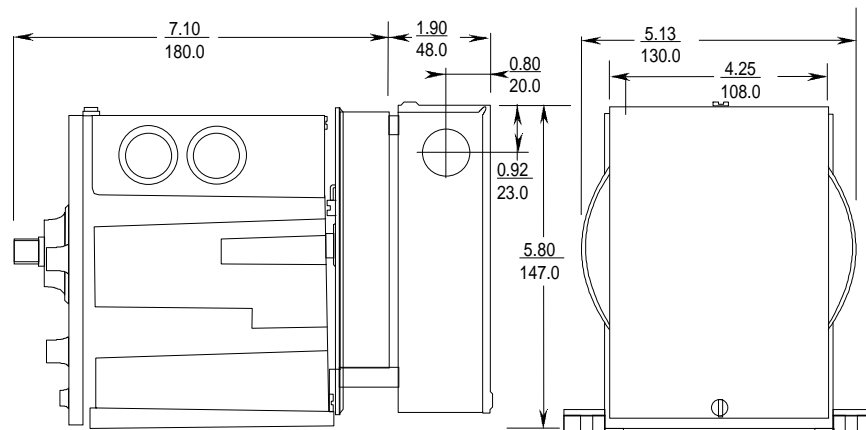


Figure 16: Spring Return with Switch Kit Dimensions inches/mm

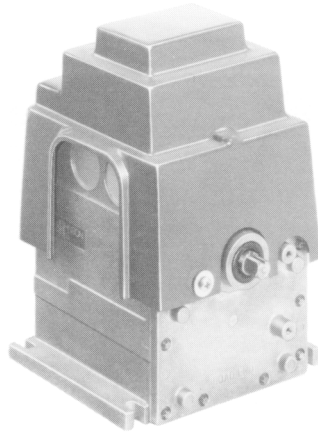


Figure 17: M100 with CVR83A-600R Weather Resistant Cover

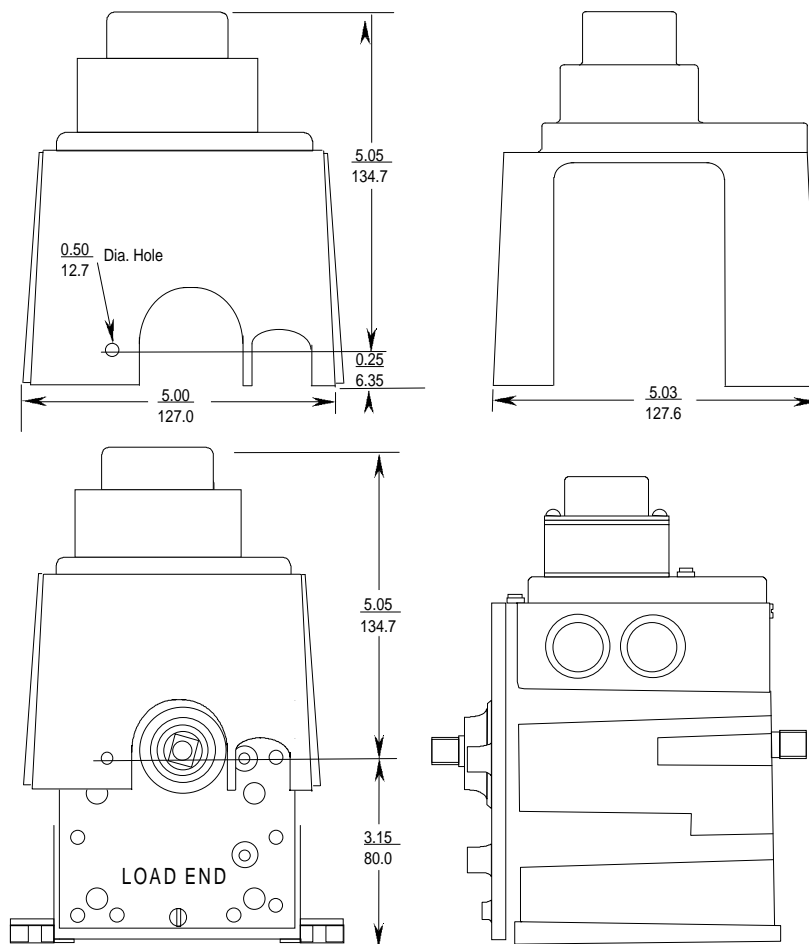


Figure 18: Weather Resistant Cover Dimensions inches/mm

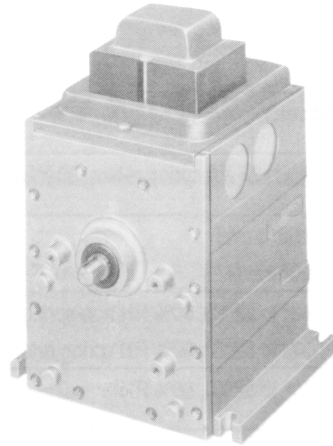


Figure 19: M100 with Cover Mounted Transformer

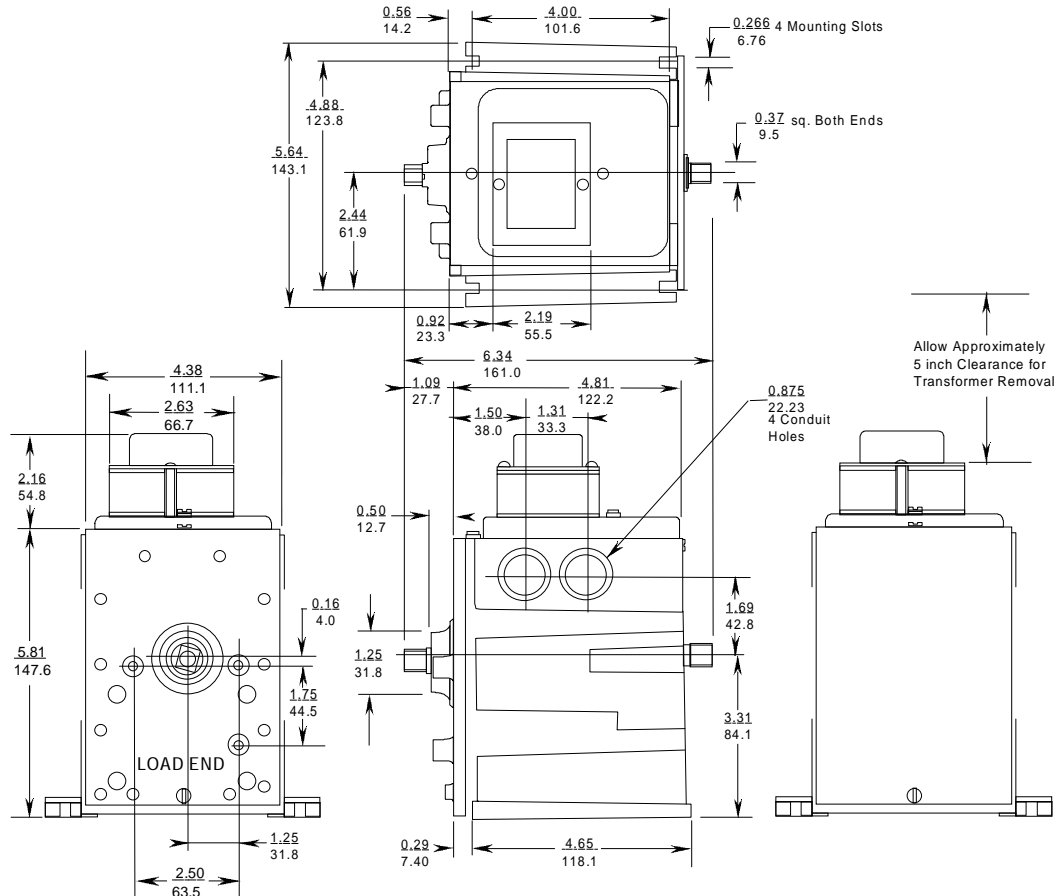


Figure 20: M100 with Cover Mounted Transformer Dimensions inches/mm

Specifications

Product	M100 Motor Actuator
Power Requirements	24 VAC at 50/60 Hz, 25 VA spring return, 20 VA non-spring return
Rotation Timing	60 seconds for 160° travel 38 seconds for 90° travel
Ambient Operating Conditions	-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
Ambient Storage Conditions	-40° to 125°F (-40° to 52°C), 90% RH
Dimensions (H x W x D)	5.64 in. x 4.38 in. x 4.94 in. (143 mm x 111 mm x 125 mm)
Shipping Weight	9 lbs (4.1 kg)
Enclosure	NEMA-1
Agency Compliance	FCC, UL, CSA
Agency Listings	UL Recognized File E27734 Guide XAPX2 CSA certified temperature indicating and regulating equipment
Accessories (Order Separately)	Transformers, see page 9 Valve linkage, see page 10 Damper linkage, see page 15 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 SEL12A-600R, Weatherproofing kit for S91 CVR83A-600R, Weather resistant cover Q99ADN-1 or Q99AUP-1, Assembly charge for 2-way valves, 1/2 through 2 inch Q99ADN-2 or Q99AUP-2, Assembly charge for 2-way valves, 2-1/2 inch and over Q99ADN-3 or Q99AUP-3, Assembly charge for 3-way valves, 1/2 through 2 inch Q99ADN-4 or Q99AUP-4, Assembly charge for 3-way valves, 2-1/2 inch and over Q99AAB-1, Assembly charge for S91 switch

Note: Valves or switches, which are to be factory assembled with M100 motors, must be ordered as consecutive line items with the valve code number listed first, M100 Series motor, Y20 linkage, and (ending) with the Q99 assembly charge code number. If any of these items are omitted or out of sequence, the remaining items will be shipped as separate components.

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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