Series EA Low and Medium Torque Actuators with Integrated Controller

invensys Eurotherm

1321-IN-012-0-01

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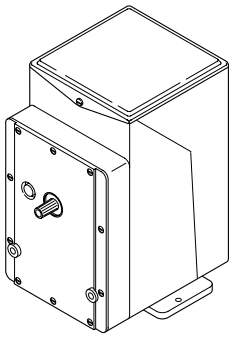
Contents

For use with VB-7000 and VB-9000 Series valve bodies from Invensys Eurotherm and many other commercially available rotary shaft valve bodies with crank arm and combustion air dampers.

Used for proportional control of dampers and valves in industrial applications. Typical applications are heat treat furnaces, ovens, heat recovery systems, water or oil cooling systems.



Features

- Spring Return and Non-spring Return Models Available
- 24 Vac, 120 Vac and 240 Vac Models Available
- Die Cast Housings with Four 1/2" Conduit Openings
- Oil Immersed Motor and Gear Train

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Instruction Manual

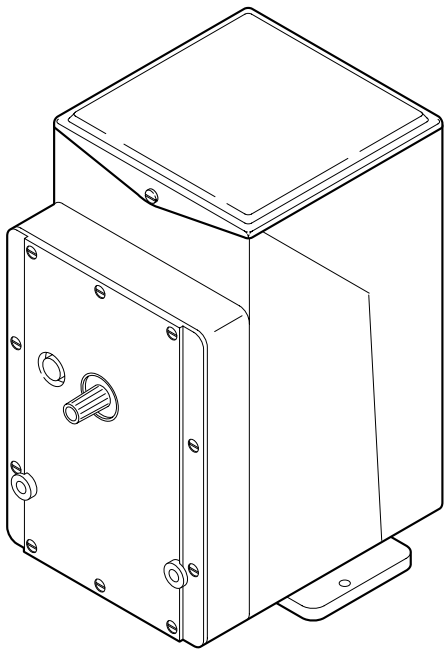
1. Introduction

Actuators of this family may be easily identified by referring to the part number shown on the nameplate on top of the gear case. The date of manufacture is stamped on the case as a four digit number. The first two digits represent the week of the year, the last two digits represent the year.

These actuators meet the requirements of both damper control and valve control applications where it is desirable to move the load in either direction, or to stop it at any point in the stroke. All models contain circuits for true position-proportional control.

Actuators are shipped without mounting hardware or linkage. In damper applications, crank arms, connectors, link rods and mounting brackets will be required. In valve applications, valve bodies and AV type linkages will be required.

Before installing the actuator, look for bent or broken parts or oil leaks. Actuators should be connected to a power supply to check operation prior to installation.



2. Specifications

Control Action:

Current Input:	Factory set at 4 to 20 mA. Span adjustable from 10 to 23 mA. Zero point adjustable from 0 to 6 mA.
Voltage Input:	0-1 Vdc, 1-5 Vdc and 3-15 Vdc, switch selectable. Other ranges can be set in the configuration mode.
Resistance Input:	Any potentiometer value from 100 Ohms to 1000 Ohms can be used for the input signal.

Input Impedance:

mA Input: 250 Ohms

Vdc or Resistance input: >100K Ohms

Direction of Travel:
Factory set to CCW with increasing signal. Can be changed in configuration mode.

Stroke Length:
Factory set for 180° rotation at full scale. Can be changed to 90° by setting a switch. Other lengths can be achieved in the configuration mode.

Control Overrides:
Dry contact closure can force the actuator to either end of travel.

Deadband:
Adjustable from 1% to 6% of span in 0.4% increments.

Ambient Temperature:
-40° to 58° C.

Humidity:
5 to 95% rh, non-condensing.

Power Requirements:
See individual model numbers. Rated to operate within 10% of nominal voltage.

Option Board:
A 4 to 20 mA position signal and two form C relays rated at 3 Amps, resistive. The relays can be set to activate at any point within the operating range.

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3. Model Numbers

Model EA □□ - A □□□□ - □□3 - 0 - 00
Field No. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

EA4x Series Model Number

Fields 1, 2. EA4x Series Actuators

Fields 3, 4. Base Model

	Time	Return
42 -	90	cw
44 -	90	ccw

Field 5. Control Input
A - Analog input, proportional control

Field 6. Option Board
0 - None
1 - Position signal plus 2 relays

Fields 7, 8. Options
37 - NEMA 4 cover (factory standard)

Field 9. Voltage/Frequency
0 - 120 Vac, 60 Hz
3 - 240 Vac, 60 Hz
4 - 240 Vac, 50 Hz
5 - 24 Vac, 60 Hz

Fields 10, 11. Reserved

Field 12. Slidewire
3 - 1000 Ohm

Field 13. Reserved

Fields 14, 15. Specials
00 - None

EA5x Series Model Number

Fields 1, 2. EA5x Series Actuators

Fields 3, 4. Base Model

	Time	lbs./in. Torque
52 -	25 (adjustable)	60
54 -	25	60
56 -	80 (adjustable)	220
58 -	80	220

Field 5. Control Input
A - Analog input, proportional control

Field 6. Option Board
0 - None
1 - Position signal plus 2 relays

Fields 7, 8. Options
Options 01 through 07 are not NEMA rated
01 - 2 auxiliary SPDT switches
02 - 4 auxiliary SPDT switches
03 - Rear shaft
04 - 100 Ohm rear slidewire
05 - 100 Ohm rear slidewire and 2 switches
06 - 1000 Ohm rear slidewire
07 - 1000 Ohm rear slidewire and 2 switches

Fields 7, 8. Options (continued)
Options 31 through 37 are NEMA rated
31 - 100 Ohm rear slidewire, weather resistant
32 - Two 100 Ohm rear slidewires, weather resistant
33 - Three 100 Ohm rear slidewires, weather resistant
37 - NEMA 4 cover (factory standard)

Field 9. Voltage/Frequency
0 - 120 Vac, 60 Hz
1 - 120 Vac, 50 Hz
3 - 240 Vac, 60 Hz
4 - 240 Vac, 50 Hz
5 - 24 Vac, 60 Hz

Fields 10, 11. Reserved

Field 12. Slidewire
3 - 1000 Ohm

Field 13. Reserved

Fields 14, 15. Specials
00 - None

4. Installation

CAUTION!
Disconnect the power supply (line power) before installation to prevent injury and equipment damage!

Make all connections in accordance with the wiring diagram and in accordance with national and local electrical codes.
Use copper conductors only!

CAUTION!
Do not exceed the ratings of the devices!

Avoid locations where excessive moisture, corrosive fumes, or vibration are present!

Damper Mounting

Do not mount low torque actuators upside down. Do not mount adjustable speed units with the output shaft up, or with the speed adjustment screw pointing up. Other actuators may be mounted in any position, although the upright position is recommended.

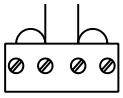
Make all electrical connections in accordance with the job wiring diagram and in compliance with local and national electrical codes. Power wire selection is shown below. When multiple 24 Vac actuators are powered from the same transformer, the actuators must be in phase; observe the connection diagram in Section 5 of this manual.

Power	AWG	Maximum Run
24 Vac	14	115 ft (35 m)
24 Vac	12	180 ft (55 m)
24 Vac	10	285 ft (87 m)
120 Vac	14	810 ft (247 m)
120 Vac	12	1275 ft (388 m)
120 Vac	10	2040 ft (622 m)
240 Vac	14	3340 ft (1018 m)

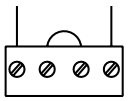
On line voltage actuators, Class I circuits must be used for connections to power terminals and auxiliary relay terminals. On 24 Vac actuators, Class II circuits may be used for connections to power terminals and auxiliary relay terminals if the auxiliary relay terminals are connected to 24 Vac or are not being used. Class II circuits may be used in the low voltage compartment to make connections to control circuit terminals.

5. Wiring and Setup

Power Connections



120 Vac or
24 Vac Power



240 Vac Power

Power wiring is a Class 1 circuit. Route the wiring through the conduit opening on the left-rear side of the actuator, adjacent to the large terminal strip. Keep all wire within the safety barrier.

The large four terminal strip on the circuit board is for connection of power from the mains. A plastic barrier around the terminal strip and immediate area serves as a safety shield between Class 1 and Class 2 wiring.

Wire the power connections as shown to the left. Proper jumpers for the operating voltage are installed at the factory. Note that the operating voltage cannot be changed without physically changing the motor.

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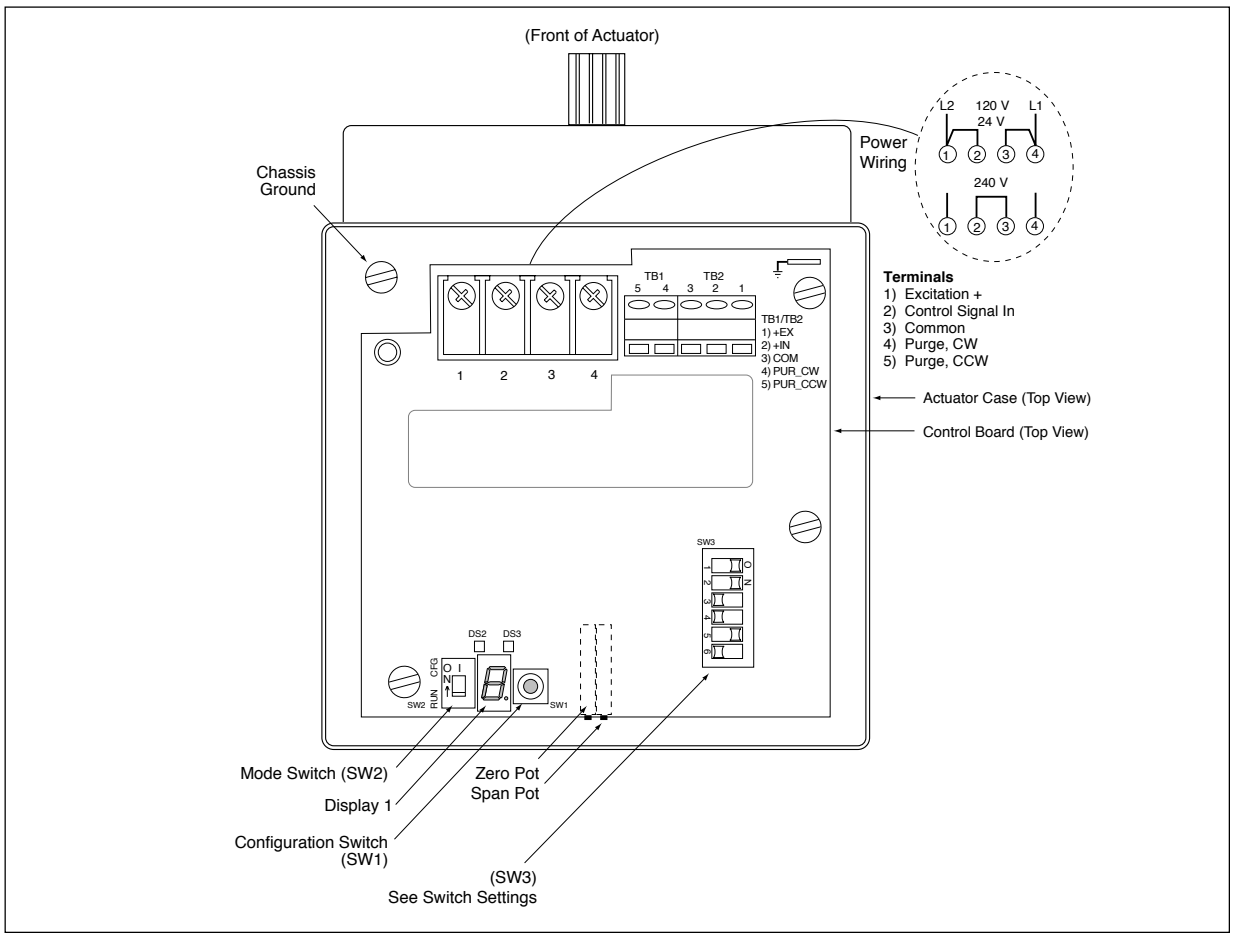


Figure 1. Controller board showing components used during setup and configuration

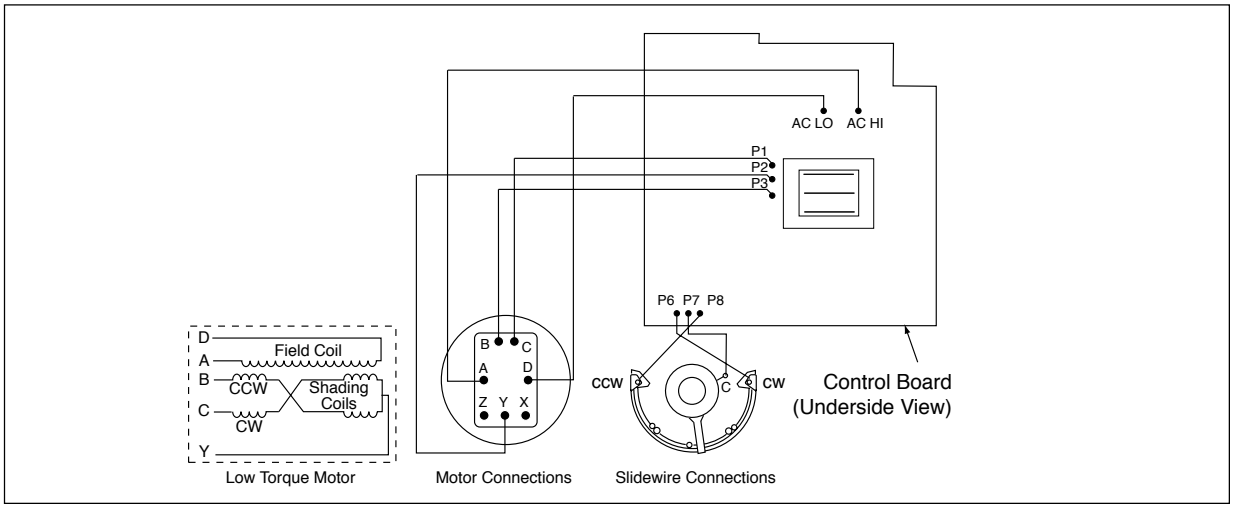
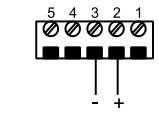


Figure 2. Motor and slidewire connections

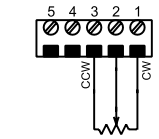
Control Connections



Voltage or mA signal

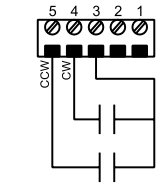
Control wiring is a Class 2 circuit. Route the wiring through the conduit opening on the right-rear side of the actuator, adjacent to the smaller five terminal strip. Keep all wire outside the safety barrier.

Input signals for mA or Vdc are connected to Terminals 2 & 3. Terminal 2 is the positive connection; Terminal 3 is the negative connection.



Potentiometer Input

Input signals for potentiometers are connected to Terminals 1, 2 & 3. Terminal 1 is the CW connection; Terminal 2 is the is the wiper connection; Terminal 3 is the CCW connection.



Control Overrides

Control overrides allow forcing the actuator to end of travel on demand. They are commonly interfaced with combustion safeguard systems:

1. to drive the actuator full open during purge.
2. to drive the actuator full closed prior to ignition.

A dry contact closure between Terminal 3 and Terminal 4 will drive the actuator fully clockwise.

A dry contact closure between Terminal 3 and Terminal 5 will drive the actuator fully counterclockwise.

Option Board Wiring

4 to 20 mA Position Signal
The position signal wiring is a class 2 circuit. Wiring can be routed in the same conduit as control wiring or through the conduit opening on the left front of the actuator. Refer to Figure 3 for the location of the terminals.

Auxiliary Relay Contacts
The relay contact connections are a Class 1 circuit. Route the wires through the conduit opening at the right front of the actuator. Refer to Figure 3 for the location of the terminals.

The auxiliary relays have form C contacts. The relays will activate as the position of the actuator exceeds the setpoint assigned to them. The setpoint for Aux Relay 1 is set by Function 6; for Aux Relay 2 by Function 7.

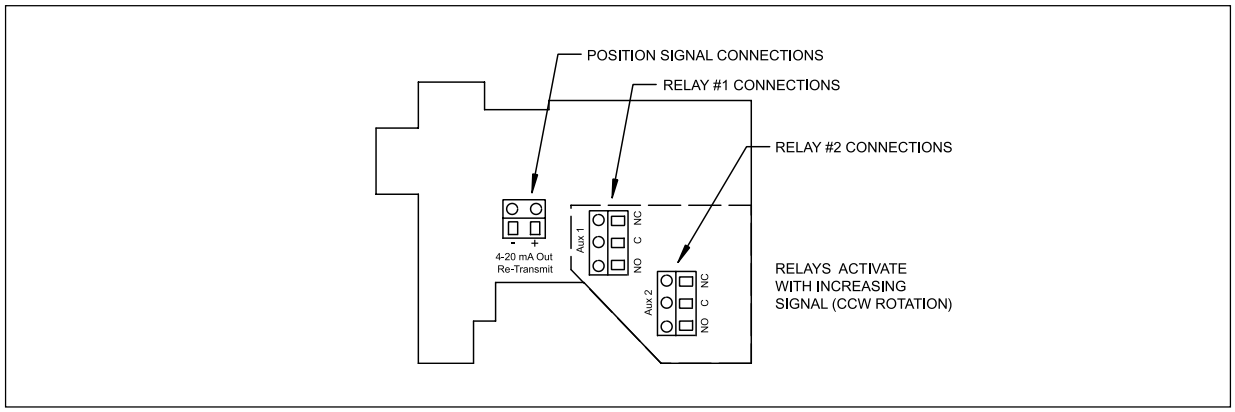


Figure 3. Option board connections

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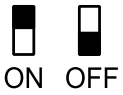
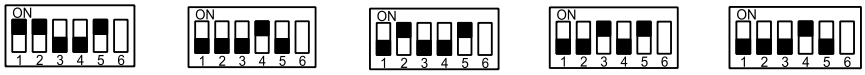
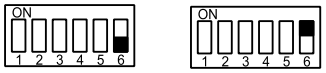
Switch Settings



Input range selection is determined using Switches 1 through 5 of the 6 pole DIP switch (SW3) on the circuit board. The default setting is for 4 to 20 mA. Other ranges can be selected as illustrated below.



Stroke length is determined using Switch 6 of the 6 pole DIP switch (SW3) as illustrated below.



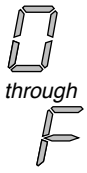
Configuration Switch (SW1) is a momentary switch, active only when the controller is in the configuration mode.

- When function codes are cycling, a single press will select the currently displayed code; press and hold will de-select it.
- When a function is selected, a single press will activate it for setting.
- When a function is activated, a single press will store the setting and return it to the selected state.

Mode Switch (SW2) must be in the CFG ("on") position to carry out the configuration procedure; and in the RUN position for normal operation.

Display 1 (seven segment LED) permits selection and configuration of operating functions. Also shows the status and mode of the controller. See "Digital Display" table for details.

DS2 and DS3 indicators are active only during the configuration mode. The left LED is lit when a function is selected, and flashes when it is de-selected. The right LED is lit when a function is activated for setting, and flashes when the setting is saved (stored).

Digital Display		
Code	**Configuration Mode**	**Run Mode**
	Indicates configuration mode when mode switch first turned on. Flashing indicates no configuration data in RAM. Data will load to RAM when the controller is switched to the run mode. With data in RAM, configuration function codes sequentially display. Indicates CW shaft travel when configuration function code 1 is selected.	n/a
	Indicates CCW shaft travel when configuration function code 2 is selected.	n/a
 *through*	Hexadecimal digits 1 through b identify configuration functions. See Configuration Procedure section of this manual.	n/a
	Access to utility information and configuration.	n/a
	EE memory constants can be *erased* and replaced with default configuration values. Appears when power is applied to the controller while in the configuration mode and switch 1 is pressed; default values will be written to EE memory when the controller is switched to run mode.	n/a
	n/a	Configuration data being loaded into RAM*Do not switch the controller to the configuration mode while loading data!*
	n/a	The controller is in the run mode and configuration data has been loaded into RAM. Active control will begin within five seconds.
	n/a	EE memory is being erased. *Do not switch the controller to the configuration mode while erasing data!*
	n/a	Data is being written to EE memory.*Do not switch the controller to the configuration mode while writing data!*
 *through*	n/a	Hexadecimal digits 0 through F indicate level of input signal, where: 0 = level (or less) of zero calibration. F = level (or greater) of span calibration.

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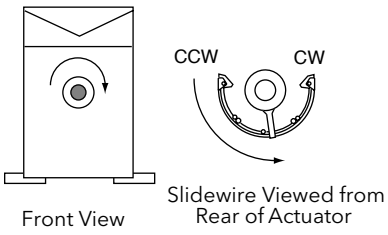
6. Configuration

In this document, CW and CCW (clockwise, counter-clockwise) define the rotation of the shaft viewed from the front of the actuator. Be aware of this distinction because during the configuration procedure you must observe the movement of the slidewire wiper – which is viewed from the rear of the actuator. Therefore, its rotation is reverse of the shaft rotation.



Note the position of the slidewire as the shaft turns clockwise.

CAUTION!
Disconnect the damper connecting link or valve linkage before entering any changes to the configuration.

The shaft and the slidewire wiper are not mechanically latched. Therefore, it is possible to rotate the shaft beyond the limits of the slidewire. Always make sure the position of the shaft is correctly correlated to the position of the wiper before linking the actuator and valve or damper.

The following functions of the actuator controller can be configured:

1. Maximum Travel Limit
2. Minimum Travel Limit
3. Deadband
4. Dead time
5. Direction of Travel
6. Auxiliary Relay 1 (optional)
7. Auxiliary Relay 2 (optional)
8. Control Input Zero
9. Control Input Span

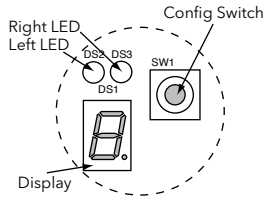
A. Retransmitter Output Zero (optional)

b. Retransmitter Output Span (optional)

Start the Configuration Procedure

Set the Mode (slide) switch SW2 to the ON position to enter configuration mode. The digital display will start scanning through the functions. The scan rate can be increased by pressing and holding the configuration switch (SW1). To select a function, *quickly* press and release the configuration switch after the display increments to that number.

Function 1. CCW Travel Limit



1. Select Function #1, CCW End of Travel Limit
When function code 1 appears, quickly press/release the configuration switch (DS2 comes on and function code 1 displays continuously).

2. Activate the Configuration Procedure
Press/release the configuration switch (DS3 comes on and function code 1 flashes).

3. Set the Configuration Value
Press/release the configuration switch until a " " (CCW) appears on the display (DS3 is also on).

Press/hold the configuration switch until the shaft (wiper) reaches the desired CCW position; then release.

If you go past the desired position, press/release the configuration switch until " " (CW) appears on the display.

Press/hold the configuration switch until the shaft (wiper) reaches the desired position; then release.

Press/release the configuration switch until " " appears.

Press/hold the configuration switch until " " flashes; then release.

4. Store the Configuration Value
Press/release the configuration switch (DS3 flashes five times; DS2 comes on and the function code displays continuously). The digital display will start scanning the functions.

Function 2. CW Travel Limit

1. Select Function #2, CW End of Travel Limit
When function code 2 appears, quickly press/release the configuration switch (DS2 comes on and function code 2 displays continuously).

2. Activate the Configuration Procedure
Press/release the configuration switch (DS3 comes on and function code 2 flashes).

3. Set the Configuration Value
Press/release the configuration switch until " " (CW) appears on the display (DS3 is also on).

Press/hold the configuration switch until the shaft (wiper) reaches the desired CW position; then release.

If you go past the desired position, press/release the configuration switch until a "  " (CCW) appears on the display.

Press/hold the configuration switch until the shaft (wiper) reaches the desired position; then release.

Press/release the configuration switch until "  " appears.

Press/hold the configuration switch until "  " flashes; then release.

4. Store the Configuration Value
Press/release the configuration switch (DS3 flashes five times; DS2 comes on and the function code displays continuously). The digital display will start scanning the functions.

Function 3. Deadband

The deadband setting requires two digits. Values range from 00 to 19 where 00 = 0.4% deadband, and 19 = 8% deadband. Each digit increments the value by 0.4%. Set the least significant digit (LSD) position first; then set the most significant digit (MSD) position.

1. Select Function #3, Deadband
When function code 3 appears, quickly press/release the configuration switch (DS2 comes on and function code 3 displays continuously).

2. Activate the Configuration Procedure
Press/release the configuration switch (DS3 comes on and function code 3 flashes).

3. Set the Value for the Least Significant Digit
Press/release the configuration switch. The current LSD value appears on the digital display (default value is 3). Press/hold the configuration switch until the desired LSD value appears; then release.

4. Set the Value for the Most Significant Digit
Press/release the configuration switch to move to the MSD position. Press/hold the configuration switch until the desired MSD value appears (default value is 0); then release.

5. Set the Configuration Value
Press/release the configuration switch until "  " appears. Press/hold the configuration switch until "  " flashes; then release.

6. Store the Configuration Value
Press/release the configuration switch (DS3 flashes five times; DS2 comes on and the function code displays continuously). The digital display will start scanning the functions.

Function 4. Dead time

Dead time is a safety function that monitors the slidewire signal while the actuator is in motion. If the slidewire signal fails to change for a set amount of time, the motor will be shut down. Dead time can be set from 01 to 99. A setting of 01 equals 250 milliseconds; a setting of 99 equals 13 seconds. The default setting is 12. Too low of a setting will cause the actuator to move in jerky steps. Larger settings may be required in cold weather or heavy load conditions. Set the least significant digit (LSD) position first; then set the most significant digit (MSD) position.

1. Select Function #4, Dead Time
When function code 4 appears, quickly press/release the configuration switch (DS2 comes on and function code 4 displays continuously).

2. Activate the Configuration Procedure
Press/release the configuration switch (DS3 comes on and function code 4 flashes).

3. Set the Value for the Least Significant Digit
Press/release the configuration switch. The current LSD value appears on the digital display (default value is 2). Press/hold the configuration switch until the desired LSD value appears; then release.

4. Set the Value for the Most Significant Digit
Press/release the configuration switch to move to the MSD position. Press/hold the configuration switch until the desired MSD value appears (default value is 1); then release.

5. Set the Configuration Value
Press/release the configuration switch until "  ." appears. Press/hold the configuration switch until "  ." flashes; then release.

6. Store the Configuration Value
Press/release the configuration switch (DS3 flashes five times; DS2 comes on and the function code displays continuously). The digital display will start scanning the functions.

Function 5. Direction of Travel

1. Select Function #5, Direction of Travel
When function code 5 appears, quickly press/release the configuration switch (DS2 and function code 5 displays continuously).

2. Activate the Configuration Procedure
Press/release the configuration switch (DS3 comes on and function code 5 flashes).

3. Set the Value for the Direction of Travel
A setting of "1" causes CCW travel with an increasing signal; a setting of "2" causes CW travel with an increasing signal. Press/release the configuration switch. The current value appears on the digital display (default value is 1). Press/hold the configuration switch until the desired LSD value appears; then release.

4. Set the Configuration Value
Press/release the configuration switch until "  " appears. Press/hold the configuration switch until "  " flashes; then release.

5. Store the Configuration Value
Press/release the configuration switch (DS3 flashes five times; DS2 comes on and the function code displays continuously). The digital display will start scanning the functions.

Function 6. Auxiliary Relay #1 (Option Board Required)

Attach a signal source to the control input terminals (2 and 3).

1. Select Function #6, Auxiliary Relay K1
When function code 6 appears, quickly press/release the configuration switch (DS2 comes on and function code 6 displays continuously).

2. Activate the Configuration Procedure
Press/release the configuration switch (DS3 comes on and function code 6 flashes).

3. Set the Value for the Relay Activation Setting
Adjust the signal source to the point of rotation at which the auxiliary switch is to change states. Allow the actuator to move to that point.

4. Store the Configuration Value
Press/hold the configuration switch (DS3 flashes five times; DS2 comes on and the function code displays continuously). Release the configuration switch. The digital display will start scanning the functions.

Function 7. Auxiliary Relay #2 (Option Board Required)

1. Select Function #7, Auxiliary Relay K2
When function code 7 appears, quickly press/release the configuration switch (DS2 comes on and function code 7 displays continuously).

2. Activate the Configuration Procedure
Press/release the configuration switch (DS3 comes on and function code 7 flashes).

3. Set the Value for the Relay Activation Setting
Adjust the signal source to the point of rotation at which the auxiliary switch is to change states. Allow the actuator to move to that point.

4. Store the Configuration Value
Press/hold the configuration switch (DS3 flashes five times; DS2 comes on and the function code displays continuously). Release the configuration switch. The digital display will start scanning the functions.

Function 8. Input Zero

Input zero adjusts the input amplifier offset to the proper value for the bottom of the control signal range. Attach a signal source to the control input terminals (2 and 3).

1. Select Function #8, Input Zero
When function code 8 appears, quickly press/release the configuration switch (DS2 comes on and function code 8 displays continuously).

2. Activate the Configuration Procedure
Press/release the configuration switch (DS3 comes on and function code 8 flashes).

3. Set the Value for the Bottom of Range
Adjust the signal source to the value for the bottom of the control signal range (default value is 4 mA). Observe DS2.

If DS2 is flashing, rotate the zero potentiometer CW until DS2 is on continuously. If DS2 is off, rotate the zero potentiometer CCW until DS2 is on continuously.

4. Store the Configuration Value
Press/release the configuration switch (DS3 will flash five times and function code 8 displays continuously). Press/release the configuration switch again. DS2 will flash five times and the digital display will start scanning the functions.

Function 9. Input Span

Input span adjusts the input amplifier gain to the proper value for the top of the control signal range. Attach a signal source to the control input terminals (2 and 3).

1. Select Function #9, Input Span
When function code 9 appears, quickly press/release the configuration switch (DS2 comes on and function code 9 displays continuously).

2. Activate the Configuration Procedure
Press/release the configuration switch (DS3 comes on and function code 9 flashes).

3. Set the Value for the Top of Range
Adjust the signal source to the value for the top of the control signal range (default value is 20 mA). Observe DS2.

If DS2 is flashing, rotate the span potentiometer CCW until DS2 is on continuously. If DS2 is off, rotate the span potentiometer CW until DS2 is on continuously.

4. Store the Configuration Value
Press/release the configuration switch (DS3 will flash five times and function code 9 displays continuously). Press/release the configuration switch again. DS2 will flash five times and the digital display will start scanning the functions.

Function A. Position Signal Zero (Option Board Required)

Position signal zero adjusts the position output minimum signal to 4 mA. Attach a signal source to the control input terminals (2 and 3). Connect a DC mA meter to the two connector terminal block on the auxillary board.

1. Select Function #A, Position Zero
When function code A appears, quickly press/release the configuration switch (DS2 comes on and function code A displays continuously).

2. Activate the Configuration Procedure
Press/release the configuration switch (DS3 comes on and function code A flashes).

3. Set the Value for the Bottom of Range
Adjust the signal source until a value of 4.00 mA is indicated on the meter.

4. Store the Configuration Value
Press/release the configuration switch (DS3 will flash five times and function code A displays continuously). Press/release the configuration switch again. DS2 will flash five times and the digital display will start scanning the functions.

Function b. Position Signal Span (Option Board Required)

Posiition signal span adjusts the position output maximum signal to 20 mA. Attach a signal source to the control input terminals (2 and 3). Connect a DC mA meter to the two connector terminal block on the auxillary board.

1. Select Function #b, Position Span
When function code b appears, quickly press/release the configuration switch (DS2 comes on and function code b displays continuously).

2. Activate the Configuration Procedure
Press/release the configuration switch (DS3 comes on and function code b flashes).

3. Set the Value for the Top of Range
Adjust the signal source until a value of 20.00 mA is indicated on the meter.

4. Store the Configuration Value
Press/release the configuration switch (DS3 will flash five times and function code b displays continuously). Press/release the configuration switch again. DS2 will flash five times and the digital display will start scanning the functions.

Function U. (Reserved)

Return the mode switch to the run position to put the actuator in the normal operating state. See “Digital Display” table in preceding section for an explanation of the codes displayed while in the run mode.

Error Code Definitions

When an error occurs, the error code is flashed continuously until power is removed. The error code will continue to flash at a subsequent powerup unless the problem has been corrected. In some cases it may be necessary to use the powerup EEROM erase procedure to return the EEROM to a known state.

Code	Definition
E0	Zero crossing fail detected.
E1	Slidewire fail detected.
E2	EEROM memory fail detected.
E3	RAM memory init fail detected.
E4	Travel configuration error detected (CW - CCW span must be >= 30% of full 180 degree travel distance).
E5	Output calibration configuration error detected (output full scale must be greater than output zero by a minimum amount).
E6	Check sum error detected.
E7	Travel/stroke limits are set such that it is not possible to switch from 180 degree travel mode to 90 degree travel mode.
E8	Travel span that resulted in switching from 180 degree travel mode to 90 degree travel mode was less than 30% of the full 180 degree span.

Restoring Default Configuration Parameters using the EEROM Erase Procedure

The default configuration parameters can be restored using the following procedure:

1. Turn off power to the actuator converter.
2. Set slide switch SW2 to the CFG (ON) position.
3. Depress the SW1 pushbutton and hold in the depressed position.
4. Turn on power to the actuator converter while continuing to hold SW1 in the depressed position.

Display DS1 will show the following character:

LEDs DS2 and DS3 will be on continuously.

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5. Continue to hold SW1 in the depressed position until display DS1 changes from:

to a flashing "c":

(this will take approximately 15 seconds)

6. After the "c" character begins flashing, release the SW1 pushbutton and then switch SW2 to the run position (OFF).

7. The display will show the following character:

(three horizontal bars)

The three bars will be shown for approximately ten seconds while the EEROM is being erased.

8. When the erasure is complete, the display will rapidly cycle through the following characters:

 indicates that the default configuration data is being written to the newly erased EEROM (P = Programming EEROM).

IMPORTANT!

During the time that the display shows the three horizontal bars and the P character, SW2 should not be switched back to the CFG position nor should power to the actuator be removed. If either of these should occur the data in the EEROM may be invalid - simply start a new erase/restore procedure to ensure the correct default configuration data is written to the EEROM.

 indicates that the configuration data in the EEROM (in this case the newly restored default configuration data) is being loaded from the EEROM to the working RAM (L = Loading RAM).

 indicates that the actuator is ready to enter run-time, active control mode (r = ready to Run converter).

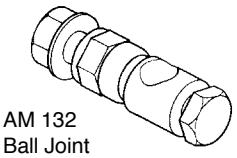
 blinks when the converter is in the active run mode. The blink rate is roughly proportional to the error between the input signal and the shaft position. If the shaft position is nulled with the input signal the rate is about 1 Hz. The rate increases in proportion to the error between shaft position and the input signal requirement.

Damper Linkage Assembly

CAUTION!
The damper must not be mechanically stopped before the actuator has reached its electrical limit of travel or permanent damage can occur to the actuator!

1. During installation of the linkage assembly, place the primary controller in the manual mode to drive the output high or low (or control the actuator manually).

2. Mount the actuator in an appropriate position near the damper. The actuator must be linked to the damper so that it can complete its full stroke. A damper rod that is too long is not rigid enough for good control and a damper rod that is too short makes it difficult to adjust the linkage.


AM 132
Ball Joint
Linkage Connector

3. Attach a ball joint (linkage connector) to the actuator and damper crank arms at the correct position in the crank arm slot depending on the application (see Figure 4). A 180° rotation damper actuator provides the best close-off at the end of stroke and the best controllability (turn down ratio).

4. Typically the damper should be linked for an angular rotation of less than 90° that provides the required flow (typically 60°). This provides the optimum close-off and controllability.

	Ball Joint Position, 180° Rotation Actuators		Ball Joint Position, 90 ° Rotation Actuators	
Damper Rotation	Actuator Arm	Damper Arm	Actuator Arm	Damper Arm
90°	2-1/4" (1)	3-1/8" (2)	3-1/8" (2)	3-1/8" (2)
80°	2"	3-1/8" (2)	2-3/4"	3"
70°	1-3/4"	3"	2-1/2"	3"
60°	1-1/2"	3"	2-1/4" (1)	3-1/8" (2)

(1) = Prick point. (2) = End of slot.

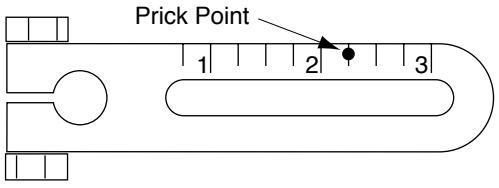


Figure 4. Slot provides adjustment from 7/8" to 3-1/8"

5. With the actuator powered, manually position it to the closed position of the damper. Rotate the damper to its mid-stroke. Install the crank arms on the damper shaft and the actuator so that crank arms are parallel. The crank arm on the damper shaft should be secured to the shaft and the crank arm on the actuator should be free to rotate.

6. Attach the push rod to the ball joint connectors on both crank arms and tighten the ball joint screws thumb tight.

7. By hand, rotate the crank arm on the actuator to drive the linkage and the damper shaft through its full stroke to ensure proper damper action.

8. Return the damper to its closed position and tighten to secure the actuator crank arm.

9. While pushing the damper closed, tighten the ball joint screws to secure the damper rod.

10. Run the actuator back and forth through its full stroke and check for proper damper and linkage operation. Adjust the linkage if required.

CAUTION!
If the crank arm does not provide proper travel, reset the linkage. Never attempt to turn the actuator shaft with a wrench or crank; this may damage the actuator!

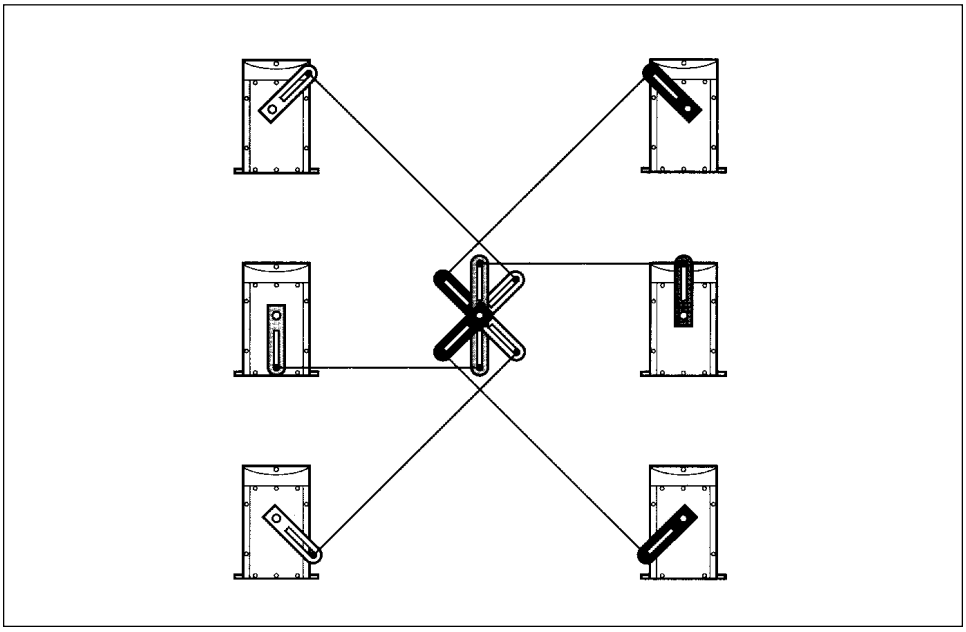


Figure 5. Typical Actuator Mounting Positions

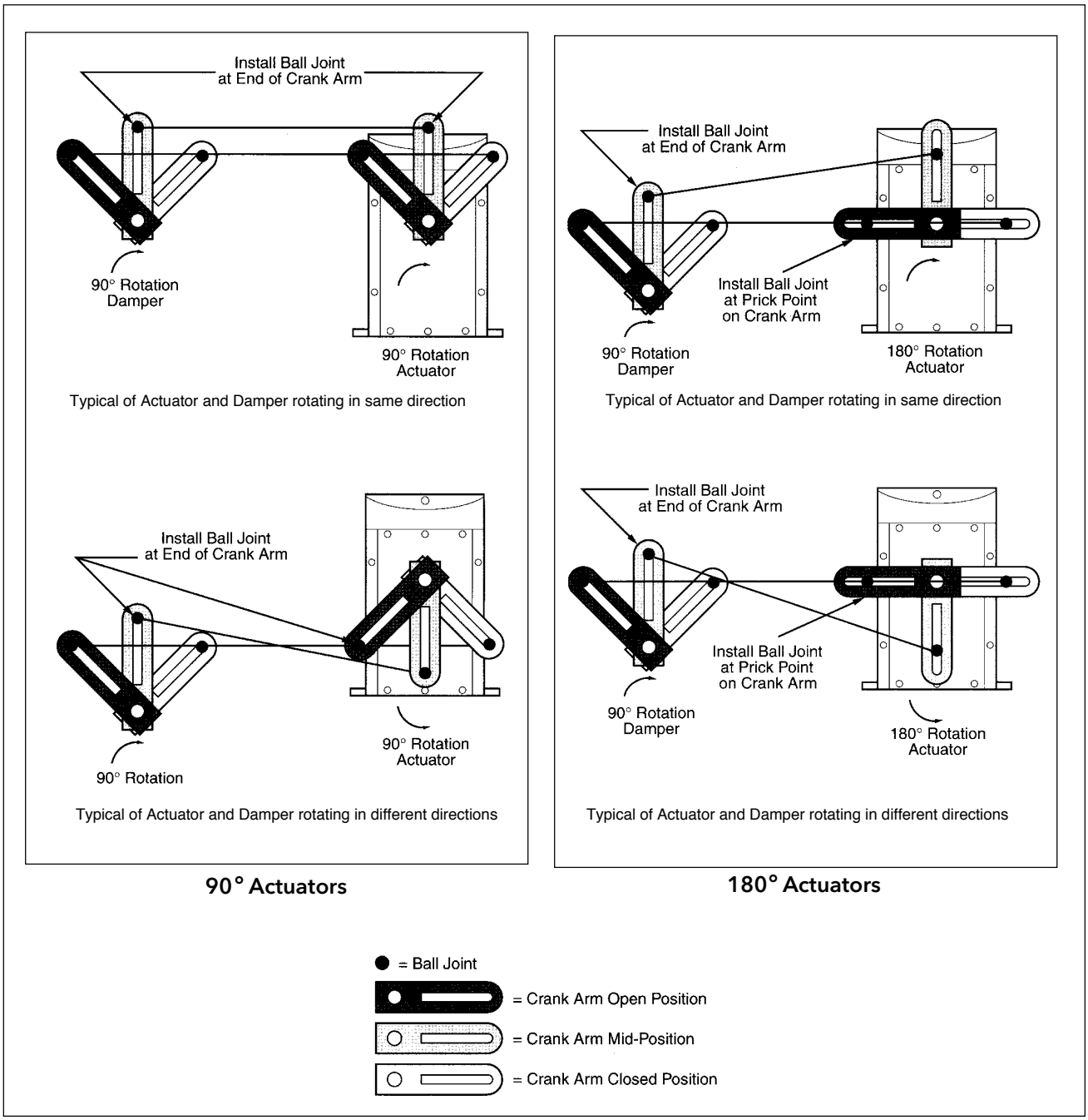


Figure 6. Typical Damper Linking

Note:

If, after wiring is completed, the actuator shaft does not turn in the desired direction, invert the leads to terminals 2 & 3, and to terminals 7 & 8 of the actuator terminal block.

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7. Mounting Dimensions

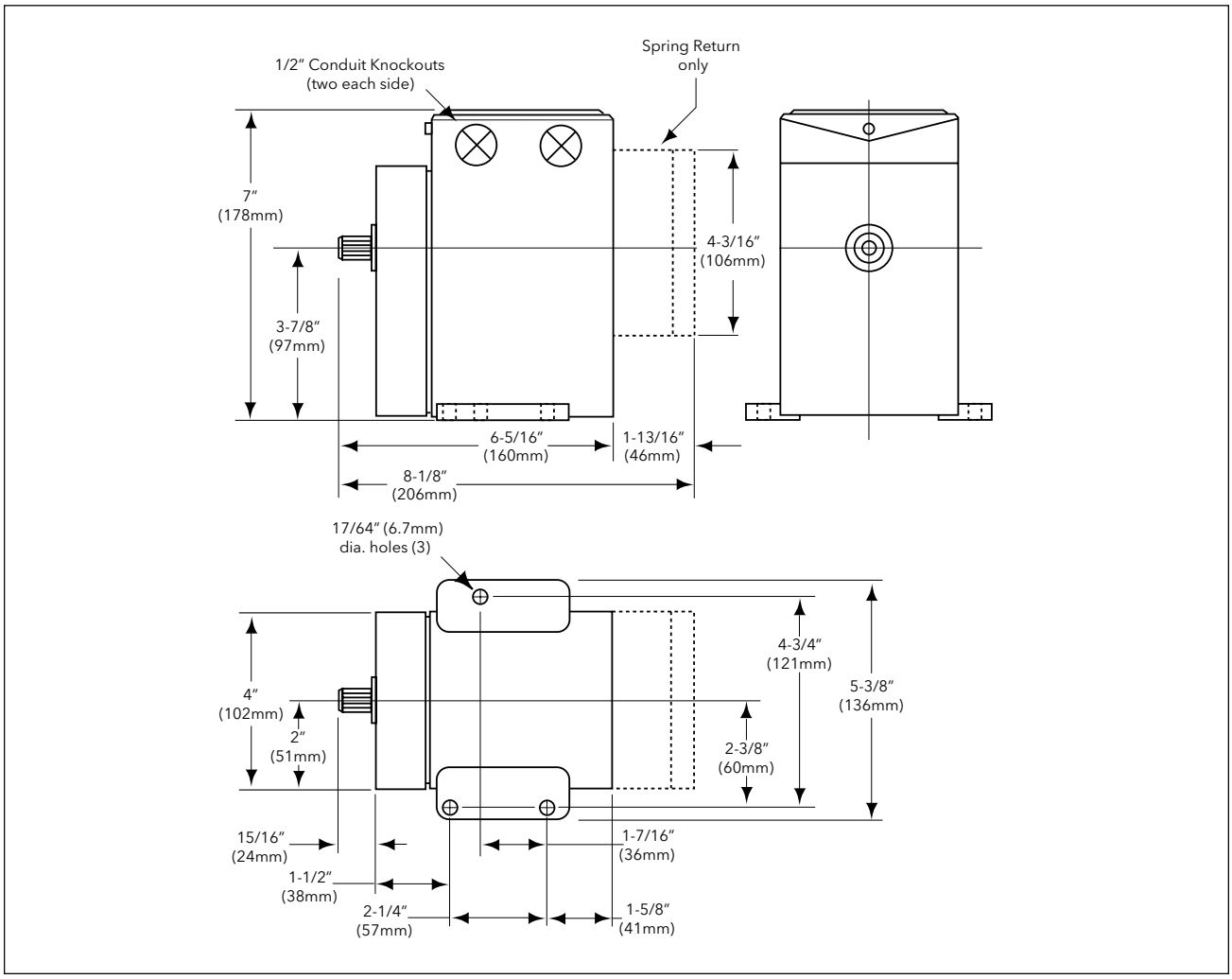

Figure 7. Mounting Dimensions, EA Actuator

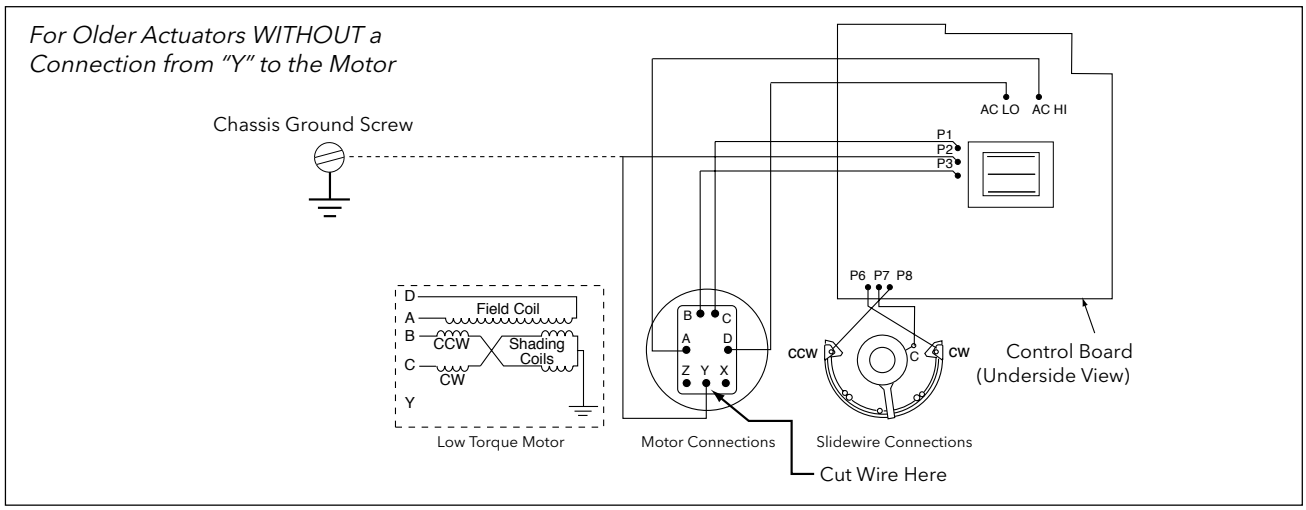

Figure 8. Motor and slidewire for older actuators

8. Retrofit Kits

The 71-1090-000 and 71-1090-100 retrofit kits allow conversion of a standard EA40 or EA50 series actuator with slidewire feedback to an analog input model.

Kit 71-1090-000 is used with 120 and 240 Vac actuators.
Kit 71-1090-100 is used with 24 Vac actuators.

Please note that the function of the internal auxiliary switch is lost when converting the actuator.

1. Remove the four screws holding the terminal block/switch plate assembly.
2. Remove the three screws connecting to the slidewire and wiper. Remove the slidewire.
3. Remove the round insulator from the feed-through connector. Unplug the harness.
4. Some actuators manufactured prior to 1992 do not have an internal wire from terminal "Y" on the round connector to the motor. To test for this condition, connect an ohmmeter between "Y" and "B" and check for continuity. Most actuators will indicate about 22 ohms. If the ohmmeter indicates infinity (meaning the internal wire is not present), cut the lead from terminal "Y" on the new wire harness and crimp the supplied terminal lug to the wire. Connect the lug to the chassis at the chassis ground screw (refer to Figure 8).
5. Remove the terminal block/switch plate assembly. Retain the screws.
6. Install the new slidewire and harness. Refer to Figure 2 or 8 for details. Note that the figure shows the circuit board upside-down. The wires will not cross when the board is installed.
7. Plug the new harness into the feed-through connector. Install the round insulator.
8. Plug the three harness connectors onto the receptacles on the bottom of the board as shown in Figure 2 and 8. The connectors have tabs to prevent plugging in backwards.
9. Configure the jumpers on the power terminal block for the proper line voltage.*
10. Install the board onto the actuator housing.
11. Installation is complete.

The board is pre-calibrated for 4-20 mA input. However, the firmware end-of-travel limits may have to be adjusted due to variations in slidewires. Connect a 4-20 source and check the travel. Use the configuration procedure for Functions 1 and 2 if adjustment is necessary.

*Do not lock down the safety cover of the terminal strip until final installation. The safety cover locking tabs grip firmly and it will be necessary to remove the circuit board to get them unlocked.

Eurotherm:
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AUSTRALIA *Melbourne*
Invensys Process Systems
Australia Pty. Ltd.
T (+61 0) 8562 9800
F (+61 0) 8562 9801
E *info.eurotherm.au@invensys.com*

AUSTRIA *Vienna*
Eurotherm GmbH
T (+43 1) 7987601
F (+43 1) 7987605
E *info.eurotherm.at@invensys.com*

BELGIUM & LUXEMBOURG
Moha
Eurotherm S.A./N.V.
T (+32) 85 274080
F (+32) 85 274081
E *info.eurotherm.be@invensys.com*

BRAZIL *Campinas-SP*
Eurotherm Ltda.
T (+5519) 3707 5333
F (+5519) 3707 5345
E *info.eurotherm.br@invensys.com*

CHINA
Eurotherm China
T (+86 21) 61451188
F (+86 21) 61452602
E *info.eurotherm.cn@invensys.com*

Beijing Office
T (+86 10) 5909 5700
F (+86 10) 5909 5709/10
E *info.eurotherm.cn@invensys.com*

FRANCE *Lyon*
Eurotherm Automation SA
T (+33 478) 664500
F (+33 478) 352490
E *info.eurotherm.fr@invensys.com*

GERMANY *Limburg*
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T (+49 6431) 2980
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INDIA *Mumbai*
Invensys India Pvt. Ltd.
T (+91 22) 67579800
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IRELAND *Dublin*
Eurotherm Ireland Limited
T (+353 1) 4691800
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E *info.eurotherm.ie@invensys.com*

ITALY *Como*
Eurotherm S.r.l
T (+39 031) 975111
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KOREA *Seoul*
Invensys Operations Management
Korea
T (+82 2) 2090 0900
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NETHERLANDS *Alphen a/d Rijn*
Eurotherm B.V.
T (+31 172) 411752
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POLAND *Katowice*
Invensys Eurotherm Sp z o.o.
T (+48 32) 7839500
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SPAIN *Madrid*
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Eurotherm AB
T (+46 40) 384500
F (+46 40) 384545
E *info.eurotherm.se@invensys.com*

SWITZERLAND *Wollerau*
Eurotherm Produkte (Schweiz) AG
T (+41 44) 7871040
F (+41 44) 7871044
E *info.eurotherm.ch@invensys.com*

UNITED KINGDOM *Worthing*
Eurotherm Limited
T (+44 1903) 268500
F (+44 1903) 265982
E *info.eurotherm.uk@invensys.com*

U.S.A. *Ashburn VA*
Invensys Eurotherm
T (+1 703) 724 7300
F (+1 703) 724 7301
E *info.eurotherm.us@invensys.com*

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