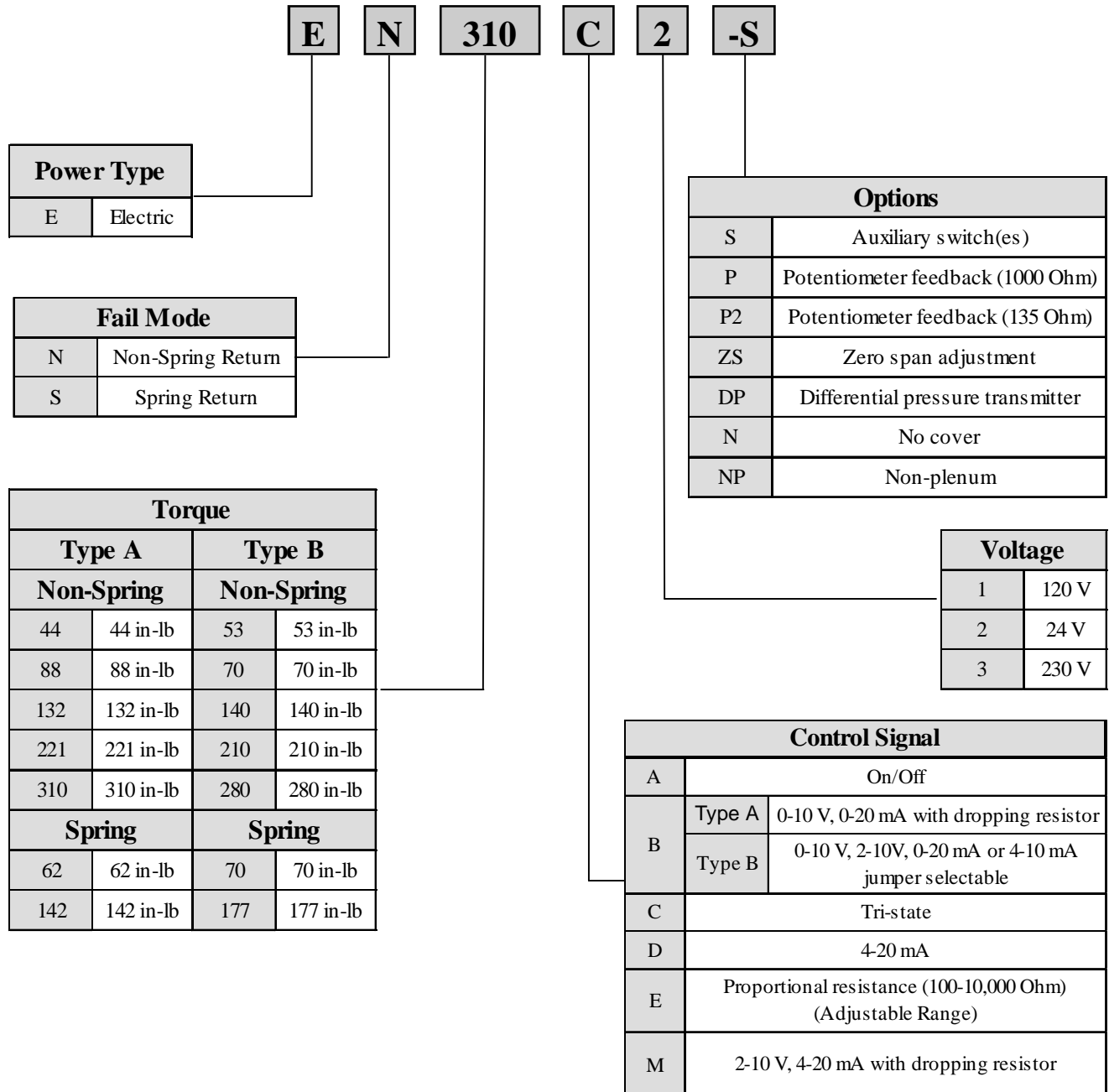




## How to Select the Commercial Electronic Actuator Part Number



*Note:*

— See Actuator Selection Chart to confirm combinations.



## Commercial Actuator Selection Chart – Non-Spring Return

Actuator Model	24 VAC Power Input	Control Signal						Position Feedback			Torque						Aux. Switches
		On/Off	Tri-State Floating	0-10 VDC, 2-10 VDC 0-20 mA, 4-20 mA	Resistive: 100-10,000 Ohm	Pulse Width Modulation (PWM)	Starting Point & Span Adjust. (zero & span)	0-10 VDC, 2-10 VDC	Resistive (-P) 0-1000 Ohm	Resistive (-P2) 0-135 Ohm	35 in-lb	53 in-lb	70 in-lb	140 in-lb	210 in-lb	280 in-lb	Built-in Auxiliary Switches, (-S) only
EN53A2(-S)	•	•	•									2					•
EN53B2(-S)	•			•		1		•				•					•
EN53C2(-S)	•		•									•					•
EN70B2(-S)	•			•		1		•					•				•
EN70B2-ZS(-S)	•			•			•	•					•				•
EN70C2(-S)	•	•	•										•				•
EN70C2(-P)/(-P2)	•	•	•						•	•			•				
EN70E2(-S)	•				•			•					•				•
EN140B2(-S)	•			•		1		•						•			•
EN140B2-ZS(-S)	•			•			•	•						•			•
EN140C2(-S)	•	•	•											•			•
EN140C2(-P)/(-P2)	•	•	•						•	•				•			
EN140E2(-S)	•				•			•						•			•
EN210B2(-S)	•			•		1		•							•		•
EN210B2-ZS(-S)	•			•			•	•							•		•
EN210C2(-S)	•	•	•												•		•
EN210C2(-P)/(-P2)	•	•	•						•	•					•		
EN210E2(-S)	•				•			•							•		•
EN280B2(-S)	•			•		1		•								•	•
EN280B2-ZS(-S)	•			•			•	•								•	•
EN280C2(-S)	•	•	•													•	•
EN280C2(-P)/(-P2)	•	•	•						•	•						•	
EN280E2(-S)	•				•			•								•	•

**Notes:**

- 1 Peripheral options are available for specialty signals such as PWM, 0-135 Ohm and 0-20 V phasecut. Call DEI.
- 2 For 1, 1.8 and 2 minute settings only. See page AC-B-6.
- Most commercial assemblies are available with an optional NEMA 4/4X type housing. See applicable data sheet for details.
- (-S) optional switch; (-P) optional resistive feedback; (-P2) optional resistive feedback; (-ZS) zero span version.



## Commercial Actuator Selection Chart – Spring Return

Actuator Model	Power Input		Nominal Spring Return Time (Sec) - Maximum	Control Signal						Position Feedback			Torque				Aux. Switches	Self-Adaptive
	24 VAC	120 VAC		On/Off	Tri-State (Floating)	0-10 VDC, 2-10 VDC 0-20 mA, 4-20 mA*	0-20 V Phasecut or 0-135 Ohm	Pulse Width Modulation (PWM)	Starting Point & Span Adjust.	0-10 VDC, 2-10 VDC	Resistive (-P) (135 Ohm)	Resistive (-P2) (1,000 Ohm)	53 in-lb	70 in-lb	140 in-lb	177 in-lb	Built-in Auxiliary Switch (-S) only	
ES53C2(-S) *	•		<15	•	•								•					
ES70A1(-S)		•	<15	•										•				
ES70A2(-S)	•		<15	•										•				
ES70B2(-S)	•		<15			•	1	1		•				•				•
ES70B2-ZS(-S)	•		<15			•	1	1	•	•				•				
ES70C2(-S)	•		<15	•	•						•	•		•				
ES140A1		•	<15	•											•			
ES140C2(-S)(-P)(-P2)	•		<15	•	•						•	•			•		•	
ES177A1(-S)		•	<15	•												•	•	
ES177A2(-S)	•		<15	•												•	•	
ES177B2(-S)	•		<15			•	1	1		•						•	•	•
ES177B2-ZS(-S)	•		<15			•	1	1	•	•						•	•	
ES177C2(-S)	•		<15	•	•						•	•				•	•	

**Notes:**

\* Requires 500 ohm (1%, 1/4 W) resistor.

1 Peripheral options are available for specialty signals such as PWM, 0-135 Ohm and 0-20 V phase cut. Call DEI.

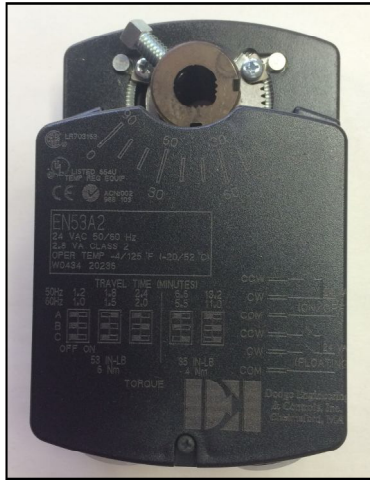
2 2-10 V, 6-9 V or 4-20 mA only

– Most commercial assemblies are available with an optional NEMA 4/4X type housing. See applicable data sheet for details.

– (-S) means the switch is optional.



## **Non-Spring Return, 24 VAC Electronic Actuators, Tri-State (Floating)/Two-Position EN53A2(-S), EN53C2(-S); EN70C2, EN140C2, EN210C2 & EN280C2(-S), (-P), (-P2)**



**EN53 Series Actuator**

The EN "A" or "C" Series is a direct-mount line of actuators that operates on 24 VAC (or 24 VDC power for the EN70, 140, 210, and 280) and is available for use with floating controllers. The EN53 actuators are easily installed on a Variable Air Volume (VAV) box, a round damper shaft up to 1/2 inch (13 mm) diameter, and a 3/8 inch (10 mm) square shaft. The EN70, 140, 210 and 280 bidirectional actuators do not require a damper linkage and are easily installed on a round shaft up to a 3/4 inch (20 mm) diameter or a square shaft up to 5/8 inch (16 mm).

All actuators can also be mounted to valves (ball, globe, and butterfly) using one of the many valve linkage kits available through Dodge Engineering & Controls.

The EN models deliver up to 280 in-lb (32 N-m) of torque in a single mount configuration, and up to 560 in-lb (64 N-m) of torque in a tandem mount configuration. The angle of rotation is mechanically adjustable from 0° to 90° in 5° increments. Integral auxiliary switches are available to indicate end-stop position or to perform switching functions at any angle within the selected rotation range. Position feedback is available through switches or a potentiometer signal.



**EN70, 140, 210, 280 Series Actuator**

**Torque Minimum:** EN53A2 or EN53C2: 53 in-lb; EN70C2: 70 in-lb; EN140C2: 140 in-lb; EN210C2: 210 in-lb; EN280C2: 280 in-lb

**Application:** EN Series actuators are designed to position air dampers and valves in HVAC systems. Applications include: positioning return air or exhaust dampers; controlling face and bypass dampers; positioning blades for variable volume fans; positioning ball, butterfly or globe valves. Refer to the manufacturer's information to size properly the damper, valve and/or actuator. Spring return actuators, such as Dodge Engineering's ES Series, are recommended for use with outdoor air dampers in cold climates.

**Operation (EN53):** The EN53 Series provides a 53 in-lb (6 N-m) running torque for floating control of dampers, VAV box dampers or control valves. The EN53 Series mounts directly on the duct surface, round damper or small rectangular damper with an anti-rotation bracket and two sheet metal screws (included). Additional linkages or couplers are not required. A controller provides a control signal to the actuator depending upon the desired movement of the damper blade. This signal causes the motor to rotate in the proper direction and moves the damper blade open or closed.

*Note: To avoid excessive wear or drive time on the motor, use a controller and/or software that provides a time-out function to remove the signal at the end of rotation (stall).*

The EN53C2(-S) actuator rotates at a nominal rate of 1.5° per second (90° in 60 seconds) at 60 Hz input (72 seconds @ 50 Hz) with a load independent rotation time. The actuator rotation is field adjustable from 30° to 90°. Actual rotation time for actuators using less than 90° rotation should be determined and that value used with the controller software. For example, 40 seconds would be used for 60° rotation. The EN53A2(-S) models offer adjustable rotation times of 1, 1.5, 2, 5.5 and 11 minutes. The 1, 1.5 and 2 minute settings provide 53 in-lb of torque and are ideal for two-position and floating applications. The 5.5 and 11 minute settings provide 35 in-lb of torque.

**Operation (EN70, 140, 210 and 280):** EN Series actuators operate on 24 VAC at 50/60 Hz or 24 VDC. These compact actuators use a DC motor with stall detection circuitry that operates throughout the entire stroke. The proportional actuators employ noise filtering techniques on the control signal to eliminate response to spurious noise. Rotation is mechanically limited to 93° by integral end-stops. The position of the actuator is visually indicated from 0° to 90° on the cover. An anti-rotation bracket prevents lateral movement of the actuator. For hand positioning the coupler, pressing the spring-loaded gear release on the actuator cover can manually disengage the gear train.



**Non-Spring Return, 24 VAC Electronic Actuators, Tri-State (Floating)/Two-Position  
EN53C2(-S); EN70C2, EN140C2, EN210C2 & EN280C2(-S), (-P), (-P2)**

Technical Data	EN53C2(-S), EN53A2(-S)	EN70C2 (-S)(-P)(-P2)	EN140C2 (-S)(-P)(-P2)	EN210C2 (-S)(-P)(-P2)	EN280C2 (-S)(-P)(-P2)
Power supply	20 to 30 VAC @ 50/60 Hz	20 to 30 VAC, 24 VDC +/- 10%, 50/60 Hz			
Transformer sizing	C2(-S) <sup>1</sup> : 2.5 VA A2(-S) <sup>2</sup> : 2.8 VA (class 2 power source req. for UL)	6.5 VA (class 2 power source req. for UL)		7.5 VA (class 2 power source req. for UL)	
Electrical connection	1/4" spade terminals**	screw terminals for 22 to 14 AWG(max. of two 18-22 AWG/terminals)			
Control signal	C2(-S): floating A2(-S): two-position or floating 20-30 VAC @ 50/60 Hz	floating (20 to 30 VAC at 50/60 Hz)			24 VAC @ 50/60 Hz or 24 VDC
Factory setting	Direct (CW) or reverse (CCW) with signal increase (jumper selectable)				
Feedback signal (-P) or (-P2) option	—	1000 Ω (-P) or 135 Ω (-P2)			
Input impedance	C2(-S) <sup>1</sup> : 200 Ω A2(-S) <sup>2</sup> : 160 Ω	400 Ω			
Switch contact rating (-S) option	Two SPDT rated @ 24 VAC, 1.5 A inductive, 3 A resistive, 35 VA max per switch, class 2				
Mechanical connection (shaft size)	3/8" to 1/2" (10-12.7 mm) diameter round shaft 3/8" (10 mm) square shaft	3/8" to 3/4" (10-20 mm) diameter round shaft 3/8" to 5/8" (10-16 mm) square shaft			
Angle of rotation	Adjustable from 30-90°	0-90° in 5° increments, mechanical limitation 93°			
Torque	1, 1.5, and 2 minute settings: 53 in-lb (6 N-m) 5.5 and 11 minute settings: 35 in-lb (4 N-m)	70 in-lb (8 N-m)	140 in-lb (16 N-m)	210 in-lb (24 N-m)	280 in-lb (32 N-m)
Direction of rotation	CW or CCW	CW or CCW with proper wiring			
Position indication	bolt indicator	clip-on indicator			
Running time	C2(-S) <sup>1</sup> : 60 secs @ 60 Hz, 72 secs @ 50 Hz A2(-S) <sup>2</sup> : 60 secs factory set, adjustable with switch: 60, 90, 120, 330, or 660 secs @ 60 Hz; 72, 108, 144, 396, or 792 secs @ 50 Hz	25-50 secs for 0-70 in-lb (0-8 N-m)	70-115 secs for 0-140 in-lb (0-16 N-m)	115-175 secs for 0-210 in-lb (0-24 N-m)	115-185 secs for 0-280 (0-32 N-m)
Humidity	0 to 90% RH non-condensing	0 to 95% RH non-condensing			
Operating temperature	-4°F to 125°F (-20°C to 52°C)	-4°F to 122°F (-20°C to 50°C)			
Storage temperature	C2(-S) <sup>1</sup> : -40°F to 176°F (-40°C to 80°C) A2(-S) <sup>2</sup> : -40°F to 186°F (-40°C to 86°C)	-40°F to 186°F (-40°C to 86°C)			
Housing type*	NEMA 2, IP32	NEMA 2, IP42			
Agency listings	UL 873 listed; CSA C22.2, CE 89/336/EEC				
Noise level	<35 dBA @ 1 m	<45 dBA @ 1 m			
Servicing	maintenance free				
Quality standard	ISO 9002				
Weight	2.4 lbs (1.08 kg)	2.9 lbs (1.3 kg)			

**Notes:**

\* Most commercial assemblies are available with an optional NEMA 4/4X type housing. See applicable data sheet for details.

\*\* Optional pluggable terminal blocks.

1 Tri-State only

2 Two-Position or Tri-State



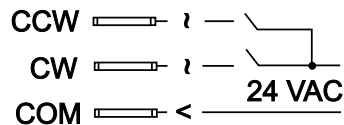
**Non-Spring Return, 24 VAC Electronic Actuators, Tri-State (Floating)/Two-Position  
EN53A2(-S), EN53C2(-S); EN70C2, EN140C2, EN210C2 & EN280C2(-S), (-P), (-P2)**

**Wiring Diagrams**

**EN53C2(-S) & EN53A2(-S)**

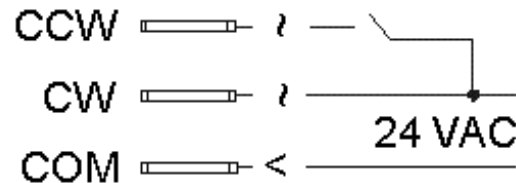
**Floating Control**

Models: EN53C2 and EN53C2-S  
EN53A2 and EN53A2-S



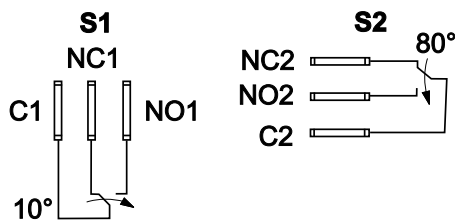
**Two-Position Control**

Models: A2 and A2-S



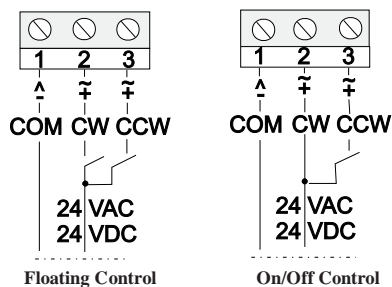
**Auxiliary Switches**

Models: EN53C2-S and EN53A2-S



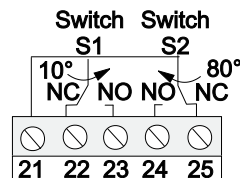
**EN70C2, EN140C2, EN210C2 & EN280C2(-S),(-P),(-P2)**

**Terminal Block 1**

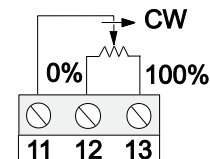


Models: C2, C2-S, C2-P2 and C2-P

**Terminal Block 2**



Auxiliary Switches  
(Shown Factory Set)  
Model: C2-S



Feedback  
Potentiometer  
Models: C2-P2 = 0-135 ohms  
C2-P = 0-1000 ohms



## Non-Spring Return, 24 VAC/VDC Electronic Actuators, Modulating EN53B2(-S), EN70B2(-S)(-ZS), EN140B2(-S)(-ZS), EN210B2(-S)(-ZS) & EN280B2(-S)



*EN53 Series Actuator*

The "EN" Series is a direct-mount line of actuators that operates on 24 VAC (for all models) or 24 VDC for the EN70, 140, 210 and 280 models and is available for use with proportional controllers. The EN53 actuators are easily installed on a Variable Air Volume (VAV) box, a round a damper shaft up to 1/2" (13 mm) diameter, and a 3/8" (10 mm) square shaft. The EN70, 140, 210 and 280 bidirectional actuators do not require a damper linkage and are easily installed on a round shaft up to 3/4" (20 mm) diameter or a square shaft up to 5/8" (16 mm). All actuators can also be mounted to valves (ball, globe, and butterfly) using one of the many valve linkage kits available through Dodge Engineering & Controls.

The EN models deliver up to 280 in-lb (32 N-m) of torque. The angle of rotation is mechanically adjustable from 0° to 90° in 5° increments. Integral auxiliary switches are available to indicate end-stop position or to perform switching functions at any angle within the selected rotation range. Position feedback is available through switches or a 0 (2) to 10 VDC signal.

**Torque Minimum:** EN53B2: 53 in-lb; EN70B2: 70 in-lb; EN140B2: 140 in-lb; EN210B2: 210 in-lb; EN280B2: 280 in-lb



*EN70, 140, 210, 280 Series Actuator*

**Application:** EN Series actuators are designed to position air dampers and valves in HVAC systems. Applications include: positioning return air or exhaust dampers; controlling face and bypass dampers; positioning blades for variable volume fans; positioning ball, butterfly or globe valves. Refer to the manufacturer's information to size properly the damper, valve and/or actuator. Spring return actuators, such as Dodge Engineering's ES Series, are recommended for use with outdoor air dampers in cold climates.

**Operation (EN53):** The EN53 Series provides a 53 in-lb (6 N-m) running torque for proportional control of dampers, VAV box dampers or control valves. The EN53 Series mounts directly on the duct surface, round damper or small rectangular damper with an anti-rotation bracket and two sheet metal screws (included). Additional linkages or couplers are not required. A controller provides a control signal to the actuator depending upon the desired movement of the damper blade. This signal causes the motor to rotate in the proper direction and moves the damper blade open or closed.

*Note: To avoid excessive wear or drive time on the motor, use a controller and/or software that provides a time-out function to remove the signal at the end of rotation (stall).*

The actuator rotates at a nominal rate of 1.5° per second (90° in 60 seconds) at 60 Hz input.

The actuator rotation is field adjustable from 30° to 90°. Actual rotation time for actuators using less than 90° rotation should be determined and that value used with the controller software. For example, 40 seconds would be used for 60° rotation.

**Operation (EN70, 140, 210, 280):** EN Series actuators operate on 24 VAC at 50/60 Hz or 24 VDC. These compact actuators use a DC motor with stall detection circuitry that operates throughout the entire stroke. The proportional actuators employ noise filtering techniques on the control signal to eliminate response to spurious noise. Rotation is mechanically limited to 93° by integral end-stops. The position of the actuator is visually indicated from 0° to 90° on the cover. An anti-rotation bracket prevents lateral movement of the actuator. For hand positioning the coupler, pressing the spring-loaded gear release on the actuator cover can manually disengage the gear train.





**Non-Spring Return, 24 VAC/VDC Electronic Actuators, Modulating  
EN53B2(-S), EN70B2(-S)(-ZS), EN140B2(-S)(-ZS), EN210B2(-S)(-ZS)  
& EN280B2(-S)**

Technical Data	EN53B2(-S)	EN70B2(-S)(-ZS)	EN140B2(-S)(-ZS)	EN210B2(-S)(-ZS)	EN280B2(-S)
Power supply	20 to 30 VAC @ 50/60 Hz	20 to 30 VAC, 24 VDC ±10%, 50/60 Hz			
Transformer sizing	3.2 VA class 2 power source req. for UL	7.5 VA class 2 power source req. for UL			
Electrical connection	1/4" spade terminals**	screw terminals for 22 to 14 AWG (max. of two 18-22 AWG/terminals)			
Control signal	0(2) to 10 VDC, 0(2) to 20 VDC, or 0(4) to 20 mA (jumper selectable)				
Control signal (-ZS option)	—	zero; 0-6 VDC, 0-12 VDC, or 0-12 mA span; 2-10 VDC, 4-20 VDC, or 4-20 mA			—
Factory setting	0-10 VDC direct CW rotation with signal increase	0-10 VDC, 0-20 mA, CW rotation with signal increase			
Feedback signal	0-10 VDC or 2-10 VDC for 90° (1 mA @ 10 VDC) (corresponds to input and signal span selection)				
Input impedance	voltage: 150 kΩ, current: 500 Ω	voltage: 205 kΩ for 0(2) to 10 V, 410 kΩ for 0(4) to 20 V, current: 500 Ω			
Switch contact rating (-S option)	two SPDT rated at 24 VAC, 1.5 A inductive, 3 A resistive 35 VA max. per switch				
Mechanical connection (shaft size)	3/8" to 1/2" (10 mm to 12.7 mm) diameter round shaft 3/8" (10 mm) square shaft	3/8" to 3/4" (10 mm to 20 mm) diameter round shaft 3/8" to 5/8" (10 mm to 16 mm) square shaft			
Angle of rotation	adjustable from 30°-90°	0°-90° in 5° increments, mechanical limitation 93°			
Torque	53 in-lb (6 N-m)	70 in-lb (8 N-m) constant	140 in-lb (16 N-m)	210 in-lb (24 N-m)	280 in-lb (32 N-m)
Direction of rotation	CW or CCW	jumper selectable			
Position indication	clip-on indicator				
Running time	60 secs @ 60 Hz, 72 secs @ 50 Hz	25-50 secs for 0-70 in-lb (0-8 N-m)	70-115 secs for 0-140 in-lb (0-16 N-m)	115-175 secs for 0-210 in-lb (0-24 N-m)	115-185 secs for 0-280 in-lb (0-32 N-m)
Humidity	0 to 90% RH non-condensing	0 to 95% RH non-condensing			
Ambient temperature	-4°F to 125°F (-20°C to 52°C)	-4°F to 122°F (-20°C to 50°C)			
Storage temperature	-40°F to 176°F (-40°C to 80°C)	-40°F to 186°F (-40°C to 86°C)			
Housing type*	NEMA 2, IP32	NEMA 2, IP42			
Agency listing	UL873 listed, CSA C22.2, CE 89/336/EEC				
Noise level	≤ 35 dBA @ 1 m	≤ 45 dBA @ 1 m			
Servicing	maintenance free				
Quality standard	ISO 9002				
Weight	2.4 lbs (1.08 kg)	2.9 lbs (1.3 kg)			

**Notes:**

\* Most commercial assemblies are available with an optional NEMA 4/4X type housing. See applicable data sheet for details.

\*\* Optional pluggable terminal blocks.





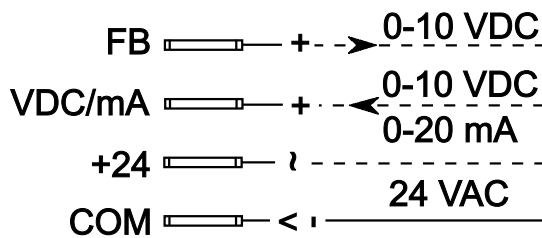
**Non-Spring Return, 24 VAC/VDC Electronic Actuators, Modulating  
EN53B2(-S), EN70B2(-S)(-ZS), EN140B2(-S)(-ZS), EN210B2(-S)(-ZS)  
& EN280B2(-S)**

**Wiring Diagrams**

**EN53B2(-S)\***

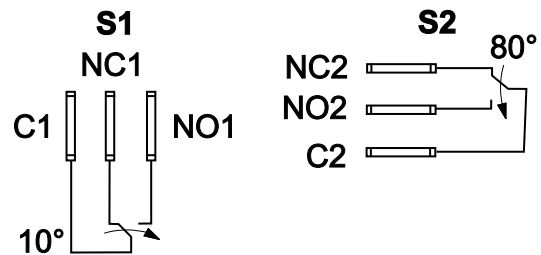
**Proportional Control**

Models: EN53B2 and EN53B2-S



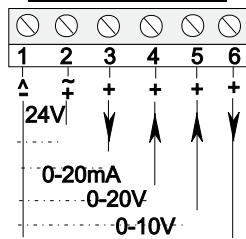
**Auxiliary Switches**

Model: EN53B2-S



**EN70B2(-S)(-ZS), EN140B2(-S)(-ZS), , EN210B2(-S)(-ZS), & EN280B2(-S)**

**Terminal Block 1**

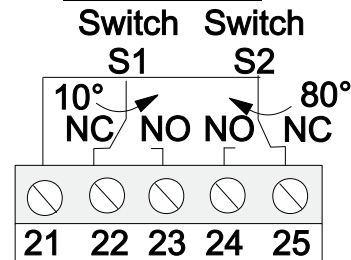


**Proportional Control**

Models: B2, B2-S, B2-ZS,  
and B2-ZS-S

- 1 = Common
- 2 = Power
- 3 = Calibration Out (for B2-ZS  
and B2-ZS-S models only)
- 4 = Current Input
- 5 = Voltage Input
- 6 = Feedback Output

**Terminal Block 2**



**Auxiliary Switches**

(Shown Factory Set)  
Models: B2-S, B2-ZS-S

**Note:**

- \* If actuator is being powered continuously it requires (-S) option, as well as a Form C relay.



## **Non-Spring Return 24 VAC/VDC Electronic Actuators, Resistive EN70E2(-S), EN140E2(-S) & EN210E2(-S)**



The EN "E" Series is a direct-mount line of actuators that operates on 24 VAC or VDC power and is available for use with resistive controllers. These bidirectional actuators do not require a damper linkage and are easily installed on a round shaft up to a 3/4" (20 mm) diameter or a square shaft up to 5/8" (16 mm). They can also be mounted to valves (ball, globe, and butterfly) using one of the many valve linkage kits available through Dodge Engineering & Controls.

The EN models deliver up to 210 in-lb (24 N-m) of torque. The angle of rotation is mechanically adjustable from 0° to 90° in 5° increments. Integral auxiliary switches are available to indicate end-stop position or to perform switching functions at any angle within the selected rotation range. Position feedback is available through switches or a 0 (2) to 10 VDC signal.

**Torque Minimum:** EN70E2: 70 in-lb; EN140E2: 140 in-lb; EN210E2: 210 in-lb.

**Application:** EN Series actuators are designed to position air dampers and valves in HVAC systems. Applications include: positioning return air or exhaust dampers; controlling face and bypass dampers; positioning blades for variable volume fans; positioning ball, butterfly or globe valves. Refer to the manufacturer's information to size properly the damper, valve and/or actuator. Spring return actuators, such as Dodge Engineering's ES Series, are recommended for use with outdoor air dampers in cold climates.

**Operation:** EN Series actuators operate on 24 VAC at 50/60 Hz or 24 VDC. These compact actuators use a DC motor with stall detection circuitry that operates throughout the entire stroke. The resistive actuators employ noise filtering techniques on the control signal to eliminate response to spurious noise.

Rotation is mechanically limited to 93° by integral end-stops. The position of the actuator is visually indicated from 0° to 90° on the cover. An anti-rotation bracket prevents lateral movement of the actuator. For hand positioning the coupler, pressing the spring-loaded gear release on the actuator cover can manually disengage the gear train.



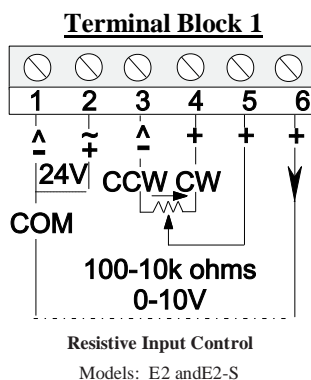
## Non-Spring Return 24 VAC/VDC Electronic Actuators, Resistive EN70E2(-S), EN140E2(-S) & EN210E2(-S)

Technical Data	EN70E2(-S)	EN140E2(-S)	EN210E2(-S)
Power supply	20 to 30 VAC, 24 VDC $\pm 10\%$ , 50/60 Hz		
Transformer sizing	7.5 VA class 2 power source req. for UL		
Electrical connection	screw terminals for 22 to 14 AWG(max. of two 18-22 AWG/terminals)		
Control signal	100 to 10,000 $\Omega$		
Factory setting	direct (CW) with signal increase		
Feedback signal	0 to 10 VDC for 90° (1 mA at 10 VDC)		
Input impedance	1.8 M $\Omega$		
Switch contact rating (-S option)	two SPDT rated @ 24 VAC, 1.5 A inductive, 3 A resistive (3.5 VA max. per switch)		
Mechanical connection (shaft size)	3/8" to 3/4" (10 mm to 20 mm) diameter round shaft 3/8" to 5/8" (10 mm to 16 mm) square shaft		
Angle of rotation	0° to 90° in 5° increments, mechanical limitation 93°		
Torque	70 in-lb (8 N-m) constant	140 in-lb (16 N-m)	210 in-lb (24 N-m)
Direction of rotation	jumper selectable		
Position indication	clip-on indicator		
Running time	25-50 secs for 0-70 in-lb (0-8 N-m)	70-115 secs For 0-140 in-lb (0-16 N-m)	115-175 secs For 0-210 in-lb (0-24 N-m)
Humidity	0 to 95% RH non-condensing		
Ambient temperature	-40°F to 122°F (-20°C to 50°C)		
Storage temperature	-40°F to 186°F (-40°C to 86°C)		
Housing type*	NEMA 2, IP42		
Agency listings	UL 873 listed; CSA C22.2, CE 89/336/EEC		
Noise level	<45 dBA @ 1 m		
Servicing	maintenance free		
Quality standard	ISO 9002		
Weight	2.9 lbs (1.3 kg)		

Note:

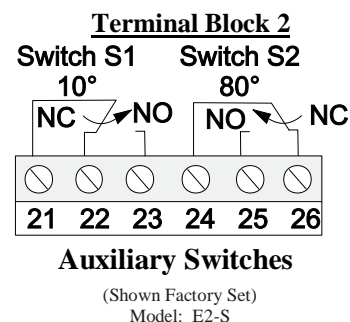
- \* Most commercial assemblies are available with an optional NEMA 4/4X type housing. See applicable data sheet for details.

### Wiring Diagrams



Note:

Terminals 3 and 4 function as CCW and CW references when the Resistive models are in the DA mode, but as CW and CCW references when these models are in the RA mode.





## Spring Return 24 VAC/VDC Electronic Actuators, Tri-State (Floating) or Two-Position ES70C2(-S)



The ES70 Series Electric Spring Return Actuators provide control of dampers in Heating, Ventilating, and Air Conditioning (HVAC) systems. All actuators in this series provide 70 lb-in (8 N·m) rated torque. A mechanical spring return system provides rated torque with and without power applied to the actuator. The series includes the following control options: On/Off and Floating Point, 24 V power

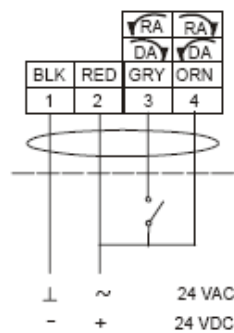
These actuators are configured for direct mounting and do not require a damper linkage. Actuators can be mounted directly to a damper shaft from 5/16 to 5/8 in. (8 to 16 mm) diameter with a universal clamp. A Shaft Coupler Kit is available for shafts up to 3/4 in. (19 mm) diameter. An accessory crankarm and remote mounting kit are available for applications where the actuator cannot be direct-coupled to the damper shaft. Optional line voltage auxiliary switches indicate an end-stop position or perform switching functions within the selected rotation range.

### Features

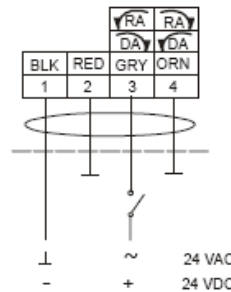
- 70 lb-in. (8 N·m) rated torque
- direct-coupled design
- reversible mounting
- electronic stall detection
- double-insulated construction
- locking manual override with auto release and crank storage
- integral cables with colored and numbered conductors
- integral connectors for 3/8 in. (10 mm) Flexible Metal Conduit (FMC)
- optional integrated auxiliary switches
- UL, CE, and C-Tick compliance
- manufactured under International Standards Organization (ISO) 9001 quality control standards

### Wiring Diagrams: ES70C2(-S)

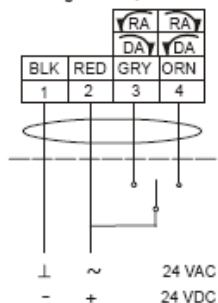
Open/Close, Single Wire Control



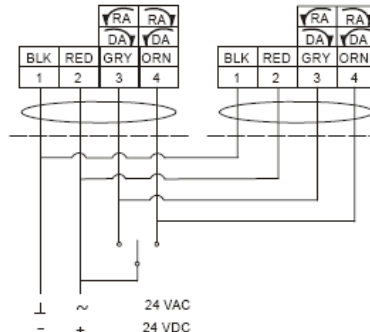
On/Off Control, Two Wire



Floating Control, Four Wire



Floating Control, Multiple Actuators with One Transformer





## Spring Return 24 VAC/VDC Electronic Actuators, Tri-State (Floating) or Two-Position ES70C2(-S)

Technical Data	ES70C2(-S)
Power supply	24 VAC @ 50/60 Hz or 24 VDC, Class 2
Power Requirements	<b>24 VAC:</b> (19.2V-28.8V) 7.9 VA Running, 5.5 VA Holding Position; <b>24 VDC: (21.6V-28.8V)</b> 3.5 W Running, 1.9 W Holding Position
Transformer sizing	7 VA per Actuator
Electrical connection	48" UL 758 Type AWM Halogen-Free Cable w/ 18 AWG Conductors and .25 in. Ferrule Ends
Control signal	Tri-State or 2-Position
Switch contact rating (-S option)	two SPDT, double insulated switches with gold over silver contacts; rated @ 24 VAC, 50 VA pilot duty 120 VAC, 5.8 Resistive, 1/4 hp, 275 VA Pilot Duty 240 VAC, 5.0 A Resistive, 1/4 hp, 275 VA Pilot Duty
Conduit Connections	Integral Connectors for 3/8 in. (10 mm) Flexible Metal Conduit
Mechanical connection (shaft size)	5/16" to 5/8" (8 to 16 mm) diameter round shaft, or 1/4" and 1/2" (6 to 12mm) square shafts.
Angle of rotation	Maximum Full Stroke: 95°, Adjustable Stop: 35° to 95°, Maximum Position
Torque	70 in-lbs (8 N-m)
Direction of rotation	Direction is Selectable with Mounting Position of Actuator
Position indication	clip-on indicator
Manual override	Locking manual override with auto release and crank storage
Running time Power On (Running)	150 Seconds Constant for 0 - 70 in-lbs (8 N-m) Load, at all Operating Conditions
Running time Power Off (Spring Returning)	17 to 25 Seconds for 0-70 in-lb (0 to 8 N-m) at room temp.; 94 Seconds Max. for 0 to 70 in-lb (0-8 N-m) at -4°F (-20°C); 22 Seconds Nominal at Full Rated Load
Ambient Conditions	<b>Operating:</b> -4 to 140°F (-20 to 60°C); 90% RH Maximum, Noncondensing <b>Storage:</b> -40 to 185°F (-40 to 85°C); 90% RH Maximum, Noncondensing
Housing type*	NEMA 2 / IP54
Agency listings U.S.	UL Listed, CCN XAPX, File E27734; to UL 60730-1A: 2003-08, Ed. 3.1, Automatic Electrical Controls for Household and Similar Use; and UL 60730-2-14: 2002- 02, Ed. 1, Part 2, Particular Requirements for Electric Actuators. (All Models)
Agency listings Canada	UL Listed, CCN XAPX7, File E27734; to UL 60730-1-1:02-CAN/CSA: July 2002, 3rd Ed., Automatic Electrical Controls for Household and Similar Use and CSA C22.2 No. 24-93 Temperature Indicating and Regulating Equipment. (All Models)
Audible Noise Rating	Power On (running): <35 dBA at 70 in-lbs (8 N-m) Load, at a Distance of 39- 13/32 in. (1 m)
	Power On (Holding): <20 dBA at a Distance of 39-13/32 in. (1 m)
	Power Off (Spring Returning): <52 dBA at 70 in-lbs (8 N-m) Load, at a Distance of 39-13/32 in. (1 m)
Servicing	maintenance free
Dimensions	6.33 x 3.90 x 2.26 in. (160.7 x 99 x 57.5 mm)
Weight	3.43 Lbs.; 3.8 lbs with switches

**Notes:**

\* Most commercial assemblies are available with an optional NEMA 4/4X type housing. See applicable data sheet for details.



## **Spring Return Electronic Actuators, Two-Position ES70A(-S)**



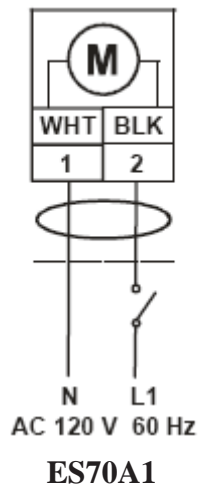
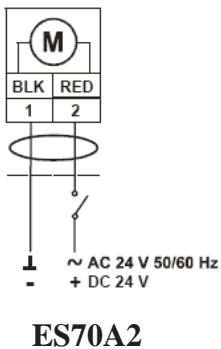
The ES70 Series Electric Spring Return Actuators provide control of dampers in Heating, Ventilating, and Air Conditioning (HVAC) systems. All actuators in this series provide 70 lb-in (8 N·m) rated torque. A mechanical spring return system provides rated torque with and without power applied to the actuator. The series includes the following control options: On/Off, 24 V and 120 VAC power

These actuators are configured for direct mounting and do not require a damper linkage. Actuators can be mounted directly to a damper shaft from 5/16 to 5/8 in. (8 to 16 mm) diameter with a universal clamp. A Shaft Coupler Kit is available for shafts up to 3/4 in. (19 mm) diameter. An accessory crankarm and remote mounting kit are available for applications where the actuator cannot be direct-coupled to the damper shaft. Optional line voltage auxiliary switches indicate an end-stop position or perform switching functions within the selected rotation range.

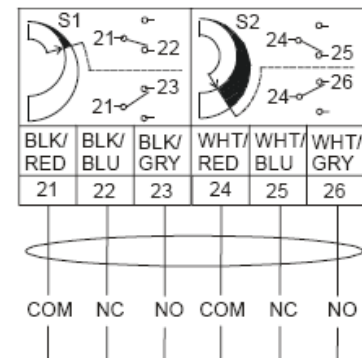
### **Features**

- 70 lb-in. (8 N·m) rated torque
- direct-coupled design
- reversible mounting
- electronic stall detection
- double-insulated construction
- locking manual override with auto release and crank storage
- integral cables with colored and numbered conductors
- integral connectors for 3/8 in. (10 mm) Flexible Metal Conduit (FMC)
- optional integrated auxiliary switches
- UL, CE, and C-Tick compliance
- manufactured under International Standards Organization (ISO) 9001 quality control standards

### **Wiring Diagrams: ES70A2(-S) and ES70A1(-S)**



### **Auxiliary Switches**



**Auxiliary Switch Models:  
ES70A2-S and ES70A1-S**





## Spring Return Electronic Actuators, Two-Position ES70A(-S)

Technical Data	ES70A2(-S)	ES70A1(-S)
Power supply	24 VAC @ 50/60 Hz or 24 VDC, Class 2	120 VAC @ 60 Hz
Power Requirements	<b>24 VAC:</b> 6.1 VA Running, 1.2 VA Holding Position; <b>24 VDC:</b> 3.5 W Running, 0.5 W Holding Position	<b>120 VAC:</b> 0.05 A Running, 0.03 A Holding Position
Transformer sizing	7 VA per Actuator	—
Electrical connection	48" UL 758 Type AWM Halogen-Free Cable w/ 18 AWG Conductors	
Control signal	2-Position	
Switch contact rating (-S option)	two SPDT, double insulated switches with gold over silver contacts; rated @ 24 VAC, 50 VA pilot duty	two SPDT, double insulated switches with gold over silver contacts; rated @ 120 VAC, 5.8 resistive, 1/4 hp, 275 VA pilot duty
Conduit Connections	Integral Connectors for 3/8 in. (10 mm) Flexible Metal Conduit	
Mechanical connection (shaft size)	5/16" to 5/8" (8 to 16 mm) diameter round shaft, or 1/4" and 1/2" (6 to 12mm) square shafts.	
Angle of rotation	Maximum Full Stroke: 95°, Adjustable Stop: 35° to 95°, Maximum Position	
Torque	70 in-lbs (8 N-m)	
Direction of rotation	Direction is Selectable with Mounting Position of Actuator	
Position indication	clip-on indicator	
Manual override	Locking manual override with auto release and crank storage	
Running time Power on (Running)	Non-spring return: 55 to 71 secs for 0 to 70 in-lb (0-8 N-m) at all operating conditions; 60 sec. Nominal at full rated load	
Running time Power off (Spring Returning)	Spring return: 13 to 26 secs for 0-70 in-lb (0 to 8 N-m) at room temp.; 39 secs max. for 0 to 70 in-lb (0-8 N-m) at -4°F (-20°C); 108 secs max. for 0 to 53 in-lb (0-6 N-m) at -40°F (-40°C)	
Ambient Conditions	<b>Operating:</b> -4 to 140°F (-20 to 60°C); 90% RH Maximum, Noncondensing	
	<b>Storage:</b> -40 to 185°F (-40 to 85°C); 90% RH Maximum, Noncondensing	
Housing type*	NEMA 2 / IP54	
Agency listings U.S.	UL Listed, CCN XAPX, File E27734; to UL 60730-1A: 2003-08, Ed. 3.1, Automatic Electrical Controls for Household and Similar Use; and UL 60730-2-14: 2002-02, Ed. 1, Part 2, Particular Requirements for Electric Actuators. (All Models)	
Agency listings Canada	UL Listed, CCN XAPX7, File E27734; to UL 60730-1-1:02-CAN/CSA: July 2002, 3rd Ed., Automatic Electrical Controls for Household and Similar Use and CSA C22.2 No. 24-93 Temperature Indicating and Regulating Equipment. (All Models)	
Noise level	<47 dBA @ 70 in-lb. (8 N-m) Load, at a distance of 39-13/32 in. (1 m)	
Servicing	maintenance free	
Dimensions	6.33 x 3.90 x 2.26 in. (160.7 x 99 x 57.5 mm)	
Weight	3.75 lbs (1.7 kg)	4.15 lbs (1.9 kg)

Note: \* Most commercial assemblies are available with an optional NEMA 4/4X type housing. See applicable data sheet for details.





## Spring Return 24 VAC/VDC Electronic Actuators, Modulating ES70B2(-S)



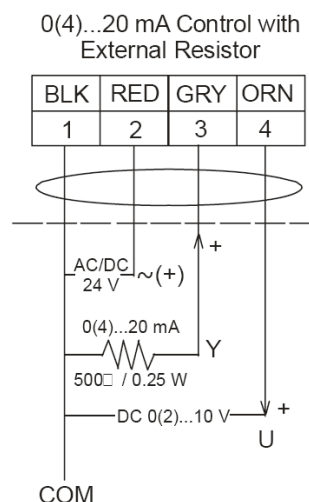
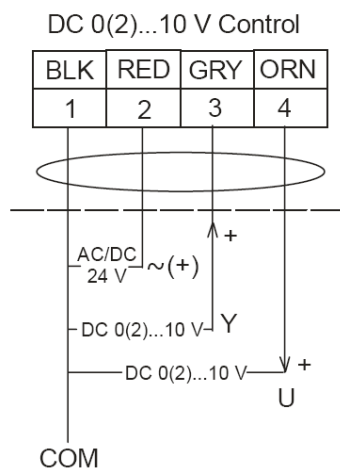
The ES70B2 Series Electric Spring Return Actuators provide control of dampers in Heating, Ventilating, and Air Conditioning (HVAC) systems. All actuators in this series provide 70 lb-in (8 N·m) rated torque. A mechanical spring return system provides rated torque with and without power applied to the actuator. This series is a proportional, 24 V power actuator offering 0(2) to 10 VDC or 0(4) to 20 mA Control Signals.

These actuators are configured for direct mounting and do not require a damper linkage. Actuators can be mounted directly to a damper shaft from 5/16 to 5/8 in. (8 to 16 mm) diameter with a universal clamp. An accessory crankarm and remote mounting kit are available for applications where the actuator cannot be direct-coupled to the damper shaft. Optional line voltage auxiliary switches indicate an end-stop position or perform switching functions within the selected rotation range.

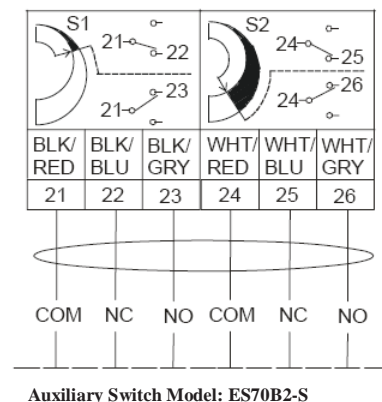
### Features

- 70 lb-in. (8 N·m) rated torque
- direct-coupled design
- reversible mounting
- electronic stall detection
- double-insulated construction
- microprocessor-controlled brushless DC motor
- external mode selection switch
- locking manual override with auto release and crank storage
- integral cables with colored and numbered conductors
- integral connectors for 3/8 in. (10 mm) Flexible Metal Conduit (FMC)
- optional integrated auxiliary switches
- UL, CE, and C-Tick compliance
- manufactured under International Standards Organization (ISO) 9001 quality control standards

### Wiring Diagrams: ES70B2(-S)



### Auxiliary Switches



Auxiliary Switch Model: ES70B2-S



## Spring Return 24 VAC/VDC Electronic Actuators, Modulating ES70B2(-S)

Technical Data	ES70B2(-S)
Power supply	24 VAC (19.2 to 28.8 VAC) @ 50/60 Hz or 24 VDC (21.6 V to 28.8 V)
Power Requirements	<b>24 VAC:</b> 7.9 VA Running, 5.5 VA Holding Position, <b>24 VDC:</b> Class 2, 3.5 W Running, 1.9 W Holding Position
Transformer sizing	8 VA Minimum per actuator Class 2
Electrical connection	48" UL 758 Type AWM Halogen-Free Cable w/ 18 AWG Wire leads with Integral Connectors for 3/8" (10 mm) flexible metal conduit and .25 in. Ferrule Ends
Control signal	Selectable DC 0(2) to 10V or 0(4) to 20 mA with field furnished 500 ohm, 0.25 W minimum resistor; Switch selectable Direct or Reverse Action with Signal Increase
Factory setting	0-10 VDC, CW rotation with increase in signal
Feedback signal	0 (2) to 10 VDC for desired rotation range up to 95° Corresponds to rotation limits, 0.5 mA at 10V Maximum
Input impedance	voltage: 100,000Ω, current: 500Ω w/ field furnished resistor
Switch contact rating (-S option)	two SPDT double insulated 24 VAC, 50 VA pilot duty 120 VAC, 5.8 A resistive, 1/4 hp, 275 VA pilot duty 240 VAC, 5.0 A resistive, 1/4 hp, 275 VA pilot duty
Mechanical connection (shaft size)	5/16" to 5/8" or (8 mm to 16 mm) diameter, round shaft 1/4" tp 1/2" or (6 to 12 mm) square shaft
Angle of rotation	mechanically limited to 95°
Torque	70 in-lbs (8 N-m)
Direction of rotation	Switch Selectable Direct or Reverse Action with Signal Increase
Position indication	clip-on indicator
Running time	150 secs for 0-70 in-lb (8 N-m) Load at all operating conditions, Spring Return: 17 to 25 secs for 0 to 70 in-lb Load, at room temperature
Humidity	0 to 95% RH, non-condensing
Ambient temp./Humidity	-40°F to 140°F (-40°C to 60°C); 0 to 95% RH, max. non-condensing
Storage temp./Humidity	-40°F to 185°F (-40°C to 85°C); 0 to 90% RH, max. non-condensing
Housing type*	NEMA 2, IP54 for All Mounting Directions
Agency listing U.S.	UL Listed, CCN XAPX, File E27734; to UL 60730-1A: 2003-08, Ed. 3.1, Automatic Electrical Controls for Household and Similar Use; and UL 60730-2-14: 2002-02, Ed. 1, Part 2, Particular Requirements for Electric Actuators. (All Models)
Agency listing Canada	UL Listed, CCN XAPX7, File E27734; to UL 60730-1-1:02-CAN/CSA: July 2002, 3rd Ed., Automatic Electrical Controls for Household and Similar Use; and CSA C22.2 No. 24-93 Temperature Indicating and Regulating Equipment (All Models)
Noise level	<52 dBA @ 70 in-lb. (8 N-m) Load, at a distance of 39-13/32 in. (1 m)
Servicing	maintenance free
Dimensions	6.33 x 3.90 x 2.26 in. (160.7 x 99 x 57.5 mm)
Weight	3.43 lbs (1.6 kg) (-S models); 3.8 lbs. (1.7 kg)

Note: \* Most commercial assemblies are available with an optional NEMA 4/4X type housing. See applicable data sheet for details.

- for 0(4) to 20 mA a field supplied 500 ohm resistor required.



## **Spring Return Rotary Electronic Actuator, Two-Position ES177A(-S)**



The ES177A Two-position Actuators are direct mount, spring return electric actuators that operate on 24 VAC or VDC, or 120 VAC power. These bidirectional actuators do not require a damper linkage, and are easily installed on dampers with 1/2 to 3/4 in. or 12 to 19 mm round shafts, or 3/8 and 1/2 in. or 10, 12, and 14 mm square shafts using the standard shaft clamp included with the actuator. An optional Jackshaft Coupler Kit is available for 3/4 to 1-1/16 in. or 19 to 27 mm round shafts, or 5/8 and 3/4 in. or 16, 18, and 19 mm square shafts.

The ES177A Series Electric Spring Return Actuators provide running and spring return torques of 177 in-lb (20 N-m). Integral line voltage auxiliary switches are available on the -S models to indicate end-stop position, or to perform switching functions within the selected rotation range.

The ES177A On/Off Electric Spring Return Actuator provides reliable, integrated damper or valve control. An AC 24 V at 50/60 Hz or DC 24 V input signal (ES177A2 model) between the black and red wires, or an AC 120 V input signal at 60 Hz (ES177A1 model) between the black and white wires, causes the output hub to rotate from -5 to 90° (unless an external mechanical limit is reached).

When power is applied, the actuator rotates and the output hub rotates against the spring from -5 to 90°. The actuator is electronically overload protected should the actuator stall before reaching 90°. It holds position at the end of the stroke until power is removed. When power is removed, the actuator spring returns to its -5° position (unless an external mechanical limit is reached). A stall condition while driving between -5 to 90° causes the output hub to stop motion and hold its position until power is removed. Rotation is mechanically limited to the -5 and 90° positions by integral end-stops. Optional end-stops are available to limit the output hub travel. An anti-rotation bracket prevents rotational movement of the actuator body.

<b>Actuator Part Number Table</b>						
Torque	Input Signal	Cabling	Operating Voltage			
			24 VAC/VDC		120 VAC	
			Standard	Dual Auxiliary Switches	Standard	Dual Auxiliary Switches
177 in-lb (20 N-m)	Two-Position	Standard or Plenum Cable	ES177A2	ES177A2-S	ES177A1	ES177A1-S



## Spring Return Rotary Electronic Actuator, Two-Position ES177A(-S)

Technical Data	ES177A2(-S)	ES177A1(-S)
Power supply	24 VAC @ 50/60 Hz or 24 VDC, Class 2	120 VAC @ 60 Hz
Power Requirements	<b>24 VAC:</b> 24.6 VA Running, 7.7 VA Holding Position, <b>24 VDC:</b> 17.6 W Running, 2.8 W Holding Position	<b>120 VAC:</b> 0.25 VA Running, 0.13 VA Holding Position
Transformer sizing	25 VA min. Class 2 power source req. for UL, CSA	
Electrical connection	48" 18 AWG Halogen-free Cable Wire Leads	
Control signal	2-Position	
Overload protection	Electronic throughout 0 to 95° rotation	
Switch contact rating (-S option)	two SPD, double insulated switches with gold flash contacts; rated @ 24 VAC, 50 VA pilot duty	two SPD, double insulated switches with gold flash contacts; rated @ 120 VAC, 5.8 resistive, 1/4 hp, 275 VA pilot duty
Conduit Connections	Integral Connectors for 3/8 in. (10 mm) Flexible Metal Conduit	
Mechanical connection (shaft size)	1/2" to 3/4" (12 to 19 mm) diameter round shaft, or 3/8" and 1/2" (10, 12 and 14mm) square shafts. Note: Optional jackshaft coupler kits are available for larger shafts.	
Angle of rotation	mechanically limited to 90°, adjustable from 30° to 90°	
Torque	177 in-lbs (20 N-m); or 354 in-lb (40 N-m) for two models mounted in tandem	
Direction of rotation	selectable when ordering valves, selectable in field for dampers	
Position indication	clip-on indicator	
Manual override	3 mm hex crank (shipped with actuator)	
Spring Return	Direction is selectable with Mounting Position of Actuator: Side A, Actuator face away from damper for CCW spring return; Side B, Actuator face away from damper for CW spring return	
Running Time	24 to 57 seconds for 0 to 177 in-lbs (0 to 20 N-m) at all operating conditions; 35 seconds nominal at full rated load. Spring Return: 11 to 15 secs for 0 to 177 in-lb (0 to 20 N-m) at room temperature; 35 secs maximum for 0 to 177 in-lb (0 to 20 N-m) at -22° (-30°C); 130 secs for 0 to 177 in-lb (0 to 20 N-m) at -40° (-40°C);	
Humidity	90% RH maximum, non-condensing	
Ambient temperature	-40°F to 131°F (-40°C to 55°C)	
Ambient Conditions	<b>Operating:</b> -40 to 131°F (-40 to 55°C); 90% RH Maximum, Noncondensing	
	<b>Storage:</b> -85 to 185°F (-65 to 85°C); 95% RH Maximum, Noncondensing	
Cycles	60,000 full stroke cycles; 1,500,000 repositions	
Storage temperature	-85°F to 185°F (-65°C to 85°C)	
Housing type*	NEMA 2 / IP54	
Housing material	Die cast aluminum alloy	
Agency listings U.S.	UL Listed, CCN XAPX, File E191697; to UL 60730-1A: Automatic Electrical Controls for Household and Similar Use; and UL 60730-2-14: Part 2, Particular Requirements for Electric Actuators. (All Models)	
Agency listings Canada	UL Listed, CCN XAPX7, File E191697; to CAN/CSA-E60730-1: Automatic Electrical Controls for Household and Similar Use. (All Models)	
Noise level	<66 dBA @ 1 m	
Servicing	maintenance free	

Notes:

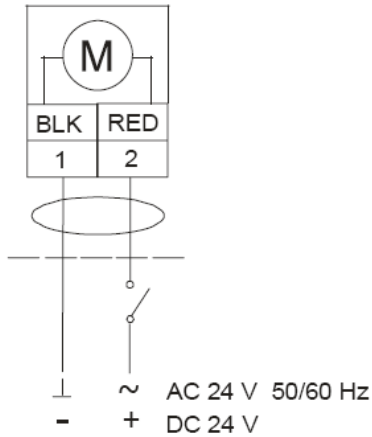
\* Most commercial assemblies are available with an optional NEMA 4/4X type housing. See applicable data sheet for details.



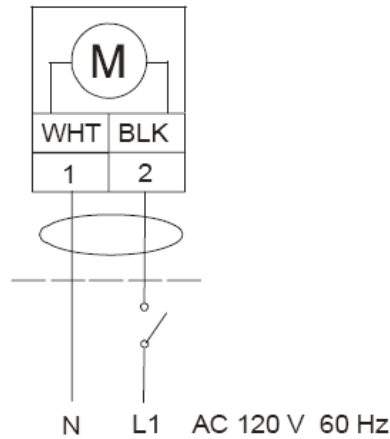
## Spring Return Rotary Electronic Actuator 24 VAC or 120 VAC Two-Position ES177A(-S)

### Wiring Diagrams

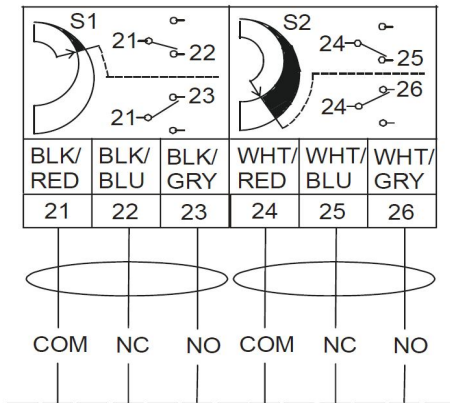
Two-Position Control (24 VAC)



Two-Position Control (120 VAC)



### Auxiliary Switches



### Notes:

- !- **SWITCH WARNING:** Apply only main voltage or only safety extra-low voltage (SELV) to switching outputs of auxiliary switches A and B. Mixed operation is not permissible.
- !- **CE WARNING:** All wiring of these actuators must be safety extra-low voltage (SELV/PELV) in accordance with EN60730.



## Spring Return Rotary Electronic Actuator 24 VAC/VDC, Modulating ES177B2(-ZS)(-S)



### Applications

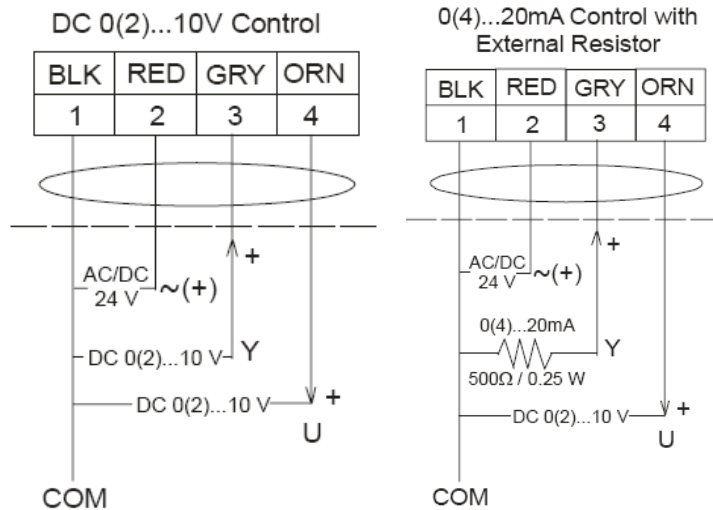
The ES177B2(-ZS)(-S) Proportional Electric Actuators are direct-mount, spring return electric actuators that operate on AC/DC 24V power. These bidirectional actuators do not require a damper linkage, and are easily installed on dampers with 1/2 to 3/4 in. or 12 to 19 mm round shafts, or 3/8 and 1/2 in. or 10, 12, and 14 mm square shafts using the standard shaft clamp included with the actuator. An optional Jackshaft Coupler Kit is available for 3/4 to 1-1/16 in. or 19 to 27 mm round shafts, or 5/8 and 3/4 in. or 16, 18, and 19 mm square shafts.

Torque Minimum: a single ES177B2(-ZS)(-S): 177 in-lb; two ES177B2(-ZS)(-S): 354 in-lb.

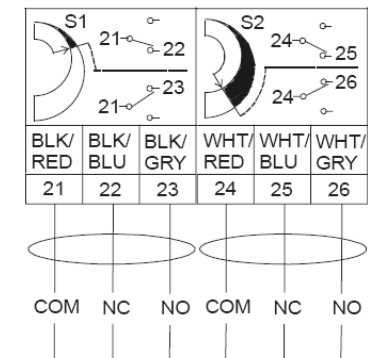
Integral line voltage auxiliary switches are available on the (-S) models to indicate end-stop position or to perform switching functions within the selected rotation range.

### Wiring Diagrams:

Models: ES177B2(-ZS)(-S)



### Auxiliary Switches



Auxiliary Switch Models: ES177B2-S and ES177B2-ZS-S.

### Notes:

- For 0(4) to 20 mA, a field supplied 500 ohm resistor required .
- ES177B2 models are not designed for 4-20mA tandem mount.



## Spring Return Rotary Electronic Actuator 24 VAC/VDC, Modulating ES177B2(-ZS)(-S)

Technical Data	ES177B2(-ZS)(-S)
Power supply	24 VAC (19.2 to 30 VAC @ 50/60 Hz) or 24 VDC (21.6 V to 26.4 V)
Power Requirements	24 VAC: 15.5 VA Running, 7.7 VA Holding Position, 24 VDC: Class 2, 6.7 W Running, 2.9 W Holding Position
Transformer sizing	20 VA Minimum per actuator
Electrical connection	48" UL 758 Type AWM Halogen-Free Cable w/ 18 AWG Wire leads with Integral Connectors for 3/8" (10 mm) flexible metal conduit
Control signal	Selectable DC 0(2) to 10V or 0(4) to 20 mA with field furnished 500 ohm, 0.25 W minimum resistor; Switch selectable direct or reverse action with signal increase  (-ZS) model: Selectable DC 0 to 10V or 0 to 20 mA with field furnished 500 ohm, 0.25 W minimum resistor; Start point programmable DC 0 to 10V; Span programmable DC 2 to 10V; Switch selectable direct or reverse action with signal increase
Factory setting	0-10 VDC, CW rotation with increase in signal
Feedback signal	0 (2) to 10 VDC for desired rotation range up to 90° Corresponds to rotation limits, 1 mA maximum  (-ZS) model: 0 to 10 VDC for desired rotation range up to 90° Corresponds to rotation limits, 1 mA maximum
Input impedance	voltage: 200,000Ω, current input: 500 ohms w/ field furnished 500 ohm resistor
Switch contact rating (-S option)	two SPDT double insulated with gold flash contacts: 24 VAC, 50 VA pilot duty 120 VAC, 5.8 A resistive, 1/4 hp, 275 VA pilot duty 240 VAC, 5.0 A resistive, 1/4 hp, 275 VA pilot duty
Mechanical connection (shaft size)	1/2" to 3/4" or (12 mm to 19 mm) diameter, round shaft or 3/8" to 1/2" or (10, 12 and 14 mm) square shaft
Angle of rotation	mechanically limited to 90°, adjustable from 30 to 90° CW or CCW with optional adjustable stop kit.
Torque	177 in-lbs (20 N-m) for single actuator 354 in-lbs (40 N-m) for two actuators, mounted in tandem
Spring Return	Direction is selectable with Mounting Position of Actuator: Side A, Actuator face away from damper for CCW spring return; Side B, Actuator face away from damper for CW spring return
Running time	150 secs for 0-177 in-lb (20 N-m) at all operating conditions; independent of load, Spring Return: 20 secs for 0 to 177 in-lb (0 to 20 N-m) at room temperature
Tandem Mount	Available for 0(2)-10 VDC, Unavailable for (0)4-20 mA
Ambient temperature/Humidity	-40°F to 131°F (-40°C to 55°C); 90% RH Maximum, Noncondensing
Storage temperature/Humidity	-85°F to 185°F (-65°C to 85°C); 95% RH Maximum, Noncondensing
Cycles	60,000 full stroke cycles; 1,500,000 repositions
Aluminum Enclosure	NEMA 2, IP54 for All Mounting Directions
Agency listing U.S.	UL Listed, CCN XAPX, File E27734; to UL 60730-1A: 2003-08, Ed. 3.1, Automatic Electrical Controls for Household and Similar Use; and UL 60730-2-14: 2002-02, Ed. 1, Part 2, Particular Requirements for Electric Actuators. (All Models)
Agency listing Canada	UL Listed, CCN XAPX7, File E27734; to UL 60730-1-1:02-CAN/CSA: July 2002, 3rd Ed., Automatic Electrical Controls for Household and Similar Use; and CSA C22.2 No. 24-93 Temperature Indicating and Regulating Equipment (All Models).
Audible Noise Rating	Power on (running): <66 dBA at 39-13/32 in. (1 m); Power on (holding): <18 dBA at 39-13/32 in. (1 m); Power off (spring returning): <66 dBA @ 39-13/32 in. (1 m)
Servicing	maintenance free

**Notes:**

\* Most commercial assemblies are available with an optional NEMA 4/4X type housing. See applicable data sheet for details.