


## **Series 70 Actuators** **24 VAC/DC and 120 VAC** **800 to 18,000 lb.-in.**

DOCUMENT	
CONTENTS	Specifications
	Model Selection
	Features
	Dimensions
	Wiring
LOOKING FOR MORE	
	© 2022 Bray International, Inc. 07/07/22

### Application

Bray's years of proven success in quarter turn electric actuation, combined with innovative engineering, has produced the modern Series 70. The Series 70 has become the industry standard in the Commercial HVAC industry due to its compact, reliable design that mounts directly to Bray's industry leading butterfly and industrial ball valves without the need for brackets and linkages. Available in torque outputs from 800 to 18,000 lb.-in. (90 to 2033 NM), 24 VAC/DC and 120 VAC, On/Off and Modulating units all in NEMA 4x and IP65 rated housings.

These actuators are ideal for use on valves for Chillers, Cooling Towers, Boilers, Heat Exchangers and other outdoor applications. Furthermore, its advanced electronics assure reliable compatibility with virtually any analog control signal used in today's building automation and temperature control system.

There is no better choice for building automation!

### System Types

Air Handling Units  
Heat Exchangers  
Computer Rooms  
and more.



### Features and Benefits

- **Compact Design and Direct Mounting**  
*Assists in field operation*
- **High Visibility Beacon Position Indicator**  
*Reduces pump head requirements for added energy efficiency*
- **Manual Declutchable Override Handwheel**  
*Manual positioning without disconnecting power*
- **Servo NXT Option for Modulating Control**  
*One Touch Menu driven pushbutton selection of all settings*
- **Available with Battery Backup on 24 VAC/DC Models**  
*Assures return to a predetermined position upon loss of power supply*

## Series 70 - Specifications

Construction		
Housing	ASTM B85 Pressure Die Cast Aluminum - Polyester Powder Coated	
Motor	120 VAC 24 VAC/DC	Single Phase, Reversible, Permanent Split Capacitor Induction Motor Permanent Magnet-Brush D.C. Motor
Heater	Optional, 5 Watt PTC style	
Terminal Strip	Switch Plate Servo	12 - 22 AWG (2.0 - 0.65mm) 14 - 24 AWG (1.63 - 0.51mm)
Torque Limiting	Optional, Open and Closed preset at factory - Standard on 13,000 & 18,000 lb.-in.	
Auxiliary/Limit Switches: SPDT	120 VAC	10A - 1/3 HP
	220 VAC	10A - 1/2 HP
	250 VDC	1/4A
	12 VDC	2A
Exposed Fasteners	Stainless Steel	
Travel Stops	Externally adjustable at both 0 and 90 degrees	
Conduit Entries	800 lb.-in.	Two 1/2" NPT
	1200 lb.-in. and Higher	Two 3/4" NPT
Weight	See Dimensions	
Enclosure	Designed to meet NEMA Type 4, 4x and IP65 specifications	
Certifications	UL/CSA 120V. CE 24 & 120V	

Operating Conditions		
Motor Insulation	120 VAC: 24 VAC/DC:	Class F, 311°F (155°C) thermal trip at 275°F (135°C) Class B, Fast Blow Fuse 5A 250 VAC
Ambient Temperature	-20° to 150°F (-29° to 65°C)	
Continuous Duty	Will operate continuously at a maximum ambient temperature of 104°F (40°C)	
Manual Operation	Pull to Engage, Push to Disengage - 30:1 drive ratio, 13 & 18K lb.-in. models are 90:1	

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

24 VAC Models	Voltage 50/60 Hz	(lb.in)	(NM)	Stroke Time*	Full Load Amps	Power Consumption Watts
70-24-0081H & 70-24-0081SVH	24 VAC/DC	800	90	60 Sec.	1.90	46
70-24-0201H & 70-24-0201SVH	24 VAC/DC	2000	226	60 Sec.	3.00	72
70-24-E301H & 70-24-E301SVH	24 VAC/DC	3000	339	60 Sec.	3.00	72
70-24-0501H	24 VAC	5000	565	60 Sec.	4.00	96
70-24-0501SVH	24 VAC/DC	5000	565	60 Sec.	4.00	96

120 VAC Models	Voltage 50/60 Hz	(lb.in)	(NM)	Stroke Time*	Full Load Amps	Locked Rotor Amps	Power Consumption Watts
70-0081H & 70-0081SVH	120 VAC	800	90	30 Sec	0.80	1.00	120
70-0121H & 70-0121SVH	120 VAC	1,200	135	30 Sec	0.75	2.10	252
70-0201H & 70-0201SVH	120 VAC	2,000	226	30 Sec	0.85	2.10	252
70-E301H & 70-E301SVH	120 VAC	3,000	339	30 Sec	1.00	2.10	252
70-0501H & 70-0501SVH	120 VAC	5,000	565	30 Sec	1.60	3.00	360
70-0651H & 70-0651SVH	120 VAC	6,500	734	30 Sec	2.30	3.10	372
70-1300H & 70-1300SVH	120 VAC	13,000	1,470	110 Sec	2.30	3.10	372
70-1800H & 70-1800SVH	120 VAC	18,000	2,034	110 Sec	2.50	3.10	372

\*Operating times shown are with 60 Hz power. Actuators with 50 Hz power supply will be 20% slower.

## Series 70 - Servo NXT Specifications

Specifications - Servo NXT		
Power Requirements	120 VAC	+/- 10% (50/60Hz)
	24 VAC	+/- 10% (50/60Hz)
	24 VDC	-10%, + 30%
	5 VA	For NXT electronic module alone (see S70 Power Consumption for full power requirements)
	Fuse	5A Fast Blow 5mm x 20mm
Input Signal	Control Signal	4-20mA, 0-10VDC, 0-5 VDC, 2-10VDC
	Input Impedance	>100 Meg Ohms (0-10V, 2-10V, 0-5V)
Output Signal	Operating Modes	4-20mA, 0-10VDC, 0-5 VDC
	Required Control Panel Impedance	≤ 400 Ohms (4-20mA Output Mode)
		≥ 1,000 Ohms (0-10VDC Output, 0-5VDC Output)
	NXT Loop Power	12 VDC Max, Do not supply external power (4-20mA Output)
24mA Max, Do not supply external power (0-10, 0-5VDC Output)		
Resolution	Absolute Position Accuracy	< 1%
	Dead Band Adjustment	1% (+/- 0.5%) to 6% (+/- 3%) (3% default) 1% minimum increment
Speed Control	Open/Close Speed	0% - 100% (default). Step size: 20%. Actuator open/close speed referenced below
Operating Mode	Normal Mode	Modulating - Follow Setpoint
	Loss of Signal	Settable to Open, Close, or Last
	Reverse Acting Modes	Flashing "ON" LED = Reversed input and output signal Solid "ON" LED = Reversed input and normal output signal
	Auto Calibration	Automation of storing calibration settings
	Manual Operation	Keypad electrical manual operation of actuator (Open, Stop, Close)
	Control Box Operation	Optional inputs available
Torque Protection	Stall Detection	Motor detected stationary > 2 Seconds (800 to 6500 lb.-in. units only)
	Torque Limit	Optional connected Open/Close Torque Limit switch
Environmental	Ambient Temperature	-22°F (-30°C) to 150°F (65°C), Non condensing humidity

**Actuator Open/Close Speed Chart**

Speed Setting	24 VAC/DC	120 VAC	120 VAC 13k/18k
100	60	30	110
80	119	59	219
60	178	88	328
40	237	117	437
20	296	146	546
0	355	175	655

The Servo NXT offers precise modulating service for accurate position control.

- One touch automatic calibration
- User-friendly interface
- Advanced control of proportional band and dead band
- Automatic pulsing mode for precise positioning
- Self diagnostics
- Action on loss of command signal
- Go to position commands



## Series 70 - Model Selection Charts

### 24 VAC/DC & 120 VAC Actuators

800 lb.in Model Number	24 VAC/DC	120 VAC	24 VAC/ 30 VDC	On/ Off	Modulating	Heater	AUX. Switches	Battery Backup
70-24-0081H	●			●		●	●	
70-24-0081SVH	●				●	●	●	
70-0081H		●		●		●	●	
70-0081SVH		●			●	●	●	
70-24-0081H-BBU			●	●		●	●	●
70-24-0081SVH-BBU			●		●	●	●	●

2000 lb.in Model Number	24 VAC/DC	120 VAC	24 VAC/ 30 VDC	On/ Off	Modulating	Heater	AUX. Switches	Battery Backup
70-24-0201H	●			●		●	●	
70-24-0201SVH	●				●	●	●	
70-0201H		●		●		●	●	
70-0201SVH		●			●	●	●	
70-24-0201H-BBU			●	●		●	●	●
70-24-0201SVH-BBU			●		●	●	●	●

3000 lb.in Model Number	24 VAC/DC	120 VAC	24 VAC/ 30 VDC	On/ Off	Modulating	Heater	AUX. Switches	Battery Backup
70-24-E301H	●			●		●	●	
70-24-E301SVH	●				●	●	●	
70-E301H		●		●		●	●	
70-E301SVH		●			●	●	●	
70-24-E301H-BBU			●	●		●	●	●
70-24-E301SVH-BBU			●		●	●	●	●

5000 lb.in Model Number	24 VAC/DC	24 VAC	120 VAC	24 VAC/ 30 VDC	On/ Off	Modulating	Heater	AUX. Switches	Battery Backup
70-24-0501H		●			●		●	●	
70-24-0501SVH	●					●	●	●	
70-0501H			●		●		●	●	
70-0501SVH			●			●	●	●	
70-24-0501H-BBU				●	●		●	●	●
70-24-0501SVH-BBU				●		●	●	●	●

**Note: Heaters are optional**

To receive units without a heater, remove the "H" from the part number. (Ex.: 70-0501, 70-24-0501-BBU)

**Application Note:**

Use Series 70 actuators only to control equipment under normal operating conditions. Where failure or malfunction of the electric actuator could lead to personal injury or property damage to the controlled equipment or other property, additional precautions must be designed into the control system. Incorporate and maintain other devices, such as supervisory or alarm systems or safety or limit controls, intended to warn of or protect against failure or malfunction of the electric actuator.

### 120 VAC Actuators

1200 lb.in Model Number	120 VAC	On/ Off	Modulating	Heater	AUX. Switches
70-0121H	●	●		●	●
70-0121SVH	●		●	●	●

6500 lb.in Model Number	120 VAC	On/ Off	Modulating	Heater	AUX. Switches
70-0651H	●	●		●	●
70-0651SVH	●		●	●	●

13000 lb.in Model Number	120 VAC	On/ Off	Modulating	Heater	AUX. Switches
70-1300H	●	●		●	●
70-1300SVH	●		●	●	●

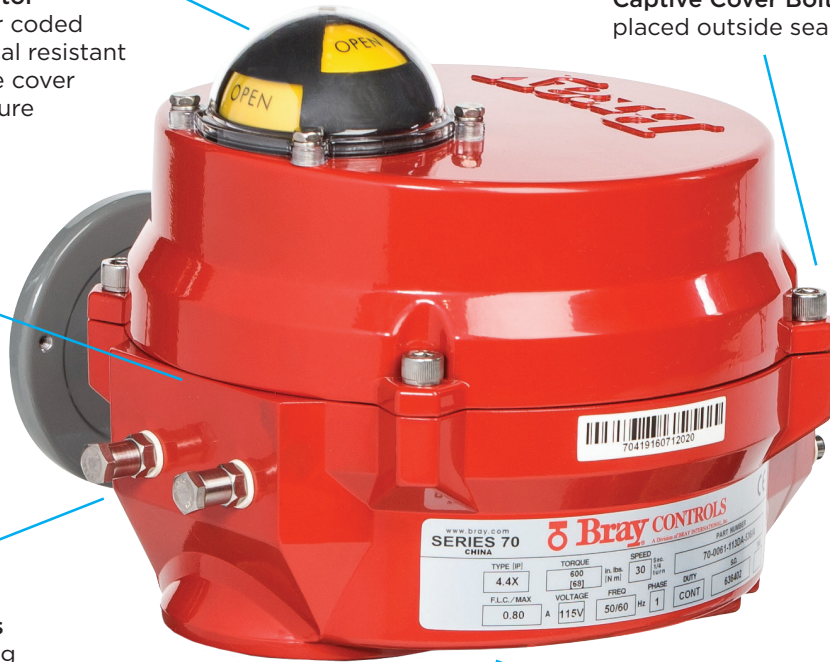
18000 lb.in Model Number	120 VAC	On/ Off	Modulating	Heater	AUX. Switches
70-1800H	●	●		●	●
70-1800SVH	●		●	●	●

## Series 70 - External Features

**High-Visibility Position Indicator**  
 Prominently labeled and color coded  
 High impact, heat and chemical resistant  
 O-Ring weather seal for dome cover  
 No protrusion through enclosure

**Captive Cover Bolts**  
 placed outside sealing area

**O-Ring Seal**  
 To ensure a weather proof enclosure- NEMA 4, 4X, IP65



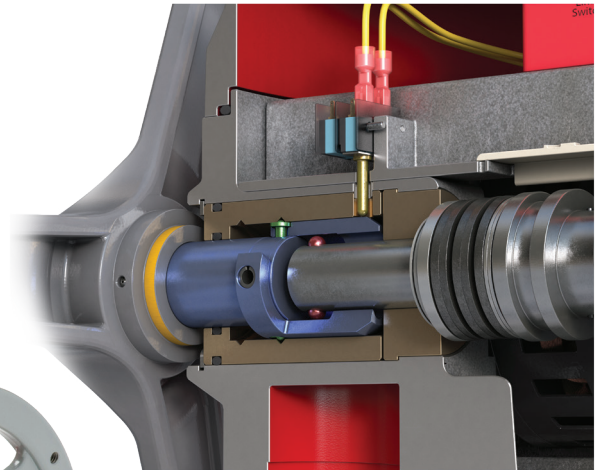
**Mechanical Travel Stop Bolts**  
 Lock-nut to prevent loosening  
 Sealed to prevent moisture ingress  
 Designed to prevent over-travel while operating the actuator manually  
 Prevents adjustment of travel stops below 90° limit switch adjustment  
 Permits up to 5° over travel

**Extremely Low Profile Actuator**  
 Direct mounting to Bray valves

**Die-Cast Aluminum Housing**  
 High quality polyester powder coating  
 Easy to remove and re-install cover



**Conduit Entries**  
 The Series 70 features two conduit connections one for power, one for control wiring.

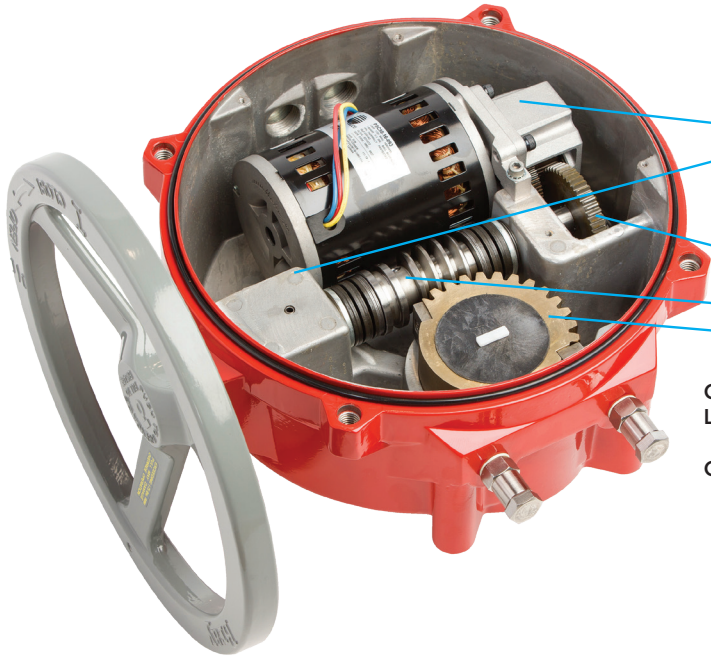


**Handwheel Manual Override**  
 Pull Out Handwheel to engage override/  
 push-in to disengage

Yellow stripe around handwheel shaft  
 notes override is engaged

Electrical switch interrupts power to  
 the motor

## Series 70 - Internal Features



### Power Center

#### BEARINGS

- Motor Gear** - Permanently sealed ball bearing
- Worm Shaft** - Sintered Bronze bushing with heavy duty thrust bearing

#### GEARING

- Spur Gearing** - AGMA Class 9, Alloy Steel, Nitride Hardened
- Worm** - Chromoly
- Worm Gear** - Aluminum Bronze

- Capacitor (120V Only)** - Metalized Polyester
- Lubrication** - High Temperature Synthetic Grease

- Override Wheel** - 17-4PH Stainless Steel Hardened to H 900

### Control Center

**SERVO NXT** - Provides precise modulating control of valve position

#### One Touch Programming

Menu driven, pushbutton-programming with LED confirmation of all settings:

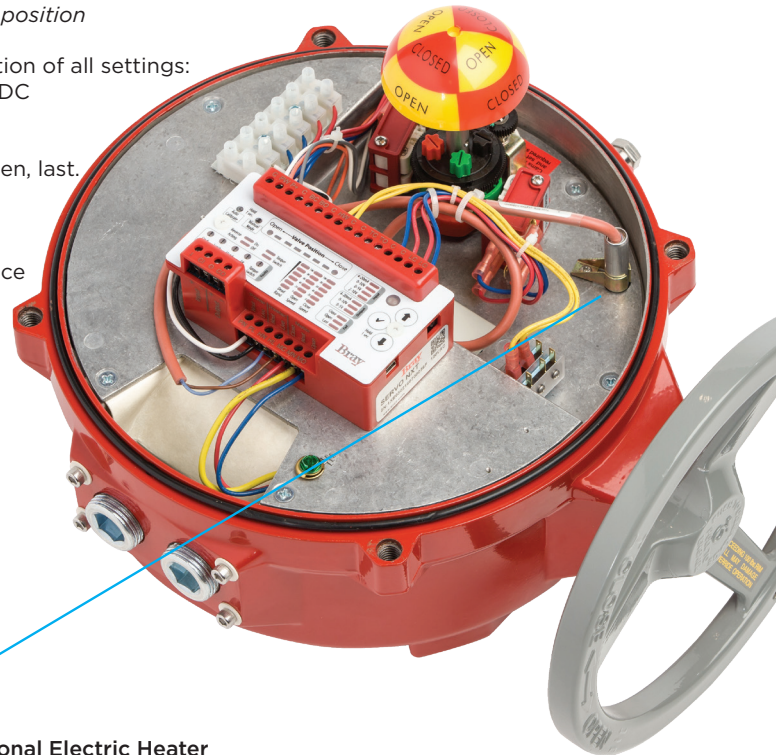
- Configurable Input Control - 4-20 mA, 0-10, 0-5 or 2-10 VDC
- Position Feedback - 4-20 mA, 0-10 or 0-5 VDC
- Auto Calibrating sequence for travel limits
- Fail Position (loss of input signal) - Configurable close, open, last.
- Speed Control - Independent for open & close direction

#### Including:

- Manual Mode - Local operation via Servo NXT user interface
- Fault display - Simplifies troubleshooting
- Stall detection - Eliminates mechanical damage in case of obstruction or bad switch settings

#### Optical Independent isolation of all inputs/outputs

- Provides interoperability with all controllers
- Earth ground tolerant
- Allows for parallel operation



#### Optional Electric Heater

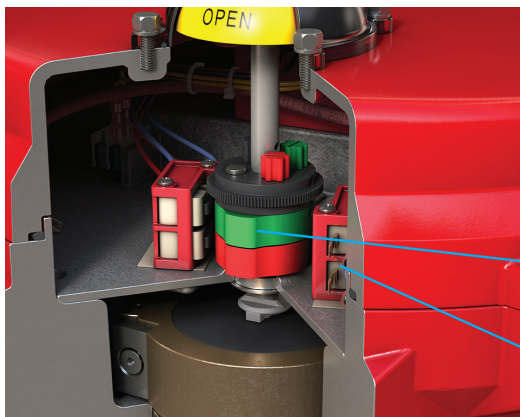
- Self-regulating temperature controlled

#### Patented Travel Limit Switch Cams

- Green Open/Red Closed
- Infinitely Adjustable

#### 2 SPDT Auxiliary Switches

- Indicate travel position to remote customer control systems

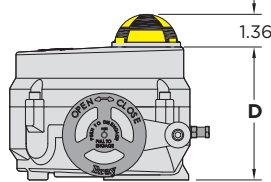
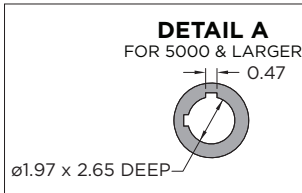
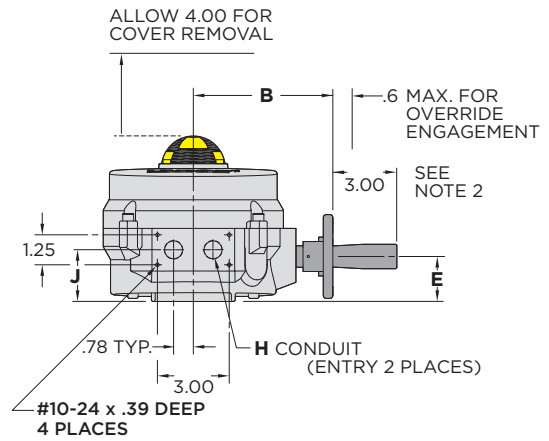
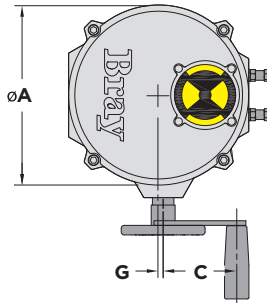
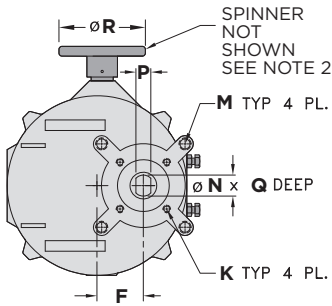


## Series 70 - Dimensions

### 70-0081 TO 70-0651

#### Series 70 Actuator - DIMENSIONS In./ (mm)

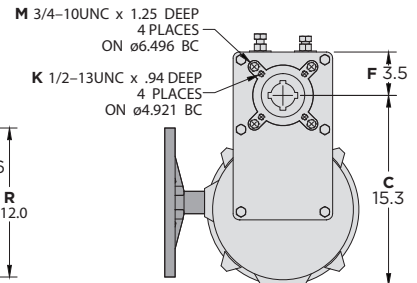
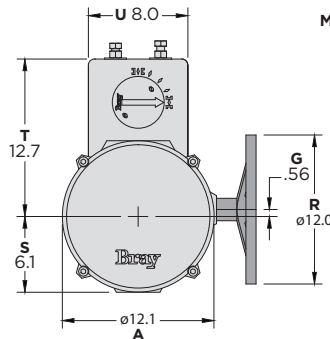
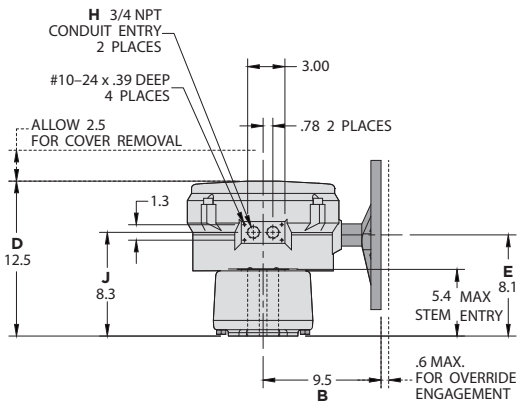
Actuator Model Number	øA	B	C	D	E	F	G	H	J	K UNC x B.C. (MM x B.C.)	M UNC x B.C. (MM x B.C.)	N	P	Q	øR	Weight lbs. (kg)
<b>S70-0081</b>	7.5 (191)	5.8 (147)	3.0 (76)	5.6 (141)	1.9 (48)	1.94 (49.2)	.19 (4.7)	1/2 (M20 x 1.5)	2.2 (55)	5/16-18 x ø2.76 [M8 x 1.25 x ø70]	—	.75 (19.0)	.51 (13.0)	1.75 (44.5)	3.5 (89)	13 (6)
<b>S70-0121 S70-0201 S70-E301</b>	10.1 (256)	7.8 (198)	3.7 (93)	6.6 (168)	2.4 (62)	2.69 (68.3)	.56 (14.3)	3/4 (M25 x 1.5)	2.6 (66)	5/16-18 x ø2.76 [M8 x 1.25 x ø70]	1/2-13 x ø4.92 [M12 x 1.75 x ø125]	1.18 (30.0)	.87 (22.0)	2.22 (56.3)	8.0 (203)	28 (13)
<b>S70-0501 S70-0651</b>	12.1 (308)	9.5 (241)	5.5 (139)	7.2 (183)	2.9 (73)	3.19 (80.9)	.56 (14.3)	3/4 (M25 x 1.5)	3.1 (78)	1/2-13 x ø4.92 [M12 x 1.75 x ø125]	3/4-10 x ø6.50 [M20 x 2.5 x ø165]	See Detail A			12.0 (305)	48 (22)



### 70-1300 TO 70-1800

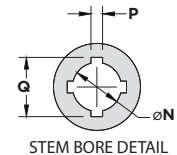
#### Series 70 Actuator - DIMENSIONS In./ (mm)

Actuator Model Number	øA	B	C	D	E	F	G	H	J	K UNC x B.C. (MM x B.C.)	M UNC x B.C. (MM x B.C.)	N	P	Q	øR	S	T	U	Weight lbs. (kg)
<b>S70-1300 S70-1800</b>	12.1 (308)	9.5 (241)	15.3 (389)	12.5 (316)	8.1 (206)	3.5 (89)	.56 (14.3)	3/4 (M25 x 1.5)	8.3 (211)	1/2-13 x ø4.921 F12 (12 x 125 BC x 23.9)	3/4-10 x ø6.496 F16 (20 x 165 BC x 31.8)	See Stem Bore Detail			12.0 (305)	6.1 (155)	12.7 (322)	8.0 (203)	118 (54)



#### STEM BORE DETAIL In./ (mm)

Size	N	P	Q
<b>70-1306 70-1806</b>	2.51 (63.6)	0.63 (15.9)	3.05 (77.5)
<b>70-1316 70-1816</b>	1.97 (50.0)	0.47 (12.0)	2.38 (60.6)

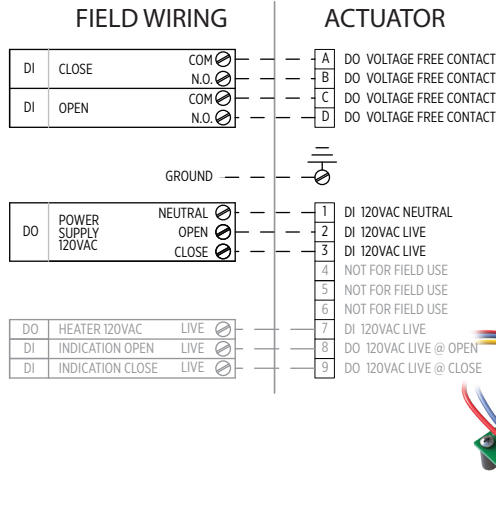


# Series 70 - Wiring - On/Off

70-0081H / 70-0121H / 70-0201H / 70-E301H /  
70-0501H / 70-0651H / 70-1300H / 70-1800H

120 VAC ON/OFF IRB

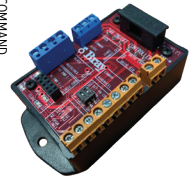
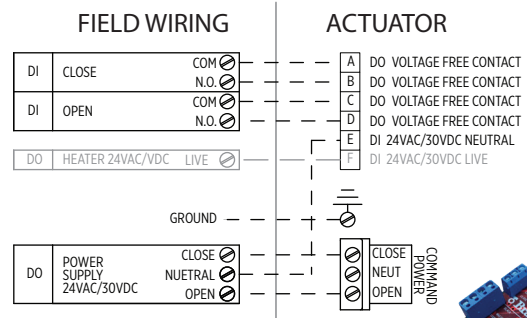
REFERENCE WIRING DIAGRAM: WD-000045



70-24-0081H / 70-24-0201H / 70-24-E301H

24 VAC/DC ON/OFF PRO

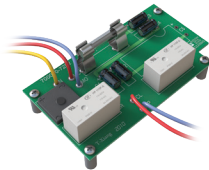
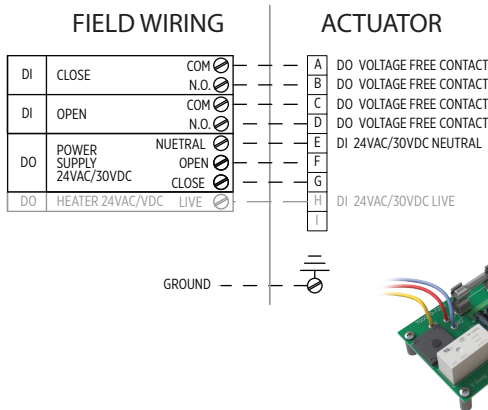
REFERENCE WIRING DIAGRAMS: WD-000276 AND WD-000327



70-24-0501H

24 VAC/ON/OFF PCB

REFERENCE WIRING DIAGRAM: WD-000111



### CALIBRATION SEQUENCE:

PLEASE VISIT THE S70 INDUSTRIAL ELECTRIC ACTUATOR SECTION OF OUR WEBSITE AND REFER TO THE QUICK START GUIDE AND VIDEO TUTORIAL LINK IN THE DOCUMENTS SECTION.

### TERMINAL STRIP:

14-24 AWG FOR CONTROLLER & BBU, MAX TIGHTENING TORQUE 3.5 IN-LBS  
14-22 AWG FOR OTHER, MAX TIGHTENING TORQUE 8 IN-LBS  
105 °C, 300V MIN RATED WIRE

### NOTES:

1. HEATER OPTIONAL.
2. SWITCHES ARE SPDT (FORM C).
3. DO NOT INSTALL OR USE THE SERIES 70 ELECTRIC ACTUATOR IN OR NEAR ENVIRONMENTS WHERE CORROSIVE SUBSTANCES OR VAPORS COULD BE PRESENT. EXPOSURE OF THE ELECTRIC ACTUATOR TO CORROSIVE ENVIRONMENTS MAY DAMAGE THE INTERNAL COMPONENTS OF THE DEVICE, AND WILL VOID THE WARRANTY.

### LEGEND:

TERMINAL SYMBOLS

FIELD WIRING

FACTORY WIRING

GROUND

### FUSE:

FAST BLOW 250V 5A 5x20MM

### LIMIT SWITCH:

125/250VAC, 10A, 1/2 HP  
125/250VDC, 0.25A INDUCTIVE  
125/250VDC, 0.5A RESISTIVE



## Series 70 - Wiring - Modulating

**70-24-0081SVH / 70-24-0201SVH / 70-24-E301SVH /  
70-24-0501SVH**

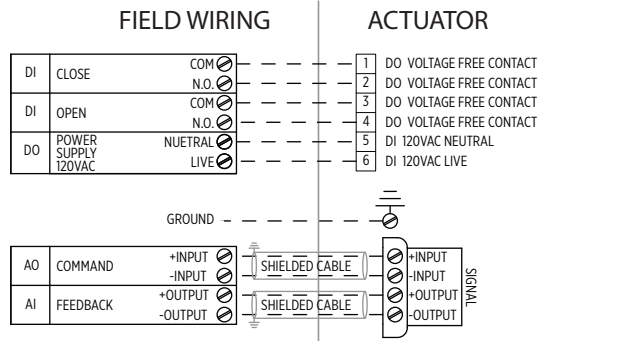
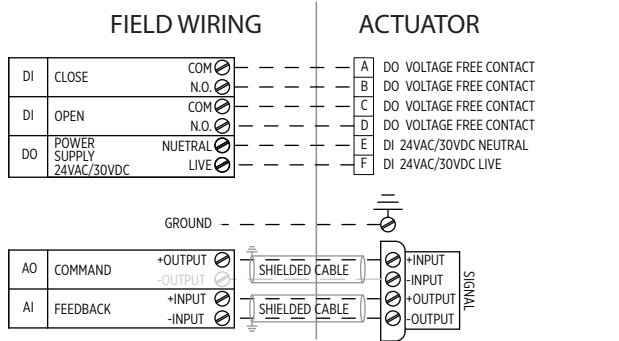
**24 VAC/DC SERVO NXT**

REFERENCE WIRING DIAGRAMS: WD-000347 AND WD-000554

**70-0081SVH / 70-0121SVH / 70-0201SVH /  
70-E301SVH / 70-0501SVH / 70-0651SVH /  
70-1300SVH / 70-1800SVH**

**120 VAC SERVO NXT**

REFERENCE WIRING DIAGRAM: WD-000339



THE COMMAND SIGNAL IS FACTORY WIRED FOR 3 WIRE (POWER LIVE, POWER NEUTRAL, COMMAND SIGNAL POSITIVE). THE JUMPER WIRE FROM COMMAND SIGNAL NEGATIVE TO POWER NEUTRAL CAN BE REMOVED FROM THE NXT CONTROL MODULE FOR 4 WIRE USE.



### CALIBRATION SEQUENCE:

PLEASE VISIT THE S70 INDUSTRIAL ELECTRIC ACTUATOR SECTION OF OUR WEBSITE AND REFER TO THE QUICK START GUIDE AND VIDEO TUTORIAL LINK IN THE DOCUMENTS SECTION.

### TERMINAL STRIP:

14-24 AWG FOR CONTROLLER & BBU, MAX TIGHTENING TORQUE 3.5 IN-LBS  
14-22 AWG FOR OTHER, MAX TIGHTENING TORQUE 8 IN-LBS  
105 °C, 300V MIN RATED WIRE

### NOTES:

1. HEATER OPTIONAL.
2. SWITCHES ARE SPDT (FORM C).
3. WHEN USING 0-10VDC, 0-5VDC & 2-10VDC, THE COMMON OF THE COMMAND SIGNAL SHOULD NOT BE GROUND/EARTH REFERENCED.
4. COMMAND SIGNAL AND FEEDBACK SIGNAL MUST BE ISOLATED FROM EACH OTHER AND ANY OTHER CIRCUITS.
5. COMMAND SIGNAL & FEEDBACK SIGNAL WIRES SHOULD BE SHIELDED PROPERLY & SHIELD SHOULD BE GROUNDED/EARTHED ON ONE END ONLY, PREFERABLY THE CONTROLLER END.
6. FEEDBACK LOOP IS POWERED BY THE SERVO, DO NOT SUPPLY EXTERNAL POWER.
7. FEEDBACK LOAD DEVICE NOT TO EXCEED 400 OHMS (4-20mA CONFIGURATION).
8. DO NOT INSTALL OR USE THE SERIES 70 ELECTRIC ACTUATOR IN OR NEAR ENVIRONMENTS WHERE CORROSIVE SUBSTANCES OR VAPORS COULD BE PRESENT. EXPOSURE OF THE ELECTRIC ACTUATOR TO CORROSIVE ENVIRONMENTS MAY DAMAGE THE INTERNAL COMPONENTS OF THE DEVICE, AND WILL VOID THE WARRANTY.

### LEGEND:

TERMINAL SYMBOLS X

FIELD WIRING

FACTORY WIRING

GROUND

### FUSE:

FAST BLOW 250V 5A 5x20MM

### LIMIT SWITCH:

125/250VAC, 10A, 1/2 HP  
125/250VDC, 0.25A INDUCTIVE  
125/250VDC, 0.5A RESISTIVE

# **Bray** COMMERCIAL

**Bray Commercial** provides automated Butterfly, Ball, Globe and Pressure Independent Control Valves to the commercial building HVAC market throughout the world. Wherever valve performance is required to maintain climate controlled environments, Bray can provide the required automated valves to meet the demanding flow applications of chiller/boiler isolation, air handlers and terminal units for new construction, retrofit and/or LEED certification applications in buildings.

## Building Types

- Healthcare
- Data Centers
- Government and Municipal
- Sports/Entertainment/Convention Centers
- K-12 and University Education
- Transportation
- Hotels
- Office Buildings
- Retail

SINCE 1986, BRAY HAS PROVIDED FLOW CONTROL SOLUTIONS FOR A VARIETY OF INDUSTRIES AROUND THE WORLD.

VISIT [BRAYCOMMERCIALDIVISION.COM](http://BRAYCOMMERCIALDIVISION.COM) TO LEARN MORE ABOUT BRAY PRODUCTS AND LOCATIONS NEAR YOU.

### CORPORATE HEADQUARTERS

**Bray International, Inc.**  
13333 Westland East Blvd.  
Houston, Texas 77041  
1-281-894-5454



### DIVISION HEADQUARTERS

**Bray Commercial**  
13788 West Road, Suite 200A  
Houston, Texas 77041  
1-888-412-Bray (2729)



All statements, technical information, and recommendations in this bulletin are for general use only. Consult Bray representatives or factory for the specific requirements and material selection for your intended application. The right to change or modify product design or product without prior notice is reserved. Patents issued and applied for worldwide. Bray® is a registered trademark of Bray International, Inc.

© 2022 BRAY INTERNATIONAL, INC. ALL RIGHTS RESERVED.