

## OpenAir™ GSD Series

### Non-Spring Return, 20 lb-in (2 Nm), Rotary Electronic Damper Actuators



#### Description

The OpenAir GSD Series direct-coupled, non-spring return rotary electronic damper actuators are 24 Vac/dc rated and available in 2-position, floating, and modulating [0(2) to 10 Vdc or 10 to 0(2) Vdc] control. The small footprint and torque make this actuator ideal for VAV boxes, small HVAC dampers, economizers, or residential zone dampers.

#### Features

- Pre-cabled
- Plenum rated models available
- Optional built-in auxiliary switches with fixed switch points at 5° and 85° rotation
- 30-second run time
- Signal inversion capability on modulating type [0(2) to 10 Vdc or 10 to 0(2) Vdc]
- Small footprint for installation flexibility
- UL and cUL listed; CE certified
- These devices were approved for installation in plenum areas by Underwriters Laboratories, Inc. per UL 2043.
- Low voltage models are 24 Vac/dc compatible
- 100 to 240 Vac models available

#### Application



Used in variable or constant air volume installations for the control of return air, mixed air, exhaust, and face and bypass, and residential zone dampers requiring up to 20 lb-in (2 Nm) torque.

#### Product Numbers

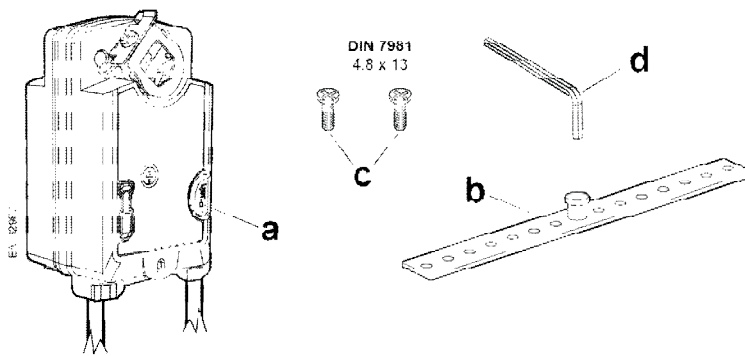
**Table 1.**

Product Number	Torque		Voltage		Control Signals		Plenum Cabling	Appliance Cable	Auxiliary Switch
	20 lb-in (2 Nm)	24 Vac/dc	100 to 240 Vac	2-Position/ Floating	Modulating 0 (2) to 10 Vdc				
GSD141.1P			—		—				
GSD146.1P					—				
GSD341.1U		—			—	—			
GSD346.1U		—			—	—			
GSD161.1P			—	—					
GSD166.1P			—	—					

### Warning/Caution Notations

<b>WARNING:</b>		Personal injury or loss of life may occur if you do not perform a procedure as specified.
<b>CAUTION:</b>		Equipment damage may occur if you do not perform a procedure as specified.

### Actuator Components



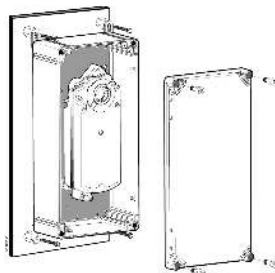
- a. Actuator
- b. Mounting bracket
- c. Mounting screws
- d. Hex key

Figure 1. Components of the GSD Non-Spring Return Actuator.

<b>Specifications</b>	Operating voltage (GSD1x)	24 Vac/dc $\pm$ 20%	
<b>Power Supply</b>	(GSD3x)	100 to 240 Vac $\pm$ 10%	
	Frequency	50/60 Hz	
<b>Equipment Rating</b>	Power consumption	<b>Running</b>	
	GSD14x; 24 Vac/dc 60 Hz	2.2 VA (1.2 W)	<b>Holding</b>
	GSD16x; 24 Vac/dc 60 Hz	2.4 VA (1.4 W)	1.0 VA (0.5 W)
	GSD34x; 120 Vac 60 Hz	4.5 VA (1.8 W)	1.2 VA (0.7 W)
<b>Auxiliary Switch Rating</b>	24 Vac	Class 2, in accordance with UL/CSA Class III per IEC 60536	
	120 Vac	Double insulation	
<b>Control Signal</b>	Fixed dual end switches	24 Vac to 250 Vac/12 to 30 Vdc	
	Switching voltage	6A resistive/2A inductive @ AC	
	Contact rating	4A resistive/2A inductive @ 30 Vdc 0.8A resistive, 0.5A inductive @ 60 Vdc	
<b>Feedback Signal</b>	Input signal (wires 2–8)	0 (2) to 10 Vdc (max. 35 Vdc)	
	voltage input signal GSD16x	>100K ohms	
<b>Feedback Signal</b>	Position output signal (wires 9–2)	0 (2) to 10 Vdc	
	voltage output signal GSD16x	+1 mA, -0.5 mA	
	maximum output current		

**Specifications, Continued**

<b>Function</b>	Running	20 lb-in (2 Nm)	
	Maximum torque	53 lb-in (6 Nm)	
	Runtime for 90°	30 seconds	
<b>Mounting</b>	Nominal angle of rotation	90°	
	Maximum angular rotation	95°	
	Damper Shaft size	3/8 to 1/2-inch (8 to 13 mm) dia. 1/4 to 7/16-inch (6 to 11 mm) square	
	Minimum shaft length	3/4-inch (20 mm)	
<b>Housing</b>	Enclosure	IP54	
	Material	Plenum-rated rugged plastic	
	Gear lubrication	Silicone-free	
<b>Ambient Conditions</b>	Ambient temperature		
	Operating	-25°F to 130°F (-32°C to 55°C)	
	Transport	-25°F to 158°F (-32°C to 70°C)	
	Ambient humidity (non-condensing)	<95% rh	
<b>Agency Certification</b>		UL listed per UL60730	
	24 Vac	cUL to CSA C22.2 No. 24-93	
	<b>NOTE:</b> These devices were approved for installation in plenum areas by Underwriters Laboratories, Inc. (UL) per UL 1995.		
<b>CE Conformity</b>	120 through 240 Vac	EMC and Low Voltage Directives	
<b>Miscellaneous</b>	Pre-cabled connection	18 AWG (0.75 mm <sup>2</sup> )	
	Cable length	3 feet (0.9 m) length	
	Life cycle	Designed for minimum of 100,000 full stroke cycles and a minimum of 5 million repositions at rated torque and temperature	
	Dimensions in inches (millimeters)	5.46" H × 2.83" W × 2.45" D (138.8 H × 72 W × 62.5 D)	
	Weight		1.54 lbs (0.55 kg)
			1.77 lbs (0.7 kg) with packaging

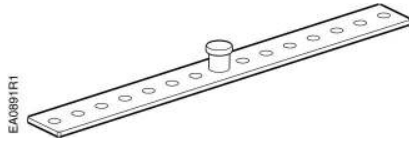
**Accessories**

**Figure 2. NEMA Type 4X Weather Shield.**

**ASK75.7U:** GSD Actuators are UL listed to meet NEMA Type 4X requirements (a degree of protection against falling dirt, rain, sleet, snow, windblown dust, splashing water, hose-directed water, corrosion, and damage from external ice formation) when installed with an ASK75.7U Weather Shield and outdoor-rated conduit fittings. This weather shield may be mounted in any orientation.

For dimensions, see Figure 9.

## Service Parts



**Figure 3. 985-055P24**  
 Anti-rotation Bracket (Mounting).



**Figure 4. 985-124**  
 499-ohm Resistor Assembly Kit for  
 4 to 20 mA Applications.

## Operation

A continuous 0 to 10 Vdc or 2 to 10 Vdc signal from a controller to wire 8 (Y) operates the damper actuator. The angle of rotation is proportional to the control signal. A 0(2) to 10 Vdc position feedback output signal is available between wire 9 (U) and wire 2 (G0) to monitor the position of the damper motor.

In the event of a power failure, the actuator holds its position. In the event that only the control signal is lost, the actuator returns to the **0** position.

## Overload Protection

In the event of a blockage in the damper, the actuator is overload protected over the full range to prevent damage to the actuator.

## Life Expectancy

An improperly tuned loop will cause excessive repositioning that will shorten the life of the actuator.

## Sizing

The type of actuator required depends on several factors:

1. Obtain damper torque ratings (lb-in/ft<sup>2</sup> or Nm/m<sup>2</sup>) from the damper manufacturer
2. Determine the area of the damper.
3. Calculate the total torque required to move the damper:

$$\text{Total Torque} = \frac{\text{Torque Rating} \times \text{Damper Area}}{\text{SF}^1}$$

4. Select a non-spring return actuator using Table 1.

<sup>1</sup> Safety Factor: When calculating the total torque required, a safety factor should be included for unaccountable variables such as slight misalignments, aging of the damper, and so on. A suggested safety factor is 0.80.

**Table 2. Sizing.**

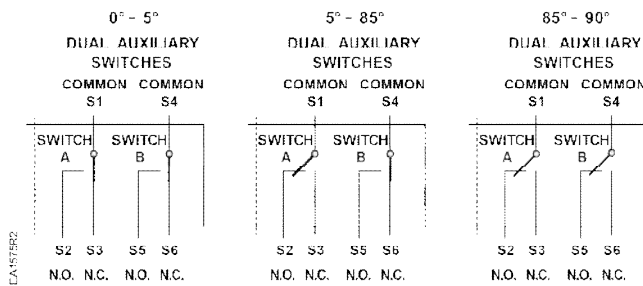
Total Torque	Actuator
<20 lb-in (2 Nm)	GSD
<44 lb-in (<5 Nm)	GDE
<88 lb-in (<10 Nm)	GLB
<132 lb-in (<15 Nm)	GEB
<221 lb-in (<25 Nm)	GBB
<310 lb-in (<35 Nm)	GIB
>310 lb-in >620 lb-in (>35 Nm to >70 Nm)	Use tandem mounting bracket ASK73.1 with any GIB1x actuator.

**NOTE:** Mechanically coupled actuators must be of the exact same type. Use the correct mounting bracket.

## Mounting and Installation

- The shaft adapter can be mounted on either side of the actuator. The actuator mounting orientation and shaft length determine how they will be mounted on the actuator.
- The minimum damper drive shaft length is 3/4-inch (20 mm).
- See *Specifications* for the minimum and maximum damper shaft dimensions.
- A mounting bracket is included with the actuator.
- See *OpenAir GSD Series, Non-Spring Return, 20 lb-In (2 Nm) Installation Instructions* (129-586) for more details.

## Auxiliary Switches



Actuator Position	Switch A Common S1 Connected to	Switch B Common S4 Connected to
0° - 5°	S3	S6
5° to 85°	S2	S6
85° - 90°	S2	S5



### CAUTION:

Mixed switch operation to the switching outputs of both dual end switches (5° and 85°) is not permitted.

Either AC line voltage from the same phase must be applied to all six outputs of the fixed dual end switches, or UL-Class 2 voltage must be applied to all six outputs.

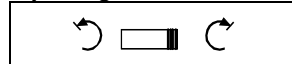
## DIP Switch Functionality

**NOTE:** The black position indicates the active switch setting.

Description	Label	Description	Function
2 to 10 Vdc		0 to 10 Vdc	Control signal selection
			<b>Not In Use</b>
Inverse Acting		Direct Acting	Input signal inversion

**Figure 5. DIP Switches.**

### Input Signal Inversion



Allows inverting the control input signal

The arrow direction indicates opening or closing (closing or opening) when operating an actuator with a given control signal.

= Direct acting (Factory setting)  
 Input signal 0 Vdc ► fail-safe position

= Inverse acting  
 Input signal 10 Vdc ► fail-safe position

## Wiring

All wiring must conform to NEC and local codes and regulations.

Use earth ground isolating step-down Class 2 transformers. Do not use autotransformers.

The maximum rating for a Class 2 step-down transformer is 100 VA. Determine the supply transformer rating by summing the VA ratings of all actuators and all other components used. It is recommended that one transformer power no more than 10 actuators (or 80% of its VA).



### WARNING:

Installations requiring  $\text{CE}$  Conformance:

- All wiring for 24 Vac/dc actuators must only be safety extra-low voltage (SELV) or protective extra-low voltage (PELV) per HD384.
- Use safety transformers per EN61558 with double isolation, designed for 100% duty-cycle for supplying SELV or PELV circuits.
- Over-current protection for supply lines is maximum 10A.

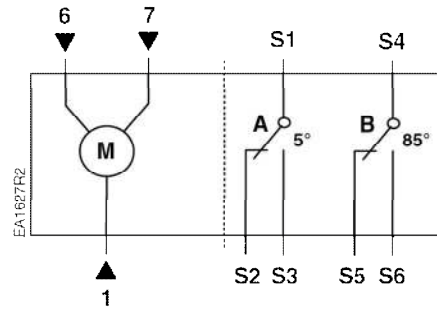
## Wire Designations

Each wire has the standard symbol printed on it. See Table 3.

**Table 3. Wire Designations.**

Connecting	Standard Symbol	Function	Color	Color Symbol
24 Vac/dc Actuator	1	Supply (SP)	Red	RD
	2	System Neutral	Black	BK
	6	Control signal clockwise (GSD14x.1P)	Violet	VT
	7	Control signal counterclockwise GSD14x.1P	Orange	OG
	8	Input Signal: 0 (2) to 10 Vdc (GSD16x)	Gray	GY
	9	Position Output: 0 (2) to 10 Vdc (GSD16x)	Pink	PK
100 to 240 Vac Actuators	4	Neutral	Lt Blue	LB
	6	Control signal clockwise (GSD34x.1U)	Black	BK
	7	Control signal counterclockwise (GSD34x.1U)	White	WH
Auxiliary Switches	S1	Switch A – Common	Gray/Red	GYRD
	S2	Switch A – N.O.	Gray/Blue	GYBU
	S3	Switch A – N.C.	Gray/Pink	GYPK
	S4	Switch B – Common	Black/Red	BKRD
	S5	Switch B – N.O.	Black/Blue	BKBU
	S6	Switch B – N.C.	Black/Pink	BKPK

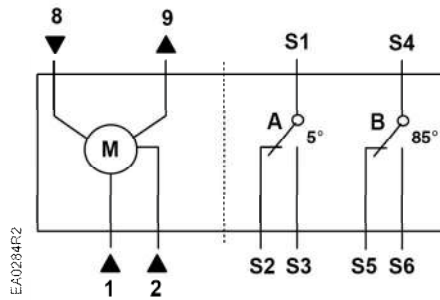
**GSD14x.1P**  
 24 Vac/dc Power  
 Supply  
 2-Position/Floating  
 Control



**Figure 6.**



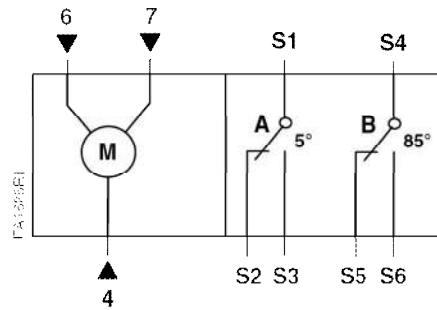
**GSD16x.1P**  
 24 Vac/dc Power  
 Supply  
 Modulating Control



**Figure 7.**



**GSD34x.1U**  
 100 to 240 Vac Power  
 Supply  
 2-Position/Floating  
 Control



**Figure 8.**



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**Start-Up/  
Commissioning**

**GSD16x**

1. Connect a Digital Multimeter (DMM) to the supply voltage wires.
2. Verify that the supply voltage is between 19.2 and 28.8 Vac/dc.
3. Turn off the power supply.

**Non-Spring Return  
Modulating Control  
24 Vac/dc**

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Check operation:

1. Connect all wires per Figure 7.
2. Set the DMM dial to Vdc.
3. Connect wires 2 (black) and 8 (gray) to the DMM.
4. Apply a full-scale input signal (10 Vdc) to wire 8 (gray).
5. Allow the actuator shaft coupling to rotate from 0° to 90°.
6. Disconnect wire 8 (gray) and the shaft coupling returns to the **0** position.

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Check feedback:

1. Set the DMM dial to Vdc.
2. Attach wires 2 (black) and 9 (pink) to the DMM.
3. Apply a full-scale input signal to wire 8 (gray). The reading at the DMM should increase.
4. Remove the signal from wire 8 (gray). The reading at the DMM should decrease, and the actuator shaft coupling returns to the **0** position.

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**GSD14x**

**2-Position/Floating  
24 Vac/dc**

1. Connect a Digital Multimeter (DMM) to the supply voltage wires.
2. Verify that the supply voltage is between 19.2 and 28.8 Vac/dc.
3. Turn off the power supply.

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Check operation:

1. Connect all wires per Figure 6.
2. Apply a control signal (24 Vac/dc) to wires 1 (red) and 6 (violet).
3. Allow the actuator shaft coupling to rotate from 0° to 90°.
4. Stop applying the control signal to wires 1 (red) and 6 (violet).
5. Apply a control signal (24 Vac/dc) to wires 1 (red) and 7 (orange).
6. Allow the actuator shaft coupling to rotate from 90° to 0°.

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**GSD34x**

**2-position/  
Floating  
100 to 240 Vac**

1. Connect a Digital Multimeter (DMM) to the supply voltage wires.
2. Verify that the supply voltage is between 100 and 240 Vac.
3. Turn off the power supply.

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Check Operation:

1. Connect all wires per Figure 8.
  2. Apply a control signal (100 to 240 Vac) to wires 4 (light blue) and 6 (black).
  3. Allow the actuator shaft coupling to rotate from 0° to 90°.
  4. Stop applying the control signal to wires 4 (light blue) and 6 (black).
  5. Apply a control signal (100 to 240 Vac) to wires 4 (light blue) and 7 (white).
  6. Allow the actuator shaft coupling to rotate from 90° to 0°.
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**Service**



**WARNING:**  
 Do not open the actuator.  
 If the actuator is inoperative, replace the unit.

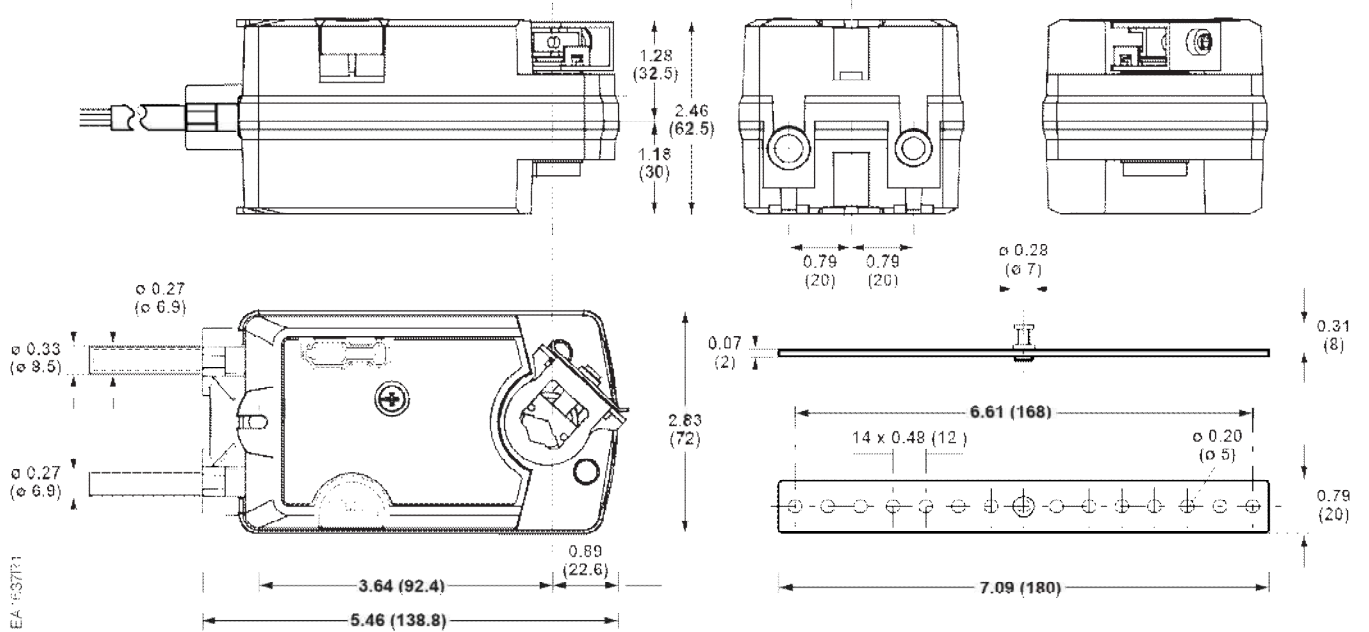
**Troubleshooting**



**WARNING:**  
 To avoid injury or loss of life, pay attention to any hazardous voltage  
 (for example, 120 Vac) when performing checks.

**Dimensions**

In Inches (Millimeters)



**Figure 9. GSD Series Damper Actuator.**

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