

OpenAir™ Electronic Damper Actuators

GLB Series

Enhanced Non-spring Return Rotary



Description

The OpenAir direct coupled enhanced non-spring return rotary electric actuators are designed for two-position/floating or modulating control of dampers.

Features

- Selectable modulating control signal (0 to 10 Vdc or 2 to 10 Vdc).
- 24 Vac/dc compatible.
- New line voltage (34x models) for 100 to 240 Vac two-position/floating control.
- Integral 1/2-inch conduit connection.
- Manual override.
- Independently adjustable dual auxiliary switches available.
- cUL and UL listed; CE certified

Application

These actuators are used in constant or variable air volume installations for control of HVAC dampers requiring up to 88 lb-in (10 Nm) of torque.

Product Numbers

Table 1.

Torque	Product Number	Control Signal	Feedback	Dual Auxiliary Switches	Pre-Cabled	Power Supply
88 lb-in (10 Nm)	GLB141.1P	2-position/ Floating	—	—	Plenum	24 Vac/dc
	GLB141.1Q		—	—	6-ft length	
	GLB146.1P*		—	•	Plenum	
	GLB341.1U		—	—	Standard	100 to 240 Vac
	GLB346.1U*	—	•	Standard		
	GLB161.1P	Modulating 0(2) to 10 Vdc	•	—	Plenum	24 Vac/dc
	GLB166.1P*		•	•	Plenum	
	GLB161.1Q		•	—	6-ft length	

* For conduit adaption, order an ASK76.1U Conduit Adapter. See *Accessories*.

Specifications	Operating voltage (G–G0)	24 Vac/dc +/-20% 100 to 240 Vac +/-10%
	Power Supply	
	Frequency	50/60 Hz
	Power consumption	VA Watt
	GLB14x	2.2 1.3
	GLB34x	5.8 1.9
	GLB16x	2.5 1.5
Control signal	Input signal (Y-G0)	
	Voltage-input	0(2) to 10 Vdc Input resistance >100K ohms
Feedback signal	Position output signal (U–G0)	
	Voltage-output	0 to 10 Vdc
	Maximum output current	DC 1 mA
Equipment rating	Rating	Class 2 according to UL, cUL Class III per EN60730
Auxiliary features	Dual auxiliary switch contact rating	4A resistive, 2A inductive
	Voltage	
	GLB1xx.1P	24 Vac/24 Vdc
	GLB34x.1U	250 Vac
	DC rating	12 to 30 Vdc DC 2A
	Switch Range	
	Switch A	0° to 90° with 5° intervals
	Recommended range usage	0° to 45°
	Factory setting	5°
	Switch B	0° to 90° with 5° intervals
Recommended range usage	45° to 90°	
Factory setting	85°	
Switching hysteresis:	2°	
Function	Torque	88 lb-in (10 Nm)
	Runtime for 90° opening or closing	150 seconds
	Nominal angle of rotation	90°
	Maximum angular rotation	95°
Mounting	Shaft size: Minimum shaft length 3/4-inch (20 mm)	

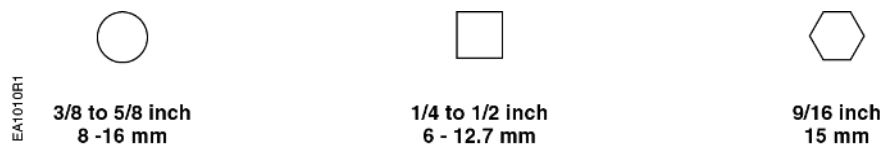


Figure 1. Acceptable Shaft Sizes.

Housing	Enclosure	NEMA Type 2 IP54 according to EN60529 (Not with cable-up mounting orientation)
	Material	Durable plastic
	Gear lubrication	Silicone-free

Specifications, Continued

Ambient conditions	Ambient temperature	
	Operation	-25°F to 130°F (-32°C to 55°C)
	Storage and transport	-40°F to 158°F (-40°C to 70°C)
	Ambient humidity (non-condensing)	95% rh
Agency certification	UL listed to UL60730 cUL certified to Canadian Standard C22.2 No. 24-93	
	These devices were approved for installation in plenum areas by Underwriters Laboratories, Inc., per UL 1995.	
CE	EN60730-1, EN60730-2-14	
Miscellaneous	Pre-cabled connection	18 AWG
	Standard cable length	3 ft (0.9 m)
	Life cycle	Designed for 100,000 full strokes and 5 million repositions at rated torque and temperature
	Actuator Dimensions, inches (mm)	6.6 L × 2.8 W × 2.4 D (166.7 L × 71 W × 61 D)
	Packaging Dimensions, inches (mm)	6.5 L × 10.3 W × 3.1 D (165.1 L × 261.1 W × 78.7 D)
	Weight	1.35 lb (0.61 kg)
	(with packaging)	1.91 lb (0.87 kg)

Accessories

NOTE: The auxiliary switches cannot be added in the field. Order the product number that includes this option. See Table 1.

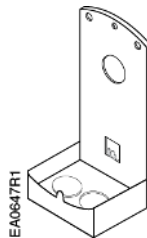


Figure 2. Conduit Adapter.

ASK76.1U: Provides a connection between the actuator and conduit for actuator models with auxiliary switches or built-in potentiometers. All other standard actuator models have built-in conduit adapters.

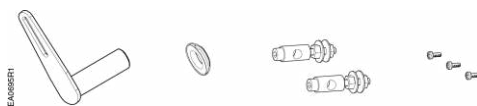


Figure 3. Rotary-to-Linear.

ASK71.5: Allows a direct-coupled actuator to provide an auxiliary linear drive.

**Accessories,
Continued**

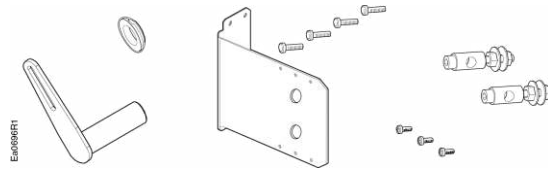


Figure 4. Rotary-to-Linear with Bracket.

ASK71.6: Allows economical mounting of an OpenAir actuator to a variety of surfaces.

Should be used in applications where the actuator can be rigid-surface mounted and a linear stroke output is needed.

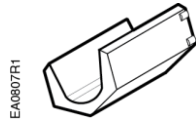


Figure 5. Shaft Insert.

ASK78.3U: Shaft inserts for use with 3/8-inch (8 to 10 mm) diameter shafts. (10/pk). Included in box with GDE/GLB Series.

NOTE: Factory-installed 1/2-inch guide must be removed prior to installation.

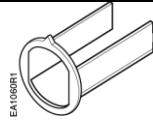


Figure 6. 1/2-inch Shaft Guide.

985-101P25: Shaft guide, 1/2-inch (25/pk). Factory-installed with GDE/GLB Series.

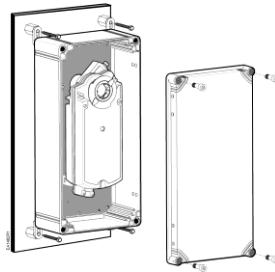


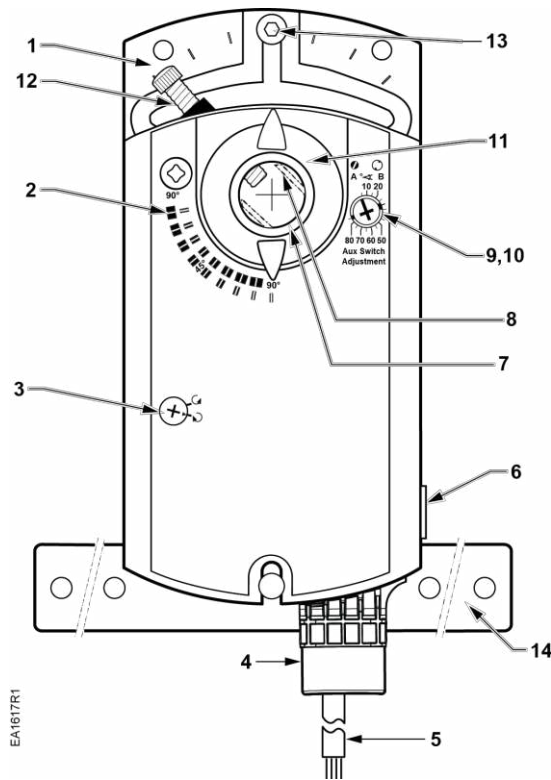
Figure 7. NEMA Type 4X Weather Shield.

ASK75.7U: GLB 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 27.

Actuator Components, Continued

**2-Position/
 Floating**

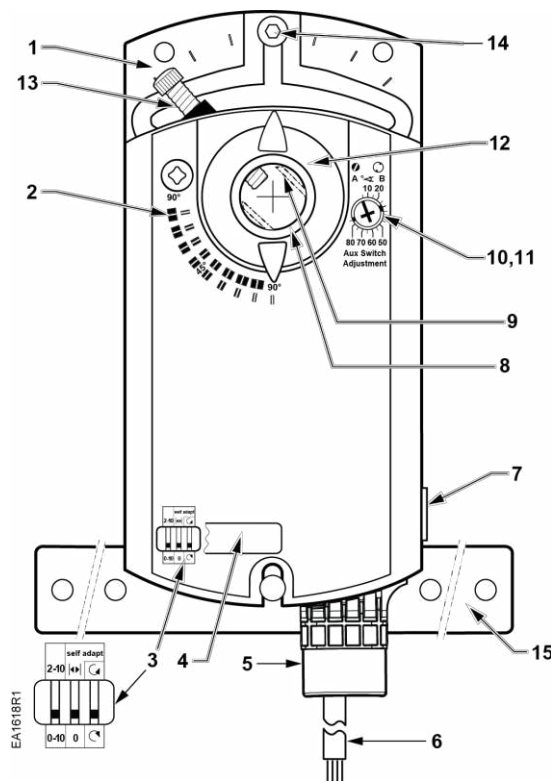


Legend

1. Base plate
2. Positioning scale for angle of rotation
3. Rotation direction adjustment
4. Conduit adapter
5. Connection cable
6. Manual override
7. Coupling bushing
8. Factory-installed 1/2-inch guide
9. Auxiliary Switch A
10. Auxiliary Switch B
11. Position indicator
12. Adjustment lever with locking screw (4 mm hex)
13. Set screw for mechanical range stop (4 mm hex)
14. Mounting bracket

Figure 8. Parts of the Actuator.

Actuator Components, Continued
Modulating



Legend

1. Base plate
2. Positioning scale for angle of rotation
3. DIP switches
4. Cover for DIP switches
5. Conduit adapter
6. Connection cable
7. Manual override
8. Coupling bushing
9. Factory-installed 1/2-inch guide
10. Auxiliary Switch A
11. Auxiliary Switch B
12. Position indicator
13. Adjustment lever with locking screw (4 mm hex)
14. Set screw for mechanical range stop (4 mm hex)
15. Mounting bracket

Figure 9. Parts of the Actuator.

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.

Life expectancy

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

Auxiliary Switches GLB146.1P, GLB346.1U, GLB166.1P

Figure 10 shows the adjustable switching values for auxiliary Switches A and B.

Actuator Scale:
 Clockwise

Adjustment range for
 Switches A and B
 Setting interval: 5°
 Switching hysteresis: 2°

Actuator Scale:
 Counterclockwise

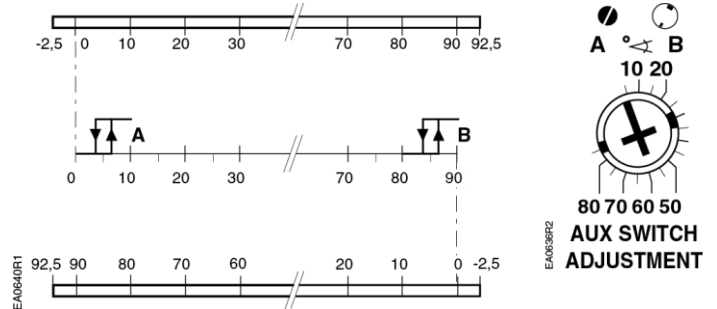


Figure 10. Adjustable Switching Values for the Dual Auxiliary Switches.

NOTE: The auxiliary switch setting shafts rotate with the actuator. The scale is valid only when the actuator is in the **0** position on clockwise motion.

Use the long arm of the † (AUX SWITCH ADJUSTMENT) to point to the position of Switch A. Use the narrower tab on the red ring to point to the position of Switch B.

Rotation Direction
 GLB14x.1P, GLB34x.1U

Two-position/Floating Control

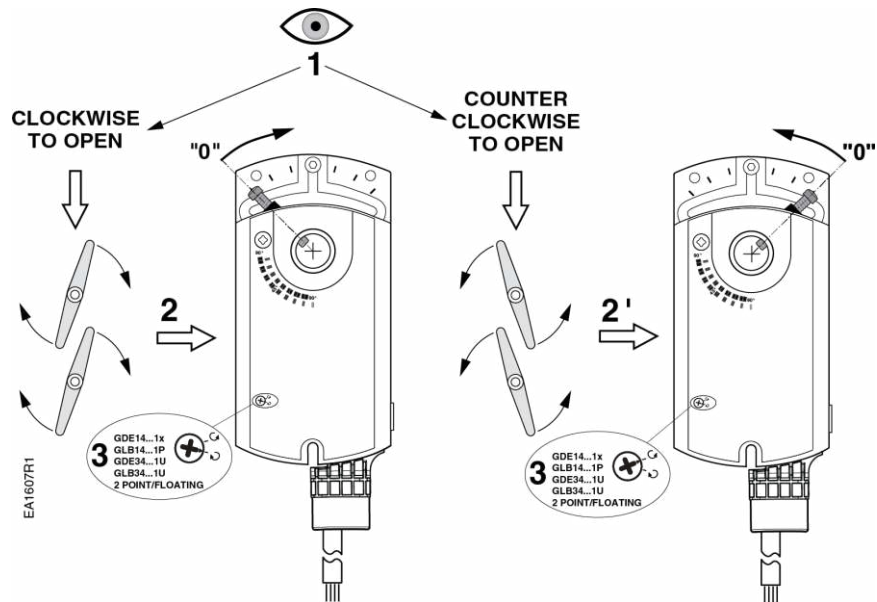


Figure 11. Setting the Rotation Direction.

Rotation Direction Switch

Modulating

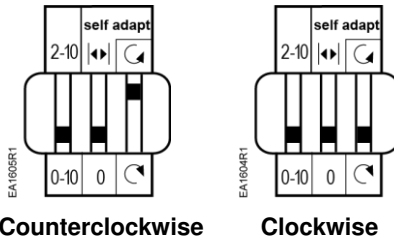


Figure 12. Direction of Rotation Switch.

The factory setting is clockwise.

The direction of rotation switch should match the damper rotation movement.

Dual in-Line Package (DIP) Switches GLB16x.1P

Raise the protective cover from left to right to locate the DIP switches. See Figure 8 for the location of the cover.

Modulating control signal selection

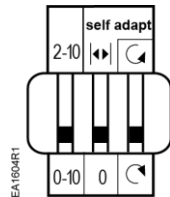


Figure 13. 0-10 Vdc Position (Factory Setting).

To change the control signal from the factory setting (0 to 10 Vdc), move the first DIP switch to the UP (2-10) position.

Self-adapt Switch

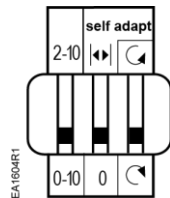


Figure 14. OFF Position (Factory Setting).

The factory setting is **0** (OFF).

When mechanical angle of rotation is limited, the self-adapt switch (middle DIP switch) may be turned ON (right-pointing arrow) so that the limited range will become the new 0 to 100% for the actuator logic. In this case, 0 to 100% is not equal to 90°



CAUTION:

When turning the self-adaptive feature on or after the software reset with the feature on, the actuator will enter a five-minute calibration cycle as the actuator adjusts to the rotation limits of the system. A software reset happens after power on or may be caused by electrostatic discharge (ESD) at levels of 2kV and above.

The self-adapt capability will scale the control signal selected, either a 0 to 10 Vdc or a 2 to 10 Vdc signal, within the adjusted mechanical range. The feedback signal will also reflect the control signal selected, either a 0 to 10 Vdc or a 2 to 10 Vdc.

Sizing

The type of actuator required depends on several factors.

1. Obtain damper torque ratings (ft-lb/ft² or Nm/m²) from the damper manufacturer.
2. Determine the area of the damper.
3. Calculate the total torque required to move the damper:

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

¹Safety Factor: When determining the torque of an actuator 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 (or 80% of the rated torque).

4. Select the non-spring return actuator type from Table 3.

Table 2.

Total Torque	Actuator
<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.

Mounting and Installation

- Place the actuator on the damper shaft so that the front of the actuator is accessible. The label is on the front side. A mounting bracket is included with the actuator.
- The minimum damper drive shaft length is 3/4-inch (20 mm).
- Observe the service envelope around the actuator as shown in Figure 28.
- Detailed mounting instructions are included with each actuator.

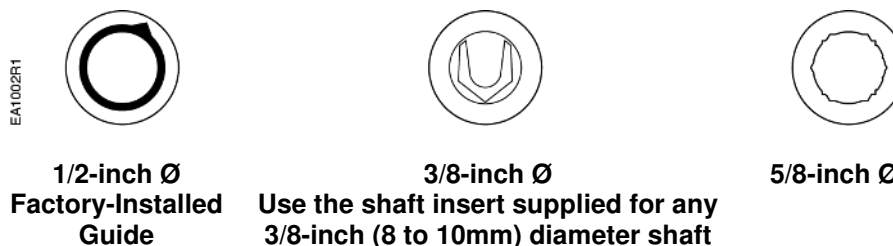


Figure 15. Damper Shaft Sizes.

NOTE: For all damper shafts with the exception of the 1/2-inch round shaft: Remove the 1/2-inch Ø factory-installed guide before installation.

Manual Override

To move the damper blades and lock the position with no power present:

1. Slide the red manual override knob toward the back of the actuator.
2. Make adjustments to the damper position.
3. Slide the red manual override knob toward the front of the actuator.

Once power is restored, the actuator returns to automated control.

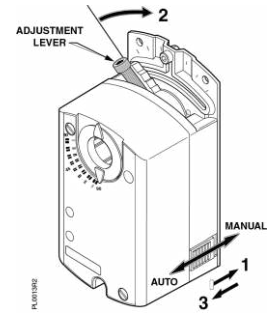


Figure 16.
Manual Override.

Mechanical Range Adjustment

To mechanically limit the range of the damper blade, do the following:

1. Loosen the stop set screw.
2. Move the screw along the track to the desired position, and fasten it in place.

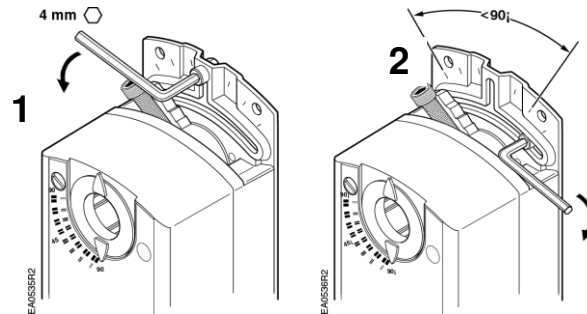


Figure 17. Moving the Mechanical Range Stop.

To use the entire 0(2) to 10V input signal to control the mechanically limited range, see Figure 14 for setting self-adaptive features.

Example:

Stop set screw at 70°
Self-adapt switch ON
Input signal Y = 5 Vdc

The damper will be at 35° (50% of the adjusted range).

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 sum of the VA ratings of all actuators and all other components powered by one transformer must not exceed the rating of the transformer.
 - It is recommended that one transformer power no more than 10 actuators.
-



WARNING:

All six outputs of the dual auxiliary switch (A and B) must only be connected to:

- Class 2 voltage (UL/CSA).
- Separated Extra-Low Voltage (SELV) or Protective Extra Low Voltage (PELV) (according to HD384-4-41) for installations requiring CE conformance.



WARNING:

Installations requiring CE Conformance:

- All wiring for CE certified actuators must be SELV or PELV rated per HD384-4-41.
- Use safety-isolating transformers (Class III transformer) per EN61558. They must be rated for 100% duty cycle.
- Over current protection for supply lines is maximum 10A.

Wiring

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

GLB14x

24 Vac/dc Power Supply, 2-Position/Floating Control

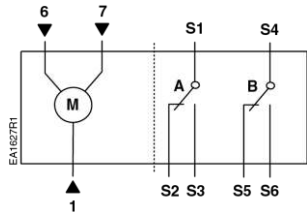


Figure 18. GLB14x Wiring Diagram.

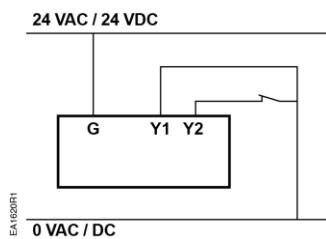


Figure 19. 2-Position, SPST (Single-Pole, Single-Throw).

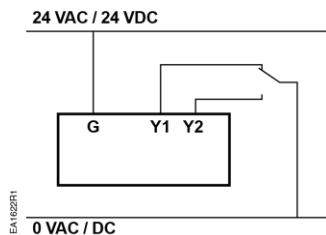


Figure 20. 2-Position, SPDT (Single-Pole, Double-Throw).

Table 3. 2-Position/Floating Control 24 Vac/dc.

Standard Symbol	Function	Terminal Designation	Color
1	Supply (SP)	G	Red
6	Control signal clockwise	Y1	Violet
7	Control signal counterclockwise	Y2	Orange

Factory-installed Options

S1	Switch A Common	Q11	Gray/red
S2	Switch A N.C.	Q12	Gray/blue
S3	Switch A N.O.	Q14	Gray/pink
S4	Switch B Common	Q21	Black/red
S5	Switch B N.C.	Q22	Black/blue
S6	Switch B N.O.	Q24	Black/pink

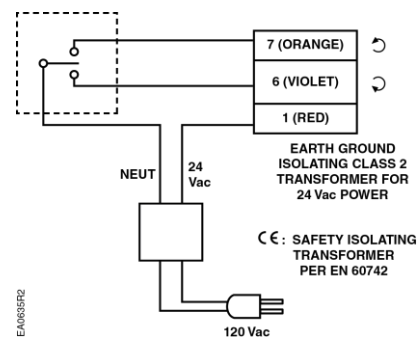


Figure 21. Floating Control, 24 Vac/dc.

Wiring, Continued

GLB34x 100 to 240 Vac Power Supply, Two-Position Floating Control

Each wire has the standard symbol printed on it. See Table 4.

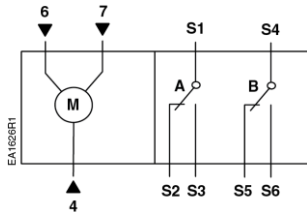


Figure 22. GLB34x Wiring.

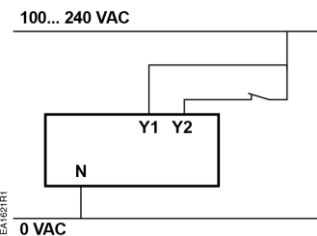


Figure 23. 2-Position, SPST (Single-Pole, Single-Throw).

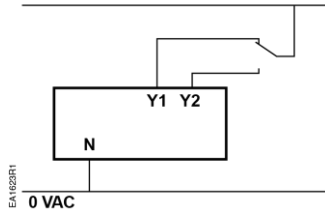


Figure 24. 2-Position, SPDT (Single-Pole, Double-Throw).

Table 4. Two-Position, Floating Control, 100 to 240 Vac.

Standard Symbol	Function	Terminal Designation	Color
4	Supply (SP)	N	Light Blue
6	Control signal clockwise	Y1	Black
7	Control signal counterclockwise	Y2	White

Factory-installed Options

S1	Switch A Common	Q11	Gray/Red
S2	Switch A - NC	Q12	Gray/Blue
S3	Switch A - NO	Q14	Gray/Pink
S4	Switch B - Common	Q21	Black/Red
S5	Switch B - NC	Q22	Black/Blue
S6	Switch B - NO	Q24	Black/Pink

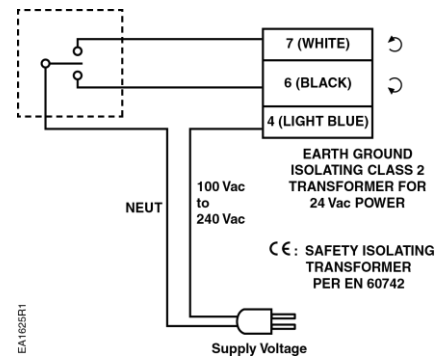


Figure 25. Floating Control, 100 to 240 Vac.

GLB 16x

24 Vac/dc Power Supply, 0(2) to 10V Modulating Control

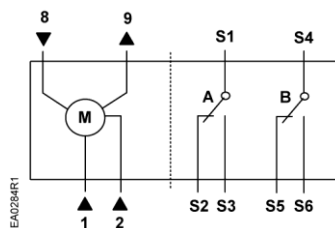


Figure 26. GLB16x Wiring.

Table 5. Modulating Control, 24 Vac/dc.

Standard Symbol	Function	Terminal Designation	Color
1	Supply (SP)	G	Red
2	Neutral (SN)	G0	Black
8	0(2) to 10 Vdc input signal	Y	Gray
9	Output for 0(2) to 10 Vdc position indication	U	Pink

Factory-installed Options

S1	Switch A Common	Q11	Gray/Red
S2	Switch A - NC	Q12	Gray/Blue
S3	Switch A - NO	Q14	Gray/Pink
S4	Switch B - Common	Q21	Black/Red
S5	Switch B - NC	Q22	Black/Blue
S6	Switch B - NO	Q24	Black/Pink

Troubleshooting**WARNING:**

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

**Start-Up/
Commissioning**

24 Vac/dc
Two-position/
Floating 24 Vac/dc
GLB14x

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.
-

Check Operation:

1. Connect all wires per Figure 18.
 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°.
-

Check Auxiliary Switch A:

1. Set the DMM dial to ohms (resistance) or continuity check.
 2. Connect wires S1 and S3 to the DMM. The DMM should indicate open circuit or no resistance.
 3. Apply a control signal (24 Vac/dc) to wires 1 (red) and 6 (violet). The DMM should indicate contact closure as the actuator shaft coupling reaches the setting of Switch A.
 4. Stop applying the control signal to wires 1 (red) and 6 (violet).
 5. Connect wires S1 and S2 to the DMM. The DMM should indicate open circuit or no resistance.
 6. Apply a control signal (24 Vac/dc) to wires 1 (red) and 7 (orange). The DMM should indicate contact closure as the actuator shaft coupling reaches the setting of Switch A.
-

Check Auxiliary Switch B:

1. Set the DMM dial to ohms (resistance) or continuity check.
 2. Connect wires S4 and S6 to the DMM. The DMM should indicate open circuit or no resistance.
 3. Apply a control signal (24 Vac/dc) to wires 1 (red) and 6 (violet). The DMM should indicate contact closure as the actuator shaft coupling reaches the setting of Switch B.
 4. Stop applying the control signal to wires 1 (red) and 6 (violet).
 5. Connect wires S4 and S5 to the DMM. The DMM should indicate an open circuit or no resistance.
 6. Apply a control signal to wires 1 (red) and 7 (orange). The DMM should indicate contact closure as the actuator shaft coupling reaches the setting of Switch B.
-

**Start-Up/
Commissioning**

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.

**Two-position/
Floating
100 to 240 Vac
GLB34x**

Check Operation:

1. Connect all wires per Figure 22.
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°.

Check Auxiliary Switch A:

1. Set the DMM dial to ohms (resistance) or continuity check.
2. Connect wires S1 and S3 to the DMM.
The DMM should indicate open circuit or no resistance.
3. Apply a control signal (100 to 240 Vac) to wires 4 (light blue) and 6 (black). The DMM should indicate contact closure as the actuator shaft coupling reaches the setting of Switch A.
4. Stop supplying the control signal to wires 4 (light blue) and 6 (black).
5. Connect wires S1 and S2 to the DMM. The DMM should indicate open circuit or no resistance.
6. Apply a control signal (100 to 240 Vac) to wires 4 (light blue) and 7 (white). The DMM should indicate contact closure as the actuator shaft coupling reaches the setting of Switch A.

Check Auxiliary Switch B:

1. Set the DMM dial to ohms (resistance) or continuity check.
 2. Connect wires S4 and S6 to the DMM. The DMM should indicate open circuit or no resistance.
 3. Apply a control signal (100 to 240 Vac) to wires 4 (light blue) and 6 (black). The DMM should indicate contact closure as the actuator shaft coupling reaches the setting of Switch B.
 4. Stop applying the control signal to wires 4 (light blue) and 6 (black).
 5. Connect wires S4 and S5 to the DMM. The DMM should indicate open circuit or no resistance.
 6. Apply a control signal (100 to 240 Vac) to wires 4 (light blue) and 7 (white). The DMM should indicate contact closure as the actuator shaft coupling reaches the setting of Switch B.
-

**Start-Up/
Commissioning**

24 Vac/dc
Two-position/
Modulating

GLB16x

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.
-

Check operation:

1. Connect all wires per Figure 26.
 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.
-

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.
-

Check Auxiliary Switch A:

1. Set the DMM dial to ohms (resistance) or continuity check.
 2. Connect wires S1 and S3 to the DMM.
The DMM should indicate open circuit or no resistance.
 3. Apply a full-scale input signal to wire 8 (gray). The DMM should indicate contact closure as the actuator shaft coupling reaches the setting of Switch A.
 4. Connect wires S1 and S2 to the DMM. The DMM should indicate open circuit or no resistance.
 5. Stop the signal to wire 8 (gray). The DMM should indicate contact closure as the actuator shaft coupling reaches the setting of Switch A.
-

Check Auxiliary Switch B:

1. Set the DMM dial to ohms (resistance) or continuity check.
 2. Connect wires S4 and S6 to the DMM. The DMM should indicate open circuit or no resistance.
 3. Apply a full-scale input signal to wire 8 (gray). The DMM should indicate contact closure as the actuator shaft coupling reaches the setting of Switch B.
 4. Connect wires S4 and S5 to the DMM. The DMM should indicate open circuit or no resistance.
 5. Stop the signal to wire 8 (gray). The DMM should indicate contact closure as the actuator shaft coupling reaches the setting of Switch B.
-

Dimensions

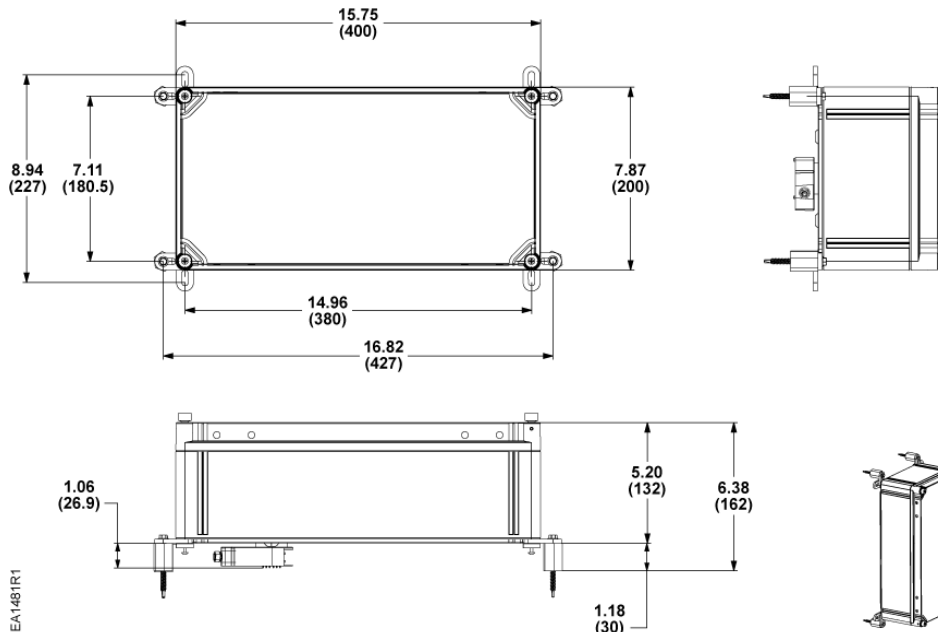


Figure 27. Dimensions of the ASK75.7U Weather Shield in Inches (Millimeters).

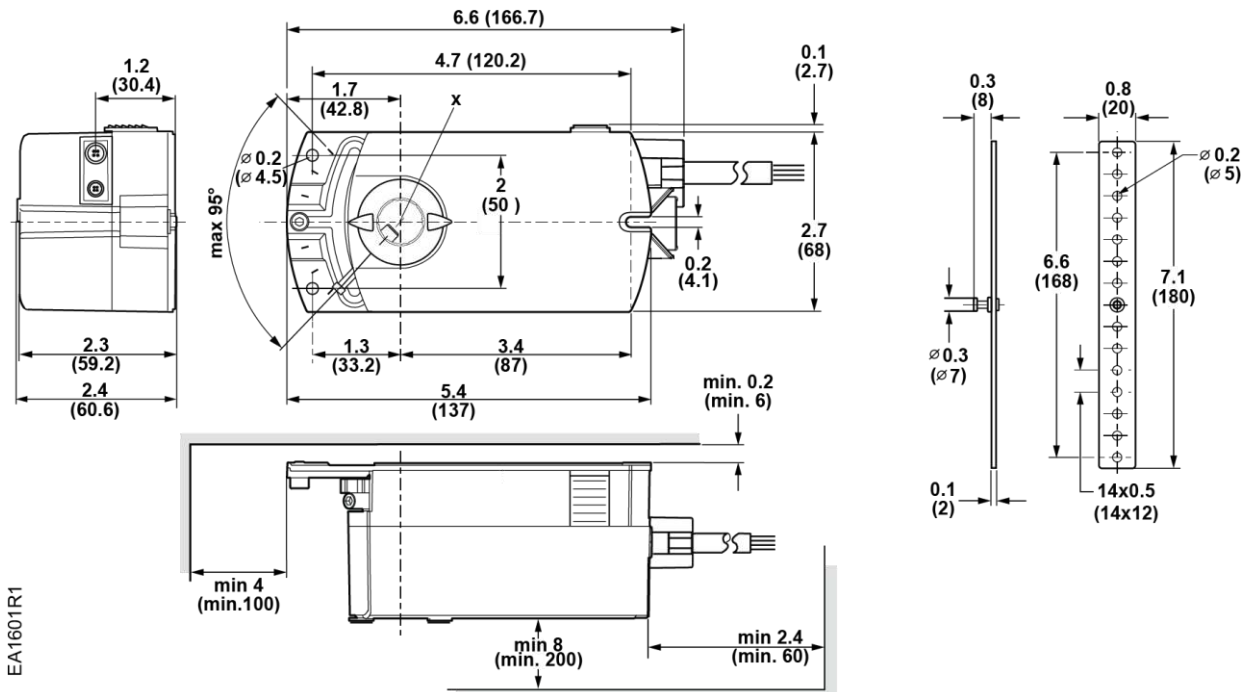


Figure 28. GLB Actuator and Mounting Bracket Dimensions in Inches (mm).

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