



400 Series Pneumatic Actuator User Manual

For 76, 86 & 96 Model Ball Valves

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This User Manual covers Gemini's Models; 400 Series Pneumatic Actuators and 76, 86, 96 Model Ball Valves. The publication of these instructions are intended as a guide only. Installation should only be performed by qualified personnel. **Additional support is also available by contacting Gemini Valve @ Telephone: 603 244-7931, Email: service@geminivalve.com.**

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SL15-1808

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Model 76, 86, 96 Ball Valves (Female Screwed End N.P.T.)

Installation

Note: If the ball valve you are installing is equipped with an actuator, the actuator can be dismantled from the ball valve if desired to facilitate ease of installation. For further instructions see associated Pneumatic Actuator Model Installation, Page 6, Actuator Removal for Ball Valve Installation.

1. Ensure that both the male pipe and female valve threads are free from dirt, debris, and corrosion. Wire brushing of the male pipe threads is recommended to ensure a good metal-to-metal joint.
2. Apply a good quality thread lubricant on the male threads. Lubricant reduces friction when making up the pipe joint. Note: thread lubricant is not intended to seal the joint and will not compensate for poor quality male pipe or fitting threads.
3. Turn the ball valve (female threads) onto the male pipe threads (or fitting) by hand. Continue to turn the valve as far up as it will go by hand. With the use of a wrench continue to tighten the valve onto the pipe. The pipe joint seal should occur within 1-3 turns after wrenching begins. Care should be taken not to exceed 3 turns in which damage to the threads can occur.
4. The pipe joint should be tested for leakage to ensure the pipe joint has been achieved.

Specifications

TEMPERATURE*: -50°F to 450°F

VALVE BODY PRESSURE RATING*: 720 P.S.I.**. C.W.P.***

MAXIMUM PRESSURE DIFFERENTIAL: 400 P.S.I.**

*see Differential Pressure - Temperature Chart

**P.S.I. = Pounds Per Square Inch

***C.W.P. = Cold Working Pressure to 150°F

VACUUM: 20 Micron SATURATED STEAM: 150 P.S.I.

CONNECTION - STYLE: Pipe / N.P.T.F. (Dryseal National Pipe Taper)

BODY DESIGN / SIZE RANGE:

One Piece Body - Model 76 Reduced Port	1/2" - 2"
Two Piece Body - Model 86 Standard Port	1/4" - 2"
Two Piece Body - Model 96 Full Port	1/2" - 1-1/2"

MATERIALS:

BODY;

Brass - ASTM B-16
Carbon Steel - ASTM A108,
316 Stainless Steel ASTM A276,
Alloy 20 - ASTM - B473
Monel - ASTM B164-75

BALL AND STEM; 316 Stainless Steel - ASTM A276

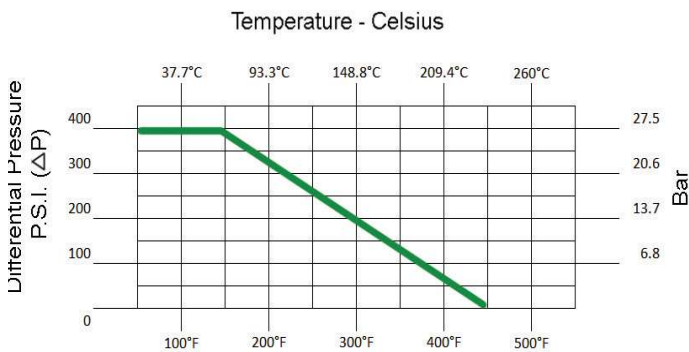
(except Alloy 20 & Monel - then same as body material)

SEATS AND STEM SEAL; Glass Reinforced P.T.F.E. (Teflon ®)

Model 76, 86, 96 Ball Valves (Female Screwed End N.P.T.)

Specifications (continued)

DIFFERENTIAL PRESSURE - TEMPERATURE CHART



Temperature - Fahrenheit

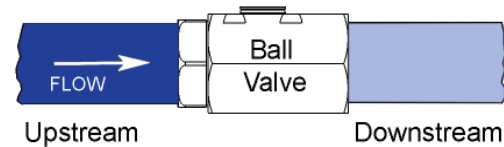
— P.T.F.E. Glass Filled Reinforced Teflon®

To Use the Pressure - Temperature Chart

Draw an imaginary line from your media Differential Pressure to your media Temperature to confirm it falls within the valve rating.

To Calculate Pressure Differential

Compare the Upstream media pressure to the Downstream. The pressure differential should not exceed 400 P.S.I. See examples below;



Examples:

Upstream Pressure of 700 P.S.I. less Downstream of 325 P.S.I. equals 375 P.S.I. which is below 400 P.S.I. differential i.e. OK

Upstream Pressure of 600 P.S.I. Less Downstream of 0 P.S.I. equals 600 P.S.I. which is above 400 P.S.I. differential - outside of ratings not recommended.

Cv

Note: The values derived from the flow equation are for estimating purposes only. Product variances or systemic factors may alter actual performance.

The approximate flow rate through a valve can be calculated as follows:

$$Q = C_v \sqrt{\frac{\Delta P}{G}}$$

where;

Q = flow rate in gallons (U.S. Std.) per minute

Cv = valve constant

P = pressure drop across the valve in pounds per square inch (P.S.I.)

G = specific gravity of the media relative to water

Approximate Cv Values			
Valve Size (inches)	Single Piece Body Reduced Port	Two Piece Body Standard Port	Two Piece Body Full Port
1/4 & 3/8	-	5.5	8
1/2	5.5	8	12
3/4	10	12	32
1	15.5	32	46
1-1/4	20	46	82
1-1/2	37	82	120
2	60	120	-

Model 76, 86, 96 Ball Valves (Female Screwed End N.P.T.)

Maintenance

Typical ball valve designs will first show signs of wear via media leakage at the stem seal. Gemini's General Industrial Series Ball Valves feature a self compensating stem seal design which use a pair of Belleville Spring Washers that when energized (flattened) maintains a preload (squeeze) of the stem seal to stem providing an extended period of leak-tight service without any maintenance required.

Depending on the application media, temperature, pressure and cycles, the stem seal may eventually wear to the point that the Belleville Spring Washers no longer can compensate for stem seal wear i.e. loosen (de-energize). Evidence of this can be seen by media seepage and eventually leakage from between the top of the valve body and the bottom of the actuator bracket. Depending on the corrosive nature of the valve media, if left, damage to the valve and or actuator materials may require replacement of the complete assembly vs. simple maintenance or replacement of the worn valve.

In many cases, readjustment of the stem nut may enable the valve to be returned to service. The following outlines the procedure to readjust the stem nut. If adjustment does not stop media leakage from the stem seal this would indicate the ball valve is worn out and in need of replacement. Please note that Gemini's Pneumatic and Electric Actuators may provide service life for two or more ball valves during their life expectancy. Additionally, the cost of a replacement ball valve is a small portion of the overall actuated ball valve assembly. If your application involves high cycling we would also suggest you consider our Performance Automation Series.

Caution: Before attempting any adjustment, isolate the valve media from the valve being adjusted i.e. no media pressure should be present. Protective clothing and eye wear is recommended.

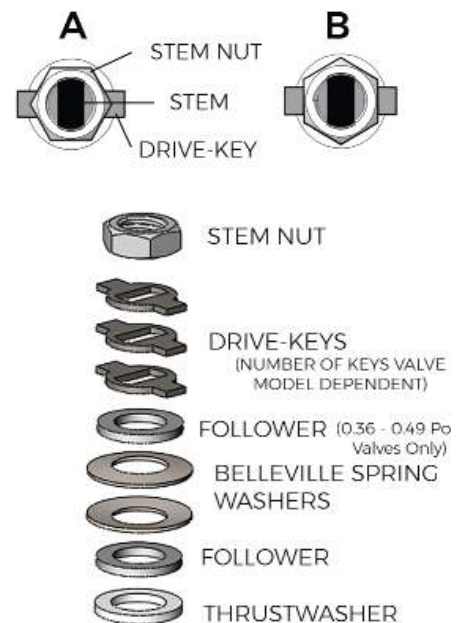
1. Prevent the stem from turning as the nut is tightened by inserting a wooden or plastic dowel through the valve, or if the valve is in-line (service), hold the 'flats' of the stem then tighten the stem nut until the Belleville Spring Washers have just become fully compressed (flattened). If a torque wrench is available refer to the Stem Nut Torque Table.

Although the stem nut may spin freely when first tightened, the torque needed to continue tightening will increase progressively after the stem nut contacts the drive key and the Belleville Spring Washers begin to deflect.

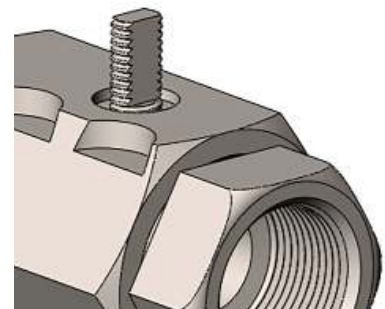
The torque required to tighten further will increase sharply once the Belleville Spring Washers have become fully flattened. Tightening beyond this point should not be attempted as damage to the stem seal will result.

2. The correct orientation of the stem nut to the drive key is shown in Figure 1; this orientation is necessary to permit engagement with the twelve-point socket in the actuator pinion driver.

In order to achieve the desired orientation, loosen the stem nut until the nut / drive key relationship corresponds to either 'A' or 'B' in Figure 1. This adjustment should require less than one-twelfth (1/12) turn of the nut.



Valve Size	Stem Nut Torque - Inch Lbs.		
	Valve Model		
Valve Size	76	86	96
1/4 & 3/8	-	30	-
1/2	30	30	50
3/4	30	50	50
1	50	50	110
1-1/4	50	110	110
1-1/2	110	110	110
2	110	-	-



Pneumatic Actuator 400 Models

Installation

These instructions detail the procedure for installing a Gemini 400 Model Pneumatic Actuator on a drive-key equipped Gemini Valve Model 76, 86 or 96 Ball Valve.

Check / Adjust Valve Locator Screws

Before assembly of the Actuator Bracket to the Actuator, confirm the proper position of the Valve Locator. The Actuator Bracket uses a Valve Locator to align the valve body to the actuator bracket. See Table 1, Figure 1. Adjust if required.

Figure 1

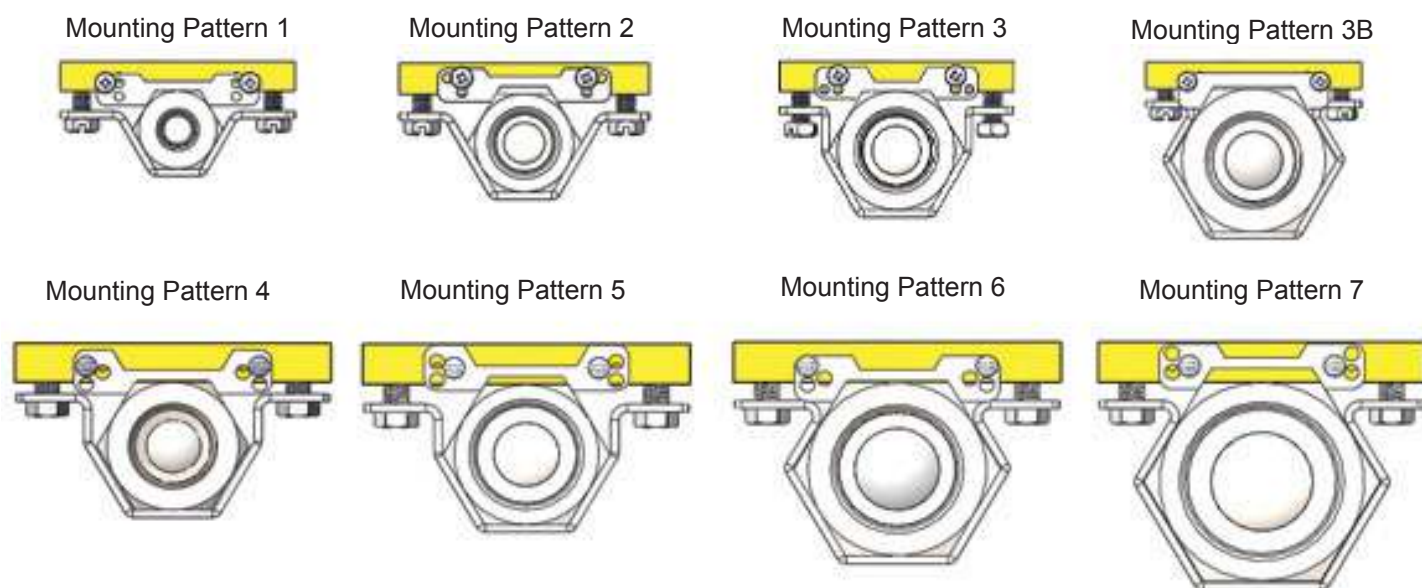


Table 1

Valve Model Size			Actuator Model Mounting Pattern		
			B411D B412SR	B412D	A421D A422D A422SR
76	86	96			
1/2	1/4 & 3/8	-	1	1	-
3/4	1/2	-	2	2	-
1	3/4	1/2	3	3	-
1-1/4	1	3/4	-	3B	4
1-1/2	1-1/4	1	-	-	5
2	1-1/2	1-1/4	-	-	6
	2	1-1/2	-	-	7

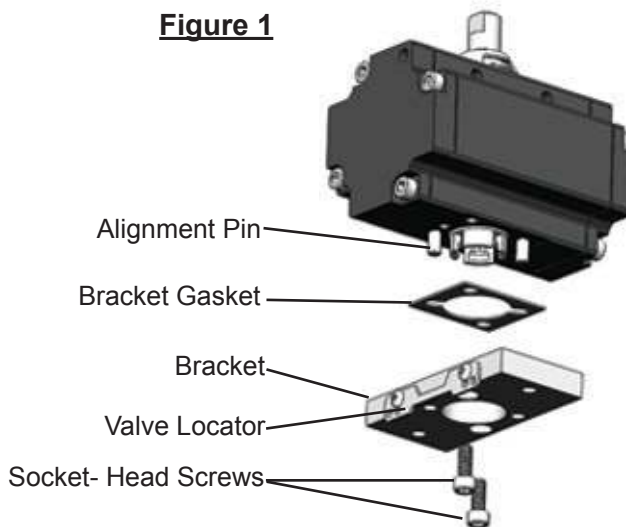
Pneumatic Actuator 400 Models

Installation

These instructions detail the procedure for installing a Gemini 400 Model Pneumatic Actuator on a drive-key equipped Gemini Valve Model 76, 86 or 96 Ball Valve.

Assemble Bracket to Actuator

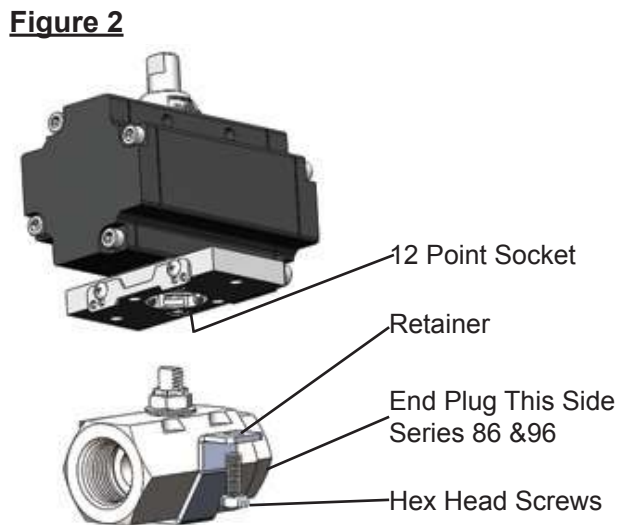
1. Position the bracket gasket on the actuator mounting surface so that the alignment pins engage the slots (B410 Series) or holes (A420 Series) in the gasket.
2. Place the bracket, from the mounting kit, on the mounting surface over the gasket so that the alignment pins engage the bracket. In the interest of uniformity, mount the bracket so that the valve locator is on the same side as the actuator inlet ports (or spring module if you are mounting a spring return) as shown in Figure 1.



Assemble Valve to Actuator

1A. Double Acting Actuators: Check the valve to be sure that it is either completely open or completely shut. Observe the OPEN / SHUT indicator mounted on the actuator shaft; turn the shaft if necessary so that the indicator corresponds to the position of the valve.

1B. Spring Return Actuators: Turn the valve stem to orient the ball in the desired for spring action, i.e. "spring to open" or "spring to close". Observe the OPEN / SHUT indicator mounted on the actuator shaft to assure that it reads correctly. If it does not, remove the two screws which hold the indicator cover and rotate the cover 180 degrees, reinstall the screws.



2. Place the actuator, with the bracket attached, atop the valve so that the 12 point socket engages the stem nut, the shaft notch engages the drive-key and locator engages the valve body hex. If your valve is a Series 86 or 96, the locator must contact the valve body on the side opposite the end plug as shown in Figure 2. If the valve stem nut will not engage the socket in the coupling, reposition the nut slightly (this should require less than 1/12 turn). The valve locator has been preassembled to the bracket to fit your valve; if the valve locator does not engage the hex, or if it prevents the bracket from contacting the upper surface of the valve body, it must be repositioned.

3. Position the retainer on the underside of the valve and fasten to the actuator bracket with the two hex-head capscrews. Tighten the screws alternately to assure balanced pulldown and to avoid skewing of the actuator bracket on the valve body. Continue tightening only until the actuator is securely anchored. A gap should remain between the lower surface of the bracket and the retainer "ears" when the assembly is complete.

Your Gemini Actuated Valve is now ready for service.

Pneumatic Actuator 400 Models

Specifications

TEMPERATURE: -20° F to 350° F

CYCLE (INDEX) TIME: Approximately 1/2-1 Second (Load Dependent)

AIR SUPPLY: 60 - 125 P.S.I. air. Sufficient air delivery must be available at the actuator to ensure dependable operation. The following precautions should be observed: Air supply should be clean and free of moisture. When dirty or wet air is a problem; a filter / separator should be specified; these units are most effective when installed as close as possible to the actuator. A filter, when used, should permit a minimum flow of 4 scfm at an upstream pressure of 60 P.S.I. Eliminate severe restrictions to air flow (certain solenoid valves & fittings). The most restricted passage must have an area no smaller than .003 inches square, the area of 1/16" diameter orifice. If more than a single actuator is to be supplied by an individual pilot, the minimum passage requirement applies per actuator. All actuator models are permanently lubricated and are not recommended to be used with any other air supply lubricants.

TUBING: For short runs up to 5 feet 5/32" I.D. is suitable, 1/4" I.D. will serve up to 30 feet. For longer runs, use 3/8" I.D. or larger.

AIR CONNECTIONS: Female 1/8" NPT / NAMUR Interface

MATERIALS:

BODY, END CAPS: Aluminum with Teflon ® Impregnated Hard Anodized (Polylube ®) Surfaces

SPRING MODULES: Aluminum with Teflon ® Impregnated Hard Anodized (Polylube ®) Surfaces

SHAFT / DRIVER & EXTERNAL TRIM: 300 Series Stainless Steel

Operation

Double-Acting Models B411D / B412D / A421D / A422D

Use air to move the internal pistons in two directions which rotates the actuator pinion 90° which is attached to the ball valve stem. Air supplied to port 'A' causes counter clockwise rotation, which with a normally closed assembly, opens the ball valve. Air supplied to port 'B' causes clockwise rotation which in turn closes the ball valve. For most applications a four-way solenoid valve like the Gemini model 4GP is used to pilot the air. Remote piloting can also be achieved utilizing the 'A' & "B" air supply ports. In summary the solenoid (pilot) valve uses an electric signal to cycle air in and out of the pneumatic actuator subsequently opening / closing the ball valve.

Spring-Return Models B412SR / A422SR

Use air to move the internal pistons in one direction and springs in the other, which rotates the actuator pinion 90°. Air supplied to port 'A' causes counter clockwise rotation, which on a normally closed assembly opens the ball valve. Upon release of air, springs cause clockwise rotation, which closes the ball valve. For most applications, a three-way solenoid valve is used to pilot the air. Remote piloting can also be achieved utilizing the 'A' air supply port. In summary, the solenoid (pilot) valve uses an electric signal to cycle air in and out of the pneumatic actuator, subsequently opening / closing the ball valve.

Maintenance

Gemini's pneumatic actuators are engineered to be maintenance free. No adjustments or maintenance is required to achieve maximum service life. Care must be taken to ensure a clean / dry air supply is provided per the above AIR SUPPLY Specifications.

Pneumatic Actuator Accessory - Solenoid Model GP

Installation

These instructions describe the operation and installation of the 4-way (4GP) Gemini pilot valve. The 4GP pilot valve can be mounted to 400 Series double acting actuators which have the optional NAMUR interface as designated by the suffix N in the model number confirmed by the 'N' stamped on the endcap.

4GP - Double Acting Models

Installation - Normally Closed Operation. Valve in closed position when coil is de-energized.

1. Fit the two o-ring seals into the pockets on the underside of the pilot valve body.

2. Install the orientation screw (M5X10) into the top, center tapped hole of the actuator end cap, identified as 'Normally Closed' in Figure 1, leaving 1/16" - 1/8" of the screw protruding above the surface of the actuator end cap.

3. Position the pilot valve so that actuator orientation screw fits into the shallow drilled hole in the GP body. Nameplate on the Pilot Valve Body should face same way as Nameplate on Actuator Body.

4. Insert the mounting screws (M5X35) through the mounting holes in the pilot body valve and tighten until secure.

5. Connect the air supply (60 - 125 P.S.I.) to the 1/8" NPT inlet port and the wire for the voltage marked on the coil.

6. GP coil is usually equipped with a 'DS' DIN x Strain, Figure 2, or 'DC' DIN x Conduit electrical connector. To wire the connector, remove the center mounting screw, and with a small screwdriver, pry the inner element from the body of the connector to expose the terminal blocks inside. Route the wire through the hub of the connector. For the 'DS,' loosen the sealing nut and ensure the wire insulation passes through the rubber grommet inside the hub. Affix the wires to the appropriate terminal block. (Figure 2)

Retighten sealing nut to secure the wire and provide a seal.

Installation - Normally Open Operation. Valve in open position when coil is de-energized.

Follow the same instructions for Normally Closed substituting item 2 as follows;

2. Install the orientation screw (M5X10) into the bottom, center tapped hole of the actuator end cap, identified as 'Normally Open' in figure 1. Nameplate on Pilot Valve Body should face opposite Nameplate on Actuator Body.

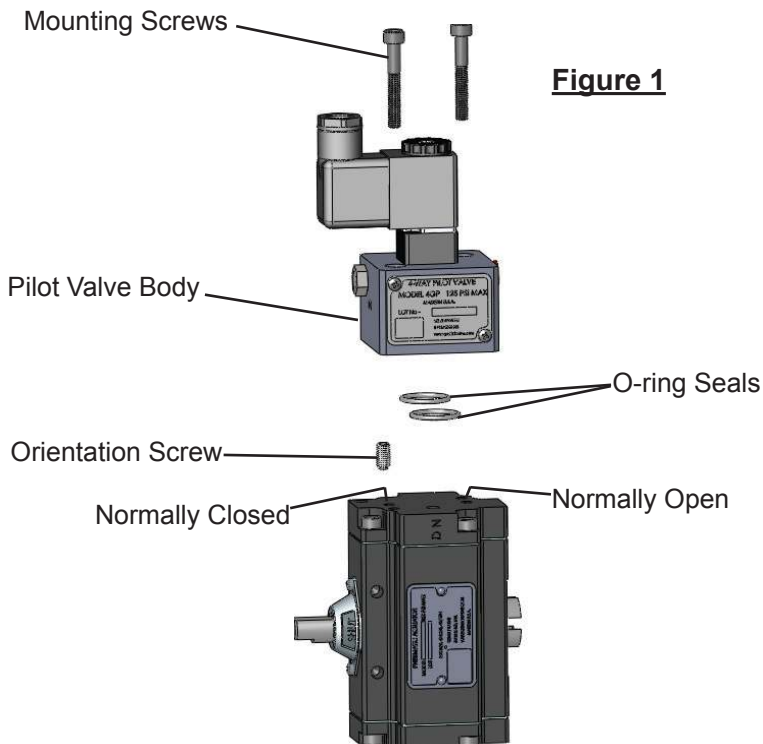


Figure 1



Figure 2

Pneumatic Actuator Accessory - Solenoid Model GP

Specifications

TEMPERATURE: -20° F to 350° F

AIR SUPPLY: 60 - 125 P.S.I air. Sufficient air delivery must be available at the actuator to ensure dependable operation. The following precautions should be observed: Air supply should be clean and free of moisture. When dirty or wet air is a problem; a filter / separator should be specified; these units are most effective when installed as close as possible to the actuator. A filter, when used, should permit a minimum flow of 4 scfm at an upstream pressure of 60 P.S.I. Eliminate severe restrictions to air flow (certain solenoid valves & fittings). The most restricted passage must have an area no smaller than .012 inches square, the area of 1/8" diameter orifice. If more than a single actuator is to be supplied by an individual pilot, the minimum passage requirement applies per actuator. All actuator models are permanently lubricated and are not recommended to be used with any other air supply lubricants.

TUBING: For short runs up to 5 feet 5/32" I.D. is suitable, 1/4" I.D. will serve up to 30 feet. For longer runs, use 3/8" I.D. or larger.

AIR CONNECTION: Female 1/8" NPT for Model 4GP, 1/4" NPT for Model 3GP

OPERATING COIL: Operating coil technical data is dependent on the specific model selected, however, all standard coils as designated by the 'SC' code and conform to the following:

Wattage: 5 Watts

Class: F, continuous duty

Protection: IP65 (with connector) dusttight, water resistant, Connection: Mini-DIN Standard

MATERIALS:

BODY - PTFE / Anodized Aluminum

SPOOL - 18-8 Stainless Steel

SEALS - Nitrile / Viton®

HARDWARE - 18-8 Stainless Steel

COIL / BODY - GF Nylon / GF Zytel

Maintenance

Gemini's model GP Solenoid Valves are engineered to be maintenance free. No adjustments or maintenance is required to achieve maximum service life. Care must be taken to ensure a clean / dry air supply is provided per the above AIR SUPPLY Specifications.

Pneumatic Actuator Accessory - Limit Switch Model LS-1

Installation

These instructions detail the procedure for mounting the Gemini Model LS-1 Limit Switch on Gemini A400 Series Pneumatic Actuators. See Pages 11 and 12 for electrical wiring information necessary to complete the installation. Before proceeding to the detailed instructions, check to insure that you have the appropriate LSM (Limit Switch Mounting) kit.

Mounting Instructions

Fitting of the Operating Cam and Limit Switch Mounting Bracket

1. Remove the two position indicator housing screws, which secure the position indicator housing, from the top of the actuator to which the switch is to be mounted. Remove the position indicator housing. Figure 1.

2. Remove the retaining ring from the actuator shaft. Remove the position indicator and thrustwasher. A spare retaining ring has been provided in the mounting kit for use if the original becomes damaged during removal of the position indicator.) Figure 2.

3. Place the cam in position on the actuator shaft. The flat side of the cam hole must align with the long flat on the actuator shaft. Reinstall the retaining ring atop the cam or install the spare retaining ring from the kit. Tighten the cam setscrew. (Hex wrench is included in the LSM mounting kit.) Figure 3.

4. Place the limit switch bracket atop actuator so that the long side faces the side of the actuator on which the limit switch is desired. Secure the bracket with the socket head screws. All factory mounted units are assembled so that the long side is opposite the actuator nameplate side unless otherwise specified.

Figure 1

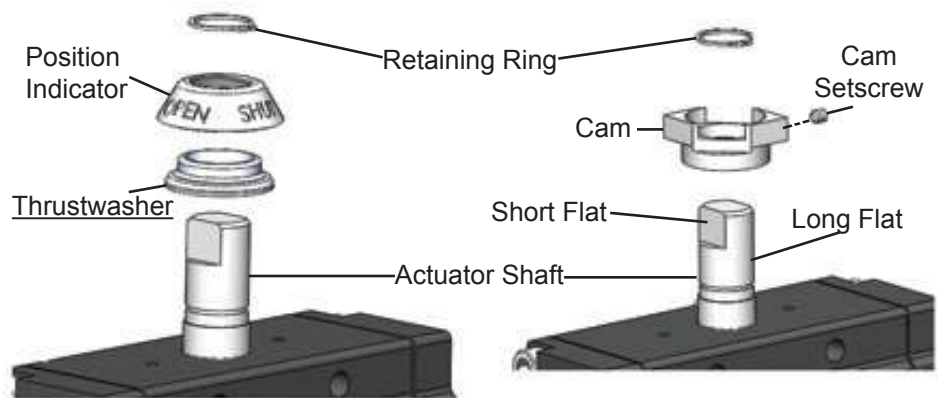
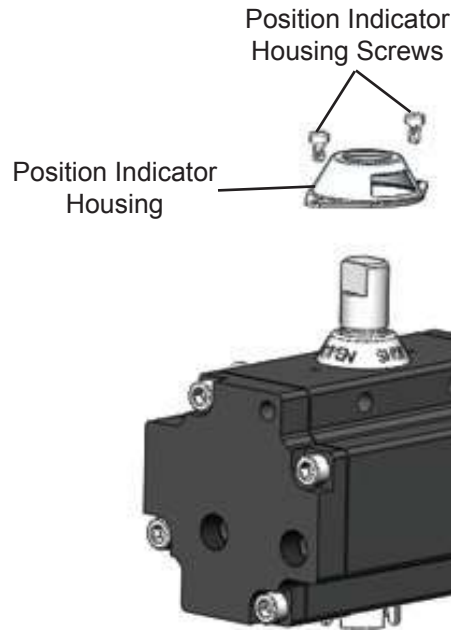


Figure 2

Figure 3

Attachment of Limit Switch

1. Fit the bushings, which extend from the Limit Switch housing, into the matching holes in the long side of the mounting bracket. Push switch housing against bracket and verify that switch body touches bracket. Secure switch body to bracket with two #10-24 set-screws using a medium strength (nonpermanent) thread locker (not included in mounting kit). Note: Hex wrench supplied with LSM Mounting Kit. Figure 5.

Wiring Instructions

1. Route the wire to be terminated through the conduit hub and up through the access space to the terminal block.

2. Strip insulation back 1/4", insert the stripped ends directly into the proper terminal clamps and tighten screws.

3. Internal interconnections between terminal-block and switches are diagrammed inside the Limit Switch Cover.

Wire Size

#12 AWG Max. #24 AWG Min.

Field Installed Conductors Must Have a Temperature Rating of 60C or 75C

Insulation Stripping Length: 1/4"

Note: If the Switch is installed in a hazardous location i.e. where flammable vapors or dust are present in the atmosphere, replace the cover and tighten securely before connecting the electrical supply circuit.

If necessary, a screwdriver shank or similar tool may be engaged in the cover wrenching lugs to assist removal and replacement.

Wiring Specifications

Switch Ratings

AC 250 volts; 10 amps

DC 250 volts; 0.25 amps
125 volts; 0.50 amps

Lamp Load 125 volts; 5 amps

Figure 4

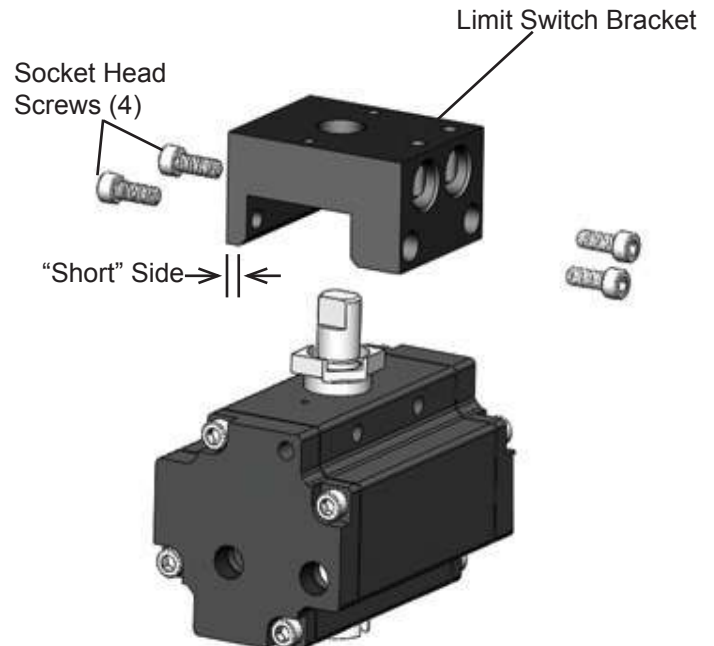
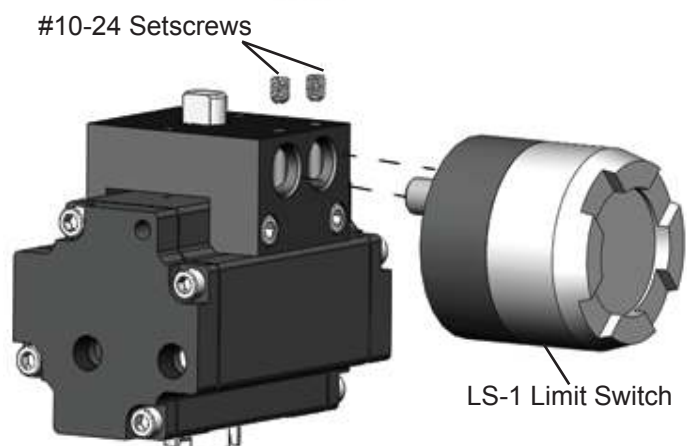


Figure 5



Pneumatic Actuator Accessory - Limit Switch Model LS-1

Wiring

Wiring Specifications

Wire Size
#12 AWG Maximum
#24 AWG Minimum

Wiring

1. Route the wire to be terminated through the conduit hub and up through the access space to the terminal block.
2. Strip insulation back 1/4", insert the stripped ends directly into the proper terminal clamps and tighten screws.
3. Internal interconnections between terminal-block and switches, Figure 1. A copy is also inside the Limit Switch Cover.

NOTE: If the Switch is installed in a hazardous location i.e. where flammable vapors or dust are present in the atmosphere, replace the cover and tighten securely before connecting the electrical supply circuit. If necessary, a screwdriver shank or similar tool may be engaged in the cover wrenching lugs to assist removal and replacement.

Specifications

MATERIALS:

Body / Cover - Aluminum with Teflon® Impregnated Hard Anodized (PolyLube®) Surfaces
Probes - 316 Stainless Steel
Cover Seal / Probes - Buna N

TEMPERATURE: 10° F to 180° F

CONDUIT CONNECTION: 1/2" NPT

ELECTRICAL RATING: 10 amp. 250VAC maximum; 1/2 amp. 125VDC; 1/4 amp. 250VDC; 5 amp. 125VAC lamp load. Note: each pole must be the same polarity to utilize these ratings.

MICROSWITCHES: Mechanical S.P.D.T. (Single Pole Double Throw)

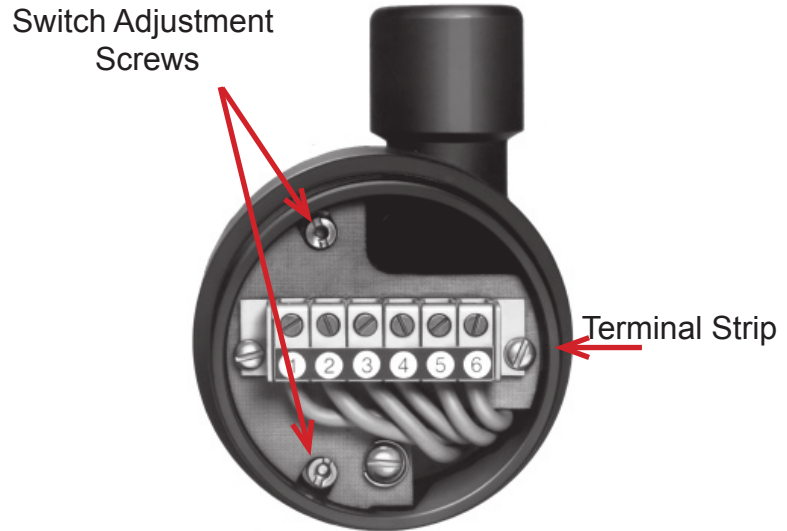
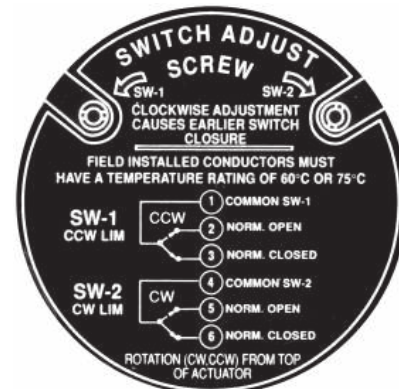


Figure 1



INTERNAL WIRING CONNECTORS: Screw Clamp

NEMA STANDARDS: NEMA 1 (General Purpose); NEMA 4 (Watertight & Dusttight); NEMA 7 (Hazardous Locations, Class I Groups B, C, & D); NEMA 9 (Hazardous Locations, Class II, Groups E, F, & G); NEMA 12 (Oiltight and Driptight); and NEMA 13 (Oiltight and Dusttight).

UL® LISTINGS: Industrial Control Equipment for use in Hazardous Locations, Class I, Groups B,C, & D and Class II, Groups E, F, & G

Maintenance

Gemini's model LS-1 Limit Switch is engineered to be maintenance free.

Engineered Automated Ball Valve Solutions



Designed, Manufactured, Assembled, Tested, Supplied, and Supported
from our Raymond, NH USA Headquarters

All specifications herein are subject to change without notice or obligation.

Seller warrants its products for a period of one (1) year, to be manufactured in accordance with our written specifications and free from material defects in material and/or workmanship. Seller, at its option, will promptly repair or replace any products returned intact to the factory, transportation charges prepaid, which Seller determines to be defective in material and/or workmanship. The foregoing shall constitute the sole remedy for any breach of Seller's warranty. Care must be taken to assure that the internal media and external environment are compatible with the materials of the ball valve. For a complete copy of our Warranty please see our Standard Terms and Conditions at www.geminivalve.com

Customer Satisfaction Promise - If for any reason our product(s) or service do not meet / exceed your expectations please contact us for prompt support. T 603 244-7931 E service@geminivalve.com
