



HVA-12880 Moya Blvd., Reno, NV 89506
Phone: 775.359.4442 Fax: 775.359.1369
sales@highvac.com / www.highvac.com



INSTALLATION INSTRUCTIONS
STANDARD GATE VALVES
SIZES 1.5"- 21.0"

READ ALL INSTRUCTIONS
PRIOR TO INSTALLATION

KEEP INSTRUCTIONS WITH THE VALVE
FOR FUTURE REFERENCE

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TABLE OF CONTENTS

Unpacking	1
Pre-Installation Instructions.....	1
Valve Operation.....	1-2
Installation Instructions	2-3
Body Flange Torque Sequence/Recommendation	4-5
Reed Switch Wiring Diagram	6-7
Micro Switch Wiring Diagram.....	8
Pneumatic Gate Valve Outline, solenoid remotely mounted.....	9
Pneumatic Gate Valve Outline, solenoid mounted.....	10
General Information	11-12
Definitions	13
Humphrey 410-70 Solenoid Information	14-16
Warranty	17

HVA GATE VALVE WARRANTY

Each product sold by High Vacuum Apparatus (**HVA**) is warranted to be free from manufacturing defects that adversely affect its normal functioning during the one-year immediately following delivery thereof by **HVA** (or in the case of products or components of any product purchased by **HVA** from another for any lesser period of time that such manufacturer warrants said product or component to **HVA**).

Notwithstanding the warranty provisions set forth above, all of **HVA**'s obligations with respect to such warranties shall be contingent on Licensee's use of the Licensed Programs in accordance with **HVA**'s instructions as provided by **HVA** in the Documentation or otherwise, and as may be amended, supplemented, or modified by **HVA** from time to time, **HVA** shall have no warranty obligations with respect to any product which has been:

- A) Operated by purchaser in a manner inconsistent with requirements set forth in the documentation or under the provisions of this agreement or that has been modified or repaired by any party other than **HVA**;
- B) Damaged in any manner and by any cause other than the act or omission of **HVA**; or.
- C) Operated or maintained in environmental conditions outside the parameters designated by **HVA** in the Documentation or elsewhere.

HVA shall not be liable for any damage, loss or expense, whether consequential, special, incidental, direct or otherwise caused by, arising out of or connected with the manufacture, delivery (including any delay in, or failure to, deliver), packaging, storage or use of any product sold or delivered by **HVA**, whether or not resulting from negligence or from breach of contract except that in the event that any product so sold or delivered by **HVA** shall fail to conform to the foregoing warranty, the purchaser, as its exclusive remedy, shall upon prompt notice to **HVA** of any such defect or failure and upon the return of the product, part or component in question to **HVA** at its factory, with transportation charges prepaid, and upon **HVA**'s inspection confirming the existence of any defect inconsistent with said warranty or any such failure, be entitled to have such defect or failure cured at **HVA**'s factory and at no charge therefore, by replacement or repair of such product as **HVA** may elect.

The warranties stated are the sole and exclusive warranties offered by **HVA**. There are no other warranties respecting the products provided hereunder, either express or implied, including but not limited to any warranty of design, merchantability, or fitness for a particular purpose, even if **HVA** has been informed of such purpose. No agent of **HVA** is authorized to alter or exceed the warranty obligations of **HVA** as set forth herein.

SPECIFICATIONS

310/410 Models	
Media	Air or inert gases
Pressure Range	0-125 psig (0-8.5 bar) 0-28" Hg vacuum (prefix "v" 3-way and all 4-way models)
Ambient temperature range	32 to 125° F (0 to 50°C)
Coil temperature rise (any voltage)	81° F (45° C)
Power consumption (AC/DC)	4.5 watts
Response time (on/off)	.012/.010 (DC), .012/.020 (AC) sec.
Voltage tolerance	Plus 10%, minus 15% of rated voltage
Coil voltages	12V DC, 24V DC, 24V AC, 100V AC, 120V AC, 200V AC, 240V AC
SCFM @ 100 psig	>10
C _v	.144
Fill/exhaust time @ 100 psig (7.0bar)	1 cu. In. .020/.032 sec. 10 cu in. .20/.32 sec. 100 cu. In. 2.00/3.20 sec.
Leak rate (max. allowed)	4cc/minute @ 100 psig
Type of operation	Direct Solenoid
Effective area	Model 310 .0069-inch ² Model 410 .0064-inch ²
Stroke	.015-inch
Maximum cycle rate (cycles/min.)	2700 (DC), 1875 (AC)
Lubrication	None required, factory pre-lubed
Filtration	40 Micron recommended
Materials	Brass, Buna N, aluminum, stainless steel, acetal

**STANDARD GATE VALVE
INSTALLATION INSTRUCTIONS**

UNPACKING

Inspect shipping container before unpacking for damage sustained during transit. Any visible damage/claims should be reported to the transportation company immediately. Remove the valve and make sure that the flange faces are free of knicks or scratches and there is no obvious damage to the actuator assembly and body.

Write the model number and serial number down for future reference. Model numbers and serial numbers are required when purchasing spare parts and when returning the valve for maintenance.

PRE-INSTALLATION

WARNING: Never put hands or any other object in the Gate Valve-serious bodily injuries will occur and valve will be damaged.

Determine that the valve and adjacent plumbing in the vacuum system will be adequately supported when installed. An excessive amount of weight mounted on the valve without adequate support may possibly impair sealing and operation of the valve. Confirm the mating flanges are in line, flat, parallel and the correct distance apart to minimize straining of valve body.

Remove the flange covers and wipe the flanges with a lint-free, dry wipe. If installing an o-ring seal flange, apply a light film of vacuum grease (Apiezon L Grease or an equivalent is recommended) to the o-ring, using extreme care to not stretch the o-ring, and install in the flange o-ring groove. Do not twist, cut or damage o-ring.

VALVE OPERATION

IMPORTANT: Air regulator must be used to confirm the valve actuates properly. Instructions must be followed in exact order or warranty is void.

Valves shipping WITH a solenoid (diagram 9 page 10): Connect the main air line to the air supply to solenoid (see diagram). Supply 5 psig, to the solenoid. This will insure the actuator is air loaded and ready to cycle and no damage will occur to valve.

Valves shipping WITHOUT a solenoid (diagram 8 page 9): Connect the normally closed airline to the air to CLOSE fitting/speed controller (see diagram). Supply 5 psig. This will insure the actuator is air loaded and ready to cycle and no damage will occur to valve.

Do not proceed if the valve is in the open position. Return to previous step. Continue if valve is in the closed position.

VALVE OPERATION CONTINUED

Using minimum air pressure required (start at 5 psig), actuate the valve into the open position. Slowly close the valve using the minimum amount of air pressure required (start with 5 psig) until you visually see the gate o-ring make contact with the case. **NOTE Kalrez sealing gate valves:** Kalrez sealing gate valves, shipped with NO solenoid are shipped in a semi-closed position. The speed controls are closed and will need to be adjusted to operate the valve. Increase air pressure in 5 psig increments, opening and closing the valve with each increment, until valve operating pressure has been achieved (see operating tag on valve). Opening and closing the valve using larger than 5 psig increments can damage the valve. **DO NOT EXCEED 80 PSIG.** If the valve does not close completely or the gate valve cycles faster than manufacturer set cycle time listed on page 11, General Information, contact the manufacturer.

INSTALLATION

Air Operated: Connect the compressed air supply to the gate valve using teflon tape or an equivalent on the threads to ensure leak-proof connections. For continued trouble-free operation, it is recommended that an air filter/lubricator be used in the air line system. Refer to the solenoid nameplate for the correct voltage when connecting to the electric service. Check the valve opening for any obstruction.

It is preferable to install the valve with vacuum on the Carriage side of the valve so the valve body remains under vacuum at all times and the pump down of the valve body is eliminated.

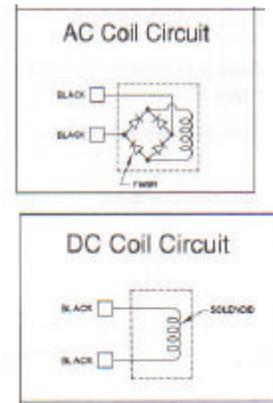
Valve Orientation: Unless otherwise specified at time of order, all valve cycle times and closing pressures are calculated using 'horizontal' (diagram 10, page 12) valve orientation. The valve orientation for 1.5" (38mm) 21" (533mm) is any; for sizes 24" (610mm) - 50" (1270mm) and greater, contact factory.

Making sure that no foreign particles enter the valve, proceed with installation. When installing a valve, it is imperative that proper length bolts be used. *Bolts longer than the combined thickness of both mating flanges will damage the body panels, destroy the seal surface area for the gate o-ring and restrict the carriage from moving to the open/close position. Always use bolts that are at least 1/4—inch (6.4 mm) shorter than the combined thickness of both mating flanges.* **IMPORTANT:** Lightly grease the flange bolts with high-temperature, non-galling type grease (Anti-Gall C-100, #51032 or an equivalent is recommended). Carefully tighten the bolts around the flange, see instructions and proper torque and torque sequence on page 4.

TROUBLESHOOTING

If valve fails to function when electrical power is supplied: Check valve function using manual override. If valve functions by manual actuation, check line voltage to determine compliance with valve electrical rating. Check valve for inoperable (open) coil, measuring milliamps per Electrical Specification Chart. Check that air supply has been delivered in adequate volume and pressure for proper functioning of the device. Ensure that there are no blockages due to air line contamination or defective/blocked fittings. If valve continues to fail contact manufacturer.

SOLENOID CIRCUIT SCHEMATICS



MANUAL OVERRIDE

Push button/spring return manual override is standard. Manual override is located on top of coil. Push red button shifts armature which actuates valve's main stem. Release of manual force permits valve spring to return valve to normal position.

TECHNICAL INFORMATION USING HUMPHREY 410-70 SOLENOID IN CONJUNCTION WITH HVA GATE VALVE FACTORY SET FOR NORMALLY CLOSED

GENERAL INFORMATION-Description—410

A 1/8-inch ported, 4-way, single solenoid, 2-position/spring return general purpose air valve, capable of being used in a variety of functions. Model 410-70 offers dual flow controls and is the HVA standard solenoid. The 410-70 is shipped with every valve unless customer specifies otherwise. The solenoid is set for normally closed gate valve.

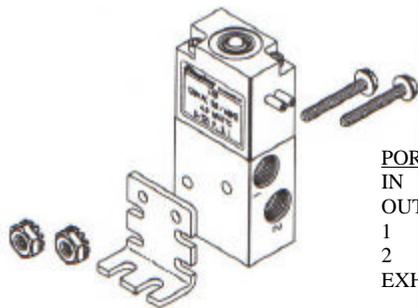
Plumbing

310/410 solenoid valves are direct acting. When used with vacuum or low pressure, use largest possible tubing size and minimum tubing length for optimum performance. **NOTE: Before connecting fittings and tubing, remove all foreign material from these components. If using a sealant, take extra care that sealant does not enter the solenoid valve. This can potentially cause malfunction and/or leakage.**

CAUTION: Compressed air is powerful and may be dangerous. Before attempting to remove a component from an air line or system, always disconnect the supply air and thoroughly exhaust the line or system. Never attempt to construct, operate, or service anything using compressed air unless you have been properly trained to do so. Failure to heed this warning could result in SERIOUS, EVEN FATAL, PERSONAL INJURY.

Installation

Solenoid valves can be mounted in any position in most environments, in keeping with the specifications. 310/410 valves Feature a Class B insulation system and molded coil for ambient temperatures from 32° to 125° F (0° to 50° C).



PORT IDENTIFICATION

IN	Pressure Supply port.
OUT	Delivery port for model 310
1	Normally Open Delivery port for model 410
2	Normally Closed Delivery port for model 410
EXH	Exhaust port, vent to atmosphere

WARNING: NEVER PUT HANDS OR ANY OTHER OBJECT IN THE GATE VALVE—SERIOUS INJURIES WILL OCCUR AND VALVE WILL BE DAMAGED.

IMPORTANT: Because of possible damage to the valve body due to the installation of improper length bolts or over torque of the bolts, carefully check the operation of the valve using 20 PSIG air pressure (required to achieve full closure). Do not continue to increase air pressure to 80 psig if the gate valve does not open/close properly. Begin trouble shooting by confirming the valve has been mounted properly and proper length bolts have been used. Bolts longer than the thickness of both mating flanges will damage the body panels, destroy the seal surface area for the gate o-ring and restrict the carriage from moving to the open/close position. Always use bolts that are at least 1/4—inch (6.4 mm) shorter than the thickness of both mating flanges. If the valve continues to open/close improperly return to the pre-installation section of the Installation Manual (page 1). If the gate valve opens/closes properly it is now set and ready for operation, do not exceed 80 psig.

Position Indicators: Position indicator switches, Reed or Micro, are preset and indicate when the valve is fully opened or fully closed. Wires are marked for open/closed indicators. See pages 6-8 for detailed Reed/Micro Switch information.

REPLACEMENT PARTS

For continued trouble free operation, keep the valve clean and free of contaminants. Valves are designed to run at 80 PSIG. Do not operate pneumatic valves above 80 PSIG. Higher PSIG will shorten the life of the valve. For higher actuator pressure requirements, contact the factory. To order parts/repair kits, call 510-785-2744 or 800-551-4422. HVA requires a Serial Number when ordering replacement parts.

PORT FLANGE BOLT TIGHTENING SEQUENCE

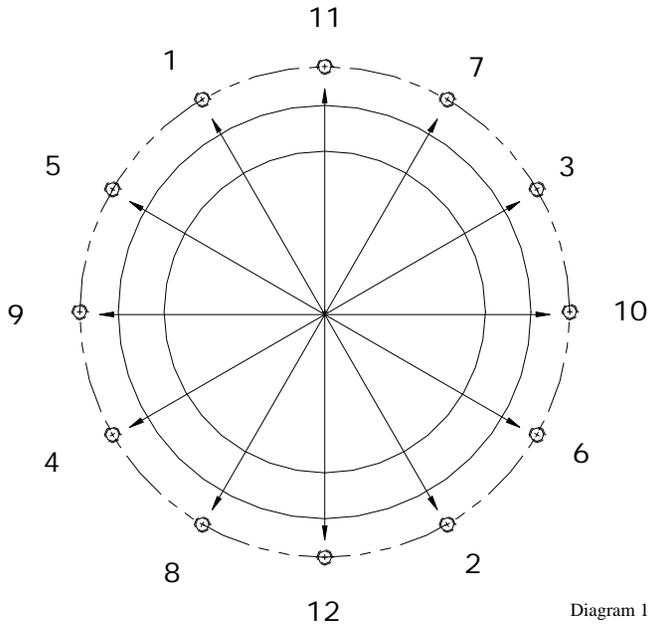


Diagram 1

PORT FLANGE TORQUE RECOMMENDATIONS

VALVE SIZE INCH MM		FLANGE TYPE	VITON O-RING		COPPER GASKETS CFF FLANGES ONLY	
			TORQUE FT. LBS.	TORQUE N•m	TORQUE FT. LBS.	TORQUE N•m
5/8"	16	KF, ISO, ANSI, JIS, OTHERS	2-3	2.7-4.1	6-8	8.2-10.9
1 ½"	38	KF, ISO, ANSI, JIS, OTHERS	3-4	4.1-5.4	12-13	16.3-17.7
2" - 21"	51-533	KF, ISO, ANSI, JIS, OTHERS	3-6	4.1-8.2	12-15	16.3-20.4

Diagram 2

DEFINITIONS

Gate Side of Valve: O-ring sealing side of mechanism. Moving gate contains O-ring to provide vacuum seal to port.

Carriage Side of Valve: Side opposite the Gate.

Lock Over Center: The gate mechanically locks in the seal/closed position and remains sealed/closed in the event of air pressure loss to the air cylinder.

No Lock Over Center: The gate maintains the lock position via the check valve (fittings must be leak tight) ONLY when there is constant air pressure to the pneumatic air cylinder. The gate valve will not seal or remain in the closed position without air pressure.

Solenoid: Gate Valves are electro pneumatically controlled via a solenoid. The solenoid is an electronic on/off switch connected directly to the Gate Valve or mounted remotely by the customer. HVA ships all standard* 4" I.D. and larger Gate Valves with the solenoid mounted on the valve unless otherwise specified by the customer. The solenoid is not mounted on 3" I.D. and smaller Gate Valves or Metal Seal Bonnet Gate Valves. HVA standard solenoid is a Humphrey 4-way solenoid (model 410), non-latching type. In the event of a power loss the Humphrey 410 will automatically position the gate valve into the closed position and "hold" or "lock" the gate valve in the closed position until the main power supply is reactivated (all fittings/connections must be leak tight to ensure the solenoid will operate properly). Contact HVA for additional solenoid options.

Check Valve: Supplied with 8" and larger valves and non-lock over center valves. The check valve will hold the valve closed during a loss of air pressure until the main air supply is reactivated (all fittings/connections must be leak tight to ensure the check valve will operate properly).

Speed Controls: All HVA valves are supplied with speed controls to the open and closed ports of the pneumatic cylinder. The function of the speed control is to regulate air flow to and from the air cylinder preventing damage to the gate valve from unrestricted air flow. Cycle speeds are preset at the Factory and should not be changed. Speed controls control exhaust side only.

Reed Switch: Also called proximity sensor or position indicator is a normally open switch that closes when a magnet is moved into its proximity via the air cylinder. The Reed switch is connected to lights or other devices to remotely indicate the open or closed position of the gate valve. Reed switches are standard HVA position indicator.

Micro Switch: Mechanical Switch, located in the air cylinder, to indicate open or closed position of the Valve. Mechanical switches make physical contact vs. sensing position.

* non-MSB valves

GATE VALVE GENERAL INFORMATION CONTINUED

MSB (Metal Sealing Bonnet) Gate Valves:

All MSB valves are adjusted to MECHANICALLY LOCK OVER CENTER.

6" I.D. and smaller pneumatic Gate Valves-except Million Cycle

All 6" and smaller pneumatic gate valves shipped with or without a solenoid LOCK OVER CENTER, except the Million Cycle Series Gate Valves.

8" I.D. and larger pneumatic Gate Valves shipped with a solenoid:

All 8" I.D. and larger pneumatic gate valves shipped with a solenoid **DO NOT** LOCK OVER CENTER. The air pressure in the air cylinder is held by a check valve mounted on the air input of the solenoid valve (diagram 9, page 10).

CAUTION: REMOVAL OF THE SUPPLIED CHECK VALVE CAN CAUSE DAMAGE TO THE GATE VALVE AND YOUR SYSTEM. DO NOT REMOVE THE SUPPLIED CHECK VALVE. The check valve must be kept at the input of the solenoid valve during operation. The check-valve insures vacuum sealing integrity in the event of air pressure loss, provided all air lines and fittings are leak tight.

Horizontal Valve Orientation

All viton bonnet Gate Valves are adjusted and tested in the Horizontal Orientation unless specified by the customer. All manual, MSB gate valves are tested Actuator up.

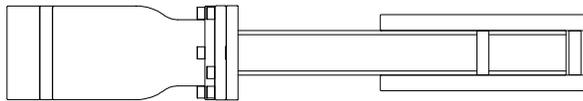


Diagram 10

Standard Valve Orientation—Horizontal

Proper Torque Sequence:

To avoid damage or distortion to the valve port flanges or valve body a sequence of tightening port flange bolts 180° apart must be followed. The example shown in Diagram 3 is for illustration only as the number of bolts will vary depending on the valve size and flange type. **IMPORTANT:** Lightly grease the flange bolts with high-temperature, non-galling type grease (Anti-Gall C-100, #51032 or an equivalent is recommended). With the valve in position for connection to the vacuum system mating flange, start all attachment bolts by hand, working back and forth between bolts bringing the two flanges together. When the valve flange is within 1/8 inch of the mating flange, check that the flanges are parallel and not cocked. With a torque wrench set at 1/2 the final torque value move back and forth across the bolt circle to bring the flanges together. Reset the torque wrench to the final torque value and tighten bolts to full torque using a cross bolt circle sequence.

1. Finger tighten all bolts using the proper torque sequence.
2. Tighten snugly with a torque wrench set to 1/2 the required torque, using the proper torque sequence.
3. Tighten to recommended torque range listed on page 4. Use proper torque sequence.

POSITION INDICATOR REED SWITCH WIRING DIAGRAM

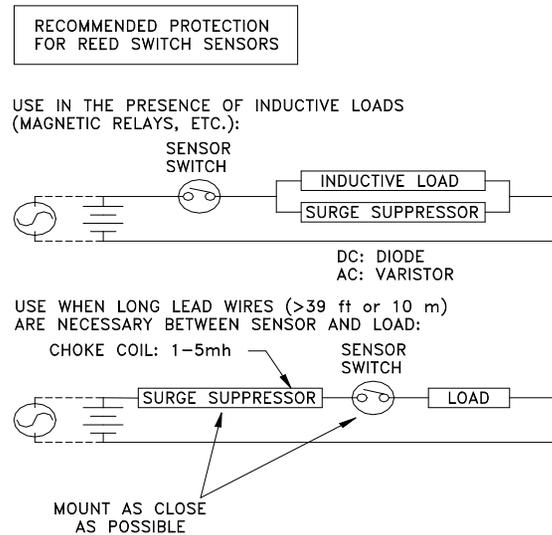


Diagram 3

Sensor Type: Two wire magnetic sensing normally open switch

Max: Electrical Ratings

Contact Rating:	3 WATT-MAX.
Current Switching:	.25 A MAX.
Carry:	.5 A MAX.
Resistance Contact:	.15 Ohms-MAX.
Capacitance Contact:	.2 pT - TYP.
Voltage Switching:	100 V DC MAX.
Breakdown:	170 V DC MAX.
Shock Resistance:	11ms ½ SINE WAVE
Vibration Resistance:	150 G MAX
Environment:	30G 50-2000 HTZ
Protection:	IP66 (IEC STANDARD)
Lead Wire:	PVC INSULATED 2 X 24 AWG
Cycle Life:	5 MILLION MIN.
Temperature Range:	-40° TO 212°F (-40° TO +100°C)
Storage Temperature:	-85° TO 257°F (-65° TO +125°C)

Operational Characteristics

Operate Time:	.35 MS MAX.
Release Time:	.1 MS MAX.

GATE VALVE GENERAL INFORMATION

Gate Valve Operation Description

HVA pneumatically actuated gate valves are opened and closed by applying air pressure to either side of a piston located in the air cylinder of an actuator housing. The Gate Valve cycle time is controlled by air pressure entering into and exhausting out of the air cylinder simultaneously. Speed controls control this air pressure and are set for optimum operation and speed. The gate/carriage assembly (seal surface assembly) travels into the closed position via internal links when air is introduced into the upper chamber of the air cylinder through the air to close fitting and exhausting out of the lower chamber of the air cylinder through the air to open fitting. Internal links extend as the piston travels to internal stops, positioning the gate/carriage assembly into the sealing position. The extension of internal links continues causing compression of the seal surface assembly into the valve case creating a vacuum tight closure.

Warranty Information

Every valve is individually adjusted, tested and inspected for reliable and continuous operation. Adjustments made to any operating component after shipment will void the HVA warranty. Gate/carriage assemblies switched from their original case require adjustments for proper valve operation. The HVA warranty is void when Gate/Carriage assemblies are removed and/or replaced from their original case. See page 17 for complete Warranty information.

Manufacturer Set Cycle Time

1 ½" - 3" ID	1.5-2.0 seconds to open/1.5-2.0 seconds to close
4" - 8" ID	2.5-3.0 seconds to open/2.5-3.0 seconds to close
10" - 14" ID	4.5-5.0 seconds to open/4.5-5.0 seconds to close
16" - 21" ID	6.5-9.0 seconds to open/6.5-9.0 seconds to close

IMPORTANT: Do not exceed the manufacturer set cycle time. Removal/Adjustment of speed controls voids warranty. Do not exceed 80 PSIG air pressure. Contact factory for faster cycle time requirements.

Pneumatic Gate Valves Shipped without a solenoid

All Gate Valves shipping without a solenoid will **MECHANICALLY LOCK OVER CENTER** unless customer specifies 'no lock over center'. Plastic Port Plugs are installed in each speed controller. The port plugs will ensure the threads and ports are protected during shipping. Remove and discard the port plugs after receipt and installation of the valve.

PNEUMATIC GATE VALVE WITH SOLENOID

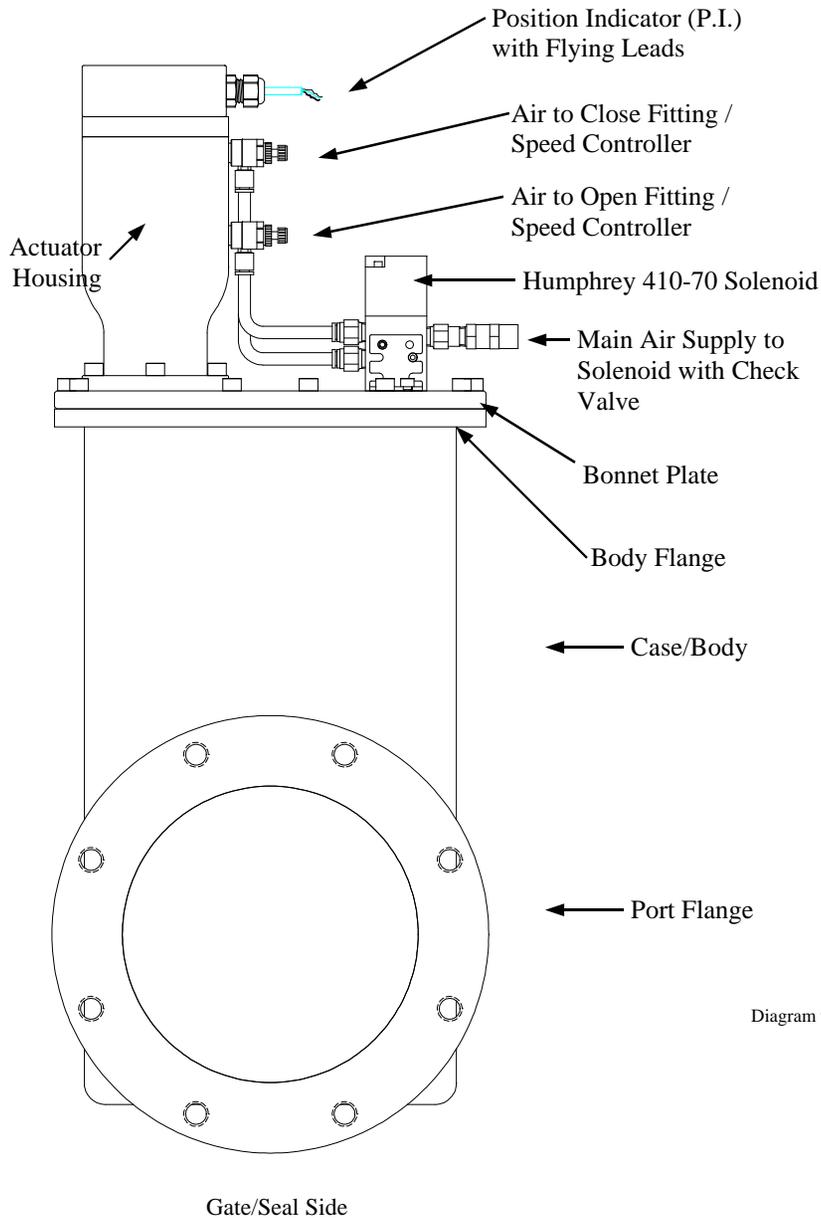


Diagram 9

POSITION INDICATOR REED SWITCH WIRING DIAGRAM

STANDARD REED SWITCH WITH OPEN LEADS

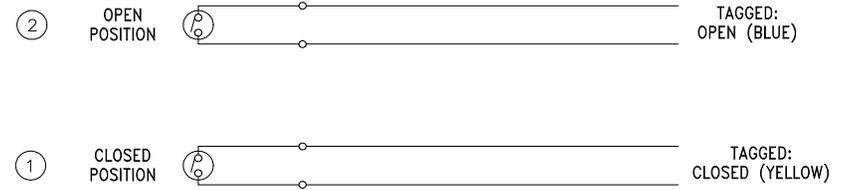


Diagram 4

STANDARD REED SWITCH WITH 6-PIN CONNECTOR

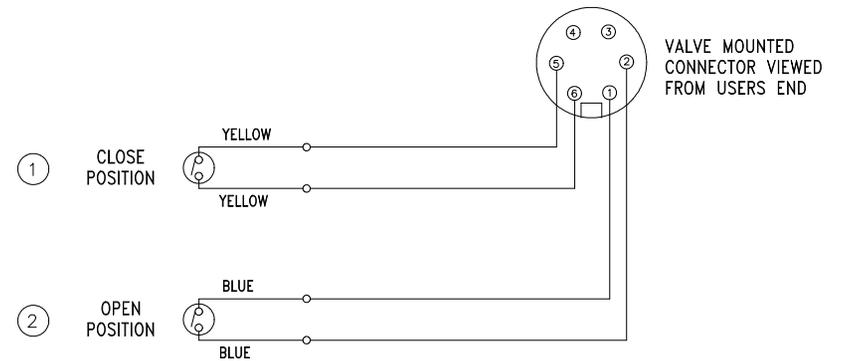


Diagram 5

Reed Switches are magnetic sensors. See definitions page 13.

POSITION INDICATOR MICRO SWITCH WIRING DIAGRAM

STANDARD MICRO SWITCH WITH OPEN LEADS

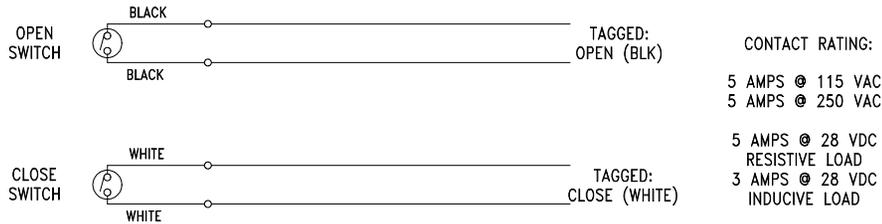


Diagram 6

STANDARD MICRO SWITCH WITH 6-PIN CONNECTOR

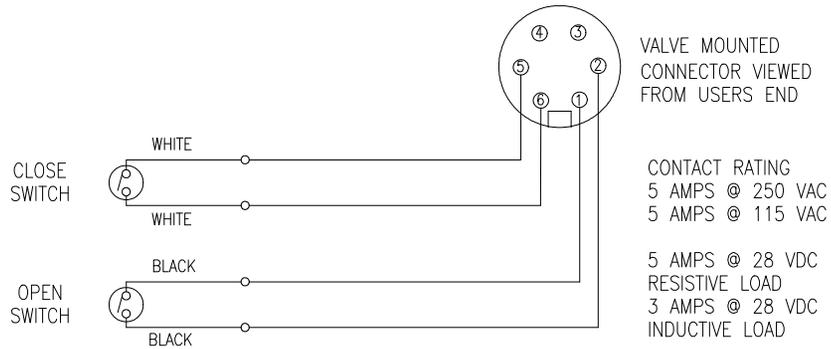


Diagram 7

Micro Switches are mechanical sensors. See Definitions page 13.

PNEUMATIC GATE VALVE WITHOUT SOLENOID

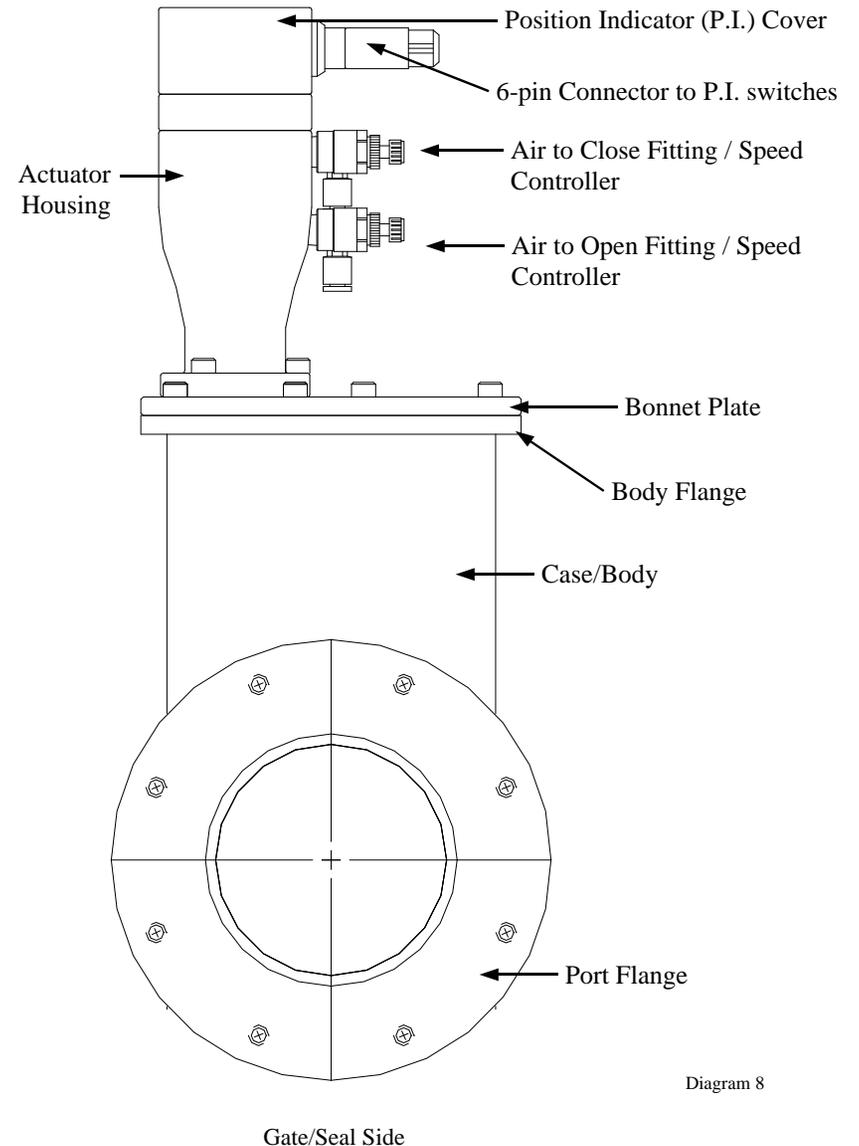


Diagram 8