VARIAN

vacuum technologies

4" and 6" Stainless Steel Swing Gate Valves

INSTRUCTION MANUAL

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4" and 6" Stainless Steel Swing Gate Valves

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Products manufactured by Seller are warranted against defects in materials and workmanship for twelve (12) months from date of shipment thereof to Customer, and Seller's liability under valid warranty claims is limited, at the option of Seller, to repair, to replace, or refund of an equitable portion of the purchase price of the Product. Items expendable in normal use are not covered by this warranty. All warranty replacement or repair of parts shall be limited to equipment malfunctions which, in the sole opinion of Seller, are due or traceable to defects in original materials or workmanship. All obligations of Seller under this warranty shall cease in the event of abuse, accident, alteration, misuse, or neglect of the equipment. In-warranty repaired or replaced parts are warranted only for the remaining unexpired portion of the original warranty period applicable to the repaired or replaced parts. After expiration of the applicable warranty period, Customer shall be charged at the then current prices for parts, labor, and transportation.

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If it is found that Seller's Product has been returned without cause and is still serviceable, Customer will be notified and the Product returned at Customer's expense; in addition, a charge for testing and examination may be made on Products so returned.

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Preface

Hazard and Safety Information

This manual uses the following standard safety protocols:

WARNING

The warning messages are for attracting the attention of the operator to a particular procedure or practice which, if not followed correctly, could lead to serious injury.

CAUTION

The caution messages are displayed before procedures, which if not followed, could cause damage to the equipment.

NOTE

The notes contain important information.

Operators and service personnel must be aware of all hazards associated with this equipment. They must know how to recognize hazardous and potentially hazardous conditions, and know how to avoid them. The consequences of unskilled, improper, or careless operation of the equipment can be serious. This product must only be operated and maintained by trained personnel. Every operator or service person must read and thoroughly understand operation/maintenance manuals and any additional information provided by Vacuum Technologies. All warning and cautions should be read carefully and strictly observed. Consult local, state, and national agencies regarding specific requirements and regulations. Address any safety, operation, and/or maintenance questions to your nearest Vacuum Technologies office.

Vacuum Equipment and Cleanliness

Cleanliness is vital when servicing any vacuum equipment.

CAUTION *Do not use silicone oil or silicone grease.*

Use powder-free butyl or polycarbonate gloves to prevent skin oils from getting on vacuum surfaces.

Do not clean any aluminum parts with Alconox®. Alconox is not compatible with aluminum and will cause damage.

NOTE

It is usually unnecessary to use vacuum grease. If it must be used, use it sparingly. Krytox® GPL207 *grease (*P/N 695400010*) is recommended.* Do not use silicone based grease.

Contacting Vacuum Technologies

In the United States, you can contact Vacuum Technologies Customer Service at 1-800-8VARIAN.

Internet users:

- Send email to Customer Service & Technical Support at vpl.customer.support@varianinc.com
- Visit our web site at www.varianinc.com/vacuum
- Order on line at www.varianinc.com

See the back cover of this manual for a listing of our sales and service offices.

Overview

This document describes the installation and maintenance procedures for both the manually-actuated and electro-pneumatically actuated swing gate valve models that are available in two port sizes, 4" and 6".

Two types of swing gate models are described:

- ❑ Valves using elastomer main seals
- ❑ Metal bonnet valves using a copper seal

The Vacuum Technologies 4" and 6" elastomer-sealed swing gate valves and the 4" and 6" metal-sealed bonnet valves are compact devices for use in high-vacuum applications where reliable, dry-lubricated vacuum mechanisms are required. The valves operate at pressures from atmospheric to below $1x10^{-9}$ Torr and provide optimum conductance for a given flange size. Electropneumatic valves have air-opened, air-closed mechanisms. All valves use metal-sealed ConFlat® flanges. Swing gate valve models are listed in Table 1 on page 2.

The stainless steel valve bodies use a stainless steel bellows for motor feedthrough. The mechanism is constructed of plated steel with hardened steel roller bearing surfaces. The seal plate is stainless steel alloy for low outgassing.

Metal Bonnet Valves

Metal bonnet valves are designed to be bakeable in the open position to 200 °C (392 °F) for extended periods of time. They have an all-metal bonnet and bellows seal and feature 60% less vacuum-exposed Viton® than their Viton-sealed counterparts. This facilitates a cleaner process environment, and decreases the pumpdown and system bake times.

The electropneumatic versions of the metal bonnet-sealed swing gate valve, including the electropneaumatic actuator, can be baked in the open position to 200 °C (392 °F). This allows installation in places that formerly were reserved for manually actuated valves due to the inability of the electropneaumatic actuator to survive temperatures above 125 °C (258 °F).

The solenoid valve is rated for a 55 °C (131 °F) rise and, therefore, must be remotely mounted out of the high temperature zone. For this reason, Vacuum Technologies has elected not to mount the solenoid or to furnish fittings and tubing; you can select fittings and mount them according to needs. Vacuum Technologies recommends ¼" OD (stainless steel or copper tubing) with flairless fittings available from any tube fitting supplier. All of the threaded ports in the air cylinder and solenoid valve are 1/8" NPT. The solenoid valve has been factory-set for the proper valve actuating time of 2 to 3 seconds.

CAUTION

If the furnished solenoid valve is to be replaced with a valve of another type, it is imperative that the 2-second minimum actuation time be maintained. Both valves must have either adjustable or fixed orifices installed.

Table 1 Swing Gate Valve Descriptions

Part Number	Description/ Lubrication Exposed to Vacuum
Elastomer-sealed swing gate valves	
951-5227	4", electropneaumatic, 120V, 60Hz/ Krytox® GPL207
951-5226	4", manual/ Krytox® GPL207
951-5219	6", electropneaumatic, 120V, 60Hz/ Krytox® GPL207
951-5218	6", manual/ Krytox® GPL207
Metal bonnet-sealed swing gate valves	
Q1523-301	4" electropneaumatic/ Molydisulphide
Q1523-302	4" manual/ Molydisulphide
Q1524-301	6" electropneaumatic/ Molydisulphide
Q1524-302	6" manual/ Molydisulphide

Specifications

Leak rate	Main seal less than $1x10^{-9}$ std cc/sec for 15 psi differential Body and bellows less than $1x10^{-10}$ std cc/sec for helium with 15 psi differential
Maximum pressure	15 psi differential
Bakeout temperature	Open: 200 °C (390 °F) Closed: 125 °C (250 °F) Solenoid valve: 55 °C (131 °F)
Manual Actuator	Nominally 20 turns to open
Electropneumatic Actuator	Electrical: 110/120 V, 50/60 Hz (optional 220 VAC, 50 Hz) Air: 75 to 100 psig
Time to close or open	Nominally two seconds for 4" series, two seconds for 6" series
Main Seal Plate	Stainless steel
Main Seal	Viton A
Body	304 series stainless steel
Flanges	4" valves: 6" OD ConFlat® flanges 6" valves: 8" OD ConFlat® flanges ConFlat® flanges: ESR 304 series stainless steel
Bellows	1½" stroke, welded AM 350 stainless steel
Lubrication exposed to vacuum	Refer to Table 1 for proper lubricant for specific models
Mounting position	Seat side must be exposed to atmosphere; valve mechanism to high vacuum.

Installation

Unpacking

Unpack the swing gate valve from the shipping container and inspect it for obvious damage. Protect the swing gate valve before and during installation. If practical, inspect the swing gate valve without removing it from its plastic bag. Make sure that machined surfaces, gasket grooves and swing gate valve interior surfaces remain clean and that no foreign matter enters the swing gate valve.

If not required for immediate installation and use, repack the swing gate valve carefully and store until required for use. The swing gate valve should be stored in an environment that prevents condensation in the swing gate valve.

Mounting Orientation

The swing gate valve can be operated in any orientation, however, the side closest to the seal plate should be the high pressure side.

NOTE

The electropneaumatic actuator should not be energized to open the swing gate valve if there is high pressure on either side, and vacuum on the opposite side of the swing gate valve. Doing so can overload and damage the bearings.

Mechanical Connections

Before beginning the actual installation, check for operational and maintenance accessibility. Place the swing gate valve into position, making sure that the mechanical connections are compatible. Check the following:

- ❑ All mating flanges meet and are parallel.
- ❑ No large strain is placed on any of the mating components when the flanges are properly mated.
- ❑ The mounting bolt holes mate properly.

1. Apply a high temperature lubricant (Fel-Pro C-100 or equivalent) to the connecting bolt threads to prevent galling.
2. Bolt the flanges together, tighten the bolt circle three times to bring the flanges squarely face to face.

Air and Electrical Connections

The valves are set up at the factory to open at air pressures from 75 to 100 psig. Smoothest operation is attained at approximately 80 psig.

The air inlet to the solenoid valve has ¼" female pipe thread.

The normally closed solenoid is actuated by a 110/220 V, 50/60 Hz AC source (optional 220 V, 50 Hz).

Energizing the solenoid valve coil opens the swing gate valve; removing electrical power closes the swing gate valve.

Swing Gate Valve Servicing

Removal of the Swing Gate Valve for Service

The swing gate valve can be serviced without removing the body from the system, however, the swing gate valve must not be under vacuum.

To remove the swing gate valve for service:

1. Determine the swing gate valve type and do the following:
   - ❑ Manual swing gate valve – Retract the swing gate valve mechanism to the open position by turning the swing gate valve handle fully counterclockwise.
   - ❑ Electropneaumatic swing gate valve – Energize the air cylinder to the open position.

   CAUTION *A electropneaumatic swing gate valve must be in the open position to safely disassemble it.*

   

   For an electropneaumatic swing gate valve:

   a. Disconnect air pressure.
      The seal plate may now occupy a position between fully open and fully closed due to natural springiness of the bellows.

   b. Disconnect electrical power.

2. Remove the bolts and nuts from the rectangular flange and remove the bonnet assembly from the body. Be careful while withdrawing the mechanism from the body so as not to scuff the main seal O-ring if it is not to be replaced and to retain and keep clean the bonnet O-ring if it is to be used again. Removing the mechanism from the body frees two loose parts: the outer gasket retainer and the bonnet O-ring. These parts should be stored in a plastic bag until reassembly.

Seal Plate Removal and Reinstallation

The seal plate is removed before beginning service on other parts of the swing gate valve.

Removal

To remove the seal plate:

1. Remove the main seal O-ring from the seal plate using a toothpick or other soft pointed device to avoid scratching the surface.
2. Lay the mechanism on a clean bench surface so that the seal plate sealing surface (from which the O-ring was removed) is facing down and the two seal plate supporting studs are pointing up.

WARNING

Sudden release of the spring pressure or careless handling of lock nuts can result in eye injuries caused by the washer flying loose. Wear a full face mask and pay strict attention to the removal procedure.

3. Use the proper size nut driver to loosen the lock nut, but do not remove it.
4. Use a pair of long nose pliers or another suitable instrument to relieve the spring pressure from the lock nut by pushing down on the load bearing washer and away from the lock nut.
5. Remove the lock nut.
6. Maintain the force applied to relieve the spring pressure, then slowly let up the washer and seal plate spring.
7. Remove the washer and spring from the post.
8. Repeat steps 3 through 7 for the other post.
9. Lift off the seal plate retaining bracket from the posts.
10. Remove the seal plate from the strongback assembly by lifting it straight up and out.

Reinstallation

To reinstall the seal plate, reverse the procedure above.

NOTE

When reinstalling the O-ring on the inner gasket retainer, avoid twisting the O-ring. This ensures that the O-ring seam lies in the plane of the inner gasket.

To insert a new O-ring main seal in the dovetail groove of the seal plate:

1. Press the O-ring into the seal groove at opposite sides of the seal plate (180°) apart, forcing approximately one inch of the O-ring into the groove with the thumbs.
2. Turn the seal plate 90° and again press approximately one inch of the O-ring into the groove.
3. Continue pressing the O-ring into the groove uniformly.

NOTE

Avoid rolling the O-ring so that its seam remains in the plane of the seal plate.

Metal Bonnet-Sealed Swing Gate Valve Actuator Maintenance

This section describes the procedures for performing 4" and 6" actuator maintenance.

Manual Valves

The stem screw has been permanently lubricated with dry Molydisulfide (Molykote 321R Spray Lubricant by Dow-Corning) and FEL-PRO C-100 (P/N 953-0031).

For optimal performance, periodically wire-brush the stem screw to remove excess dried lubricant, lightly relubricate it with FEL-PRO C-100, and open and close the swing gate valve several times to distribute the lubricant.

Electropneumatic Valves

Maintenance of the electropneaumatic air cylinder is required every 300 to 500 hours of baking. The O-rings and the piston should be replaced and lubricated at 300-500 hours of baking, or if an air leak is detected at the exhaust port of the solenoid valve.

A electropneaumatic cylinder repair kit (P/N Q3170-301), including parts and grease, is available. The maintenance procedure can be carried out without breaking the vacuum.

To perform maintenance without breaking the vacuum:

1. Close the swing gate valve to the latched position.
2. Disconnect air lines.
3. Remove the four screws.
4. Remove the air cylinder cap and the air cylinder.
5. Remove the screw, piston stop, and piston.
6. Remove the cylinder base.
7. Carefully remove O-rings from the cylinder cap and the air cylinder; do not scratch the O-ring sealing surfaces.
8. Clean all parts with a Freon degreasing solvent.
9. Lubricate the O-rings with the lubricant provided.
10. Install the O-ring into the cylinder base.
    a. Lubricate the piston shaft and install the cylinder base onto the shaft.
    b. Install the O-ring in the cylinder base.

11. Install the piston, the piston stop, and the screw onto the piston shaft. DO NOT TIGHTEN THE SCREW. Leave it loose enough to allow the piston to rotate. Position the rubber side of the piston toward the piston shaft.
12. Apply a liberal amount of FEL-PRO C-100 lubricant to the cupped area of the piston and coat the inside of the cylinder.
    a. Install the cylinder on the piston and cylinder cap.
    b. Install the four screws and lock washers.
    c. Apply FEL-PRO C-100 lubricant to the first 3 or 4 threads of the screws.
    d. Tighten the screws evenly (8 ft-lbs torque). If a torque wrench is not available, tighten the screws as tight as possible without causing any distortion of the cylinder cap.
13. Remove the air fitting from the cylinder cap, insert a Phillips head screwdriver through the hole, tighten the screw as tight as possible, and re-install the air fitting.

Seal Replacement

To replace the seal plate O-ring, the bonnet gasket, or the bellows seal, it is necessary to break the system vacuum.

1. Open the swing gate valve and vent the system.
2. If the swing gate valve type is electropneaumatic, remove the air lines.
3. Loosen and remove the screws from the bonnet flange and carefully remove the drive assembly by pulling it straight out of the swing gate valve body.

NOTE

If either the bellows or bellows seal is not being replaced, further disassembly is not required. If either is being replaced, proceed to "Bellows and Bellows Seal Replacement" on page 11, before starting step 5.

4. Remove the O-ring from the seal plate by inserting a toothpick or other soft pointed device into the vent counterbore of the O-ring groove, and prying the O-ring out. Be careful not to scratch or damage the bottom of the groove.
5. Clean the seal plate and groove with a lint-free wipe and acetone, propanol, or Freon and lightly grease the O-ring with Krytox® GPL207 vacuum lubricant (P/N 695400010). Use only enough to make the O-ring shine.
6. Install the O-ring in its groove in two places 180° apart, then two at 90°, then four at 90°. Continue pressing the O-ring until it is completely in its groove while making sure the O-ring parting line is not rolled into the sealing area.
7. Use a lint-free wipe with propanol or Freon to remove any excess grease.

Bellows and Bellows Seal Replacement

1. Remove the retaining ring and the pin.
2. Remove the six Allen head screws, remove the bellows flange on the electropneaumatic swing gate valve or stem flange on the manual swing gate valve, and withdraw the bellows and bellows seal.
3. Clean all sealing surfaces with one of the solvents (acetone, propanol, or Freon) making sure to remove lint and particle residue from all surfaces.
4. Install the bellows seal and bellows flange or the stem flange with Allen screws.
5. Lubricate the first 3 or 4 threads and under the heads of the screws. DO NOT TIGHTEN THEM.
6. Install the pin and the retaining ring to the link.
7. Tighten the screws evenly (8 ft-lbs of torque) until the flanges are in metal-to-metal contact.

Spare Parts Kits

Table 2 Spare Part Kits – Metal Bonnet Valves

Part Number	Description
Q3170301	Electropneaumatic Cylinder Repair Kit
Q3167302	Seal Kit, 4"
Q3168302	Seal Kit, 6"

Table 3 Maintenance and Spare Parts

Description	Part Number	
	Metal Bonnet Seal	**Viton Bonnet Seal**
4" valves		
Main seal O-ring, Viton	2740275500	2740275500
Body flange gasket	Q3559001	2740242500
Bellows seal (metal bonnet is gold-plated copper)	9530130	9530017
Bellows, stainless steel, manual	Q3154301	Q2061301
Bellows, stainless steel, electropneaumatic	Q3155301	Q2247301
6" valves		
Main seal O-ring, Viton	660892258	660892258
Body flange gasket	Q3560001	2740924300
Bellows seal (metal bonnet is gold-plated copper)	9530130	9530017
Bellows, stainless steel, manual	Q3154301	Q2061301
Bellows, stainless steel, electropneaumatic	Q3155301	Q2247301

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Request for Return
Health and Safety Certification

ISO 9001 REGISTERED

1. Return authorization numbers (RA#) **will not** be issued for any product until this Certificate is completed and returned to a Varian, Inc. Customer Service Representative.
2. Pack goods appropriately and drain all oil from rotary vane and diffusion pumps (for exchanges please use the packing material from the replacement unit), making sure shipment documentation and package label clearly shows assigned Return Authorization Number (RA#) VVT cannot accept any return without such reference.
3. Return product(s) to the nearest location:

North and South America	**Europe and Middle East**	**Asia and ROW**
Varian, Inc. Vacuum Technologies 121 Hartwell Ave. Lexington, MA 02421 Fax: (781) 860-9252	Varian S.p.A. Via F.lli Varian, 54 10040 Leini (TO) – ITALY Fax: (39) 011 997 9350	Varian Vacuum Technologies Local Office

For a complete list of phone/fax numbers see www.varianinc.com/vacuum

4. If a product is received at Varian, Inc. in a contaminated condition, **the customer is held responsible** for all costs incurred to ensure the safe handling of the product, and **is liable** for any harm or injury to Varian, Inc. employees occurring as a result of exposure to toxic or hazardous materials present in the product.

CUSTOMER INFORMATION

Company name: .....

Contact person: Name: ..... Tel: .....

Fax: ..... E-mail: .....

Ship method: Shipping Collect #: ..... P.O.#: .....

Europe only: VAT Reg Number: ..... *USA only:* ❒ Taxable ❒ Non-taxable

Customer ship to: ..... Customer bill to: .....

.....

.....

PRODUCT IDENTIFICATION

Product Description	Varian, Inc. Part Number	Varian, Inc. Serial Number

TYPE OF RETURN (check appropriate box)

❒ Paid Exchange	❒ Paid Repair	❒ Warranty Exchange	❒ Warranty Repair	❒ Loaner Return
❒ Credit	❒ Shipping Error	❒ Evaluation Return	❒ Calibration	❒ Other

HEALTH and SAFETY CERTIFICATION

VACUUM TECHNOLOGIES CANNOT ACCEPT ANY BIOLOGICAL HAZARDS, RADIOACTIVE MATERIAL, ORGANIC METALS, OR MERCURY AT ITS FACILITY. CHECK ONE OF THE FOLLOWING:

❒ I confirm that the above product(s) has (have) **NOT** pumped or been exposed to any toxic or dangerous materials in a quantity harmful for human contact.

❒ I declare that the above product(s) has (have) pumped or been exposed to the following toxic or dangerous materials in a quantity harmful for human contact (Must be filled in):

Print Name..... Signature ..... Date .....

PLEASE FILL IN *THE FAILURE REPORT SECTION* ON THE NEXT PAGE

Do not write below this line

Notification (RA) #: ..... Customer ID #: ..... Equipment #: .....

VARIAN

Request for Return
Health and Safety Certification

ISO 9001 REGISTERED

FAILURE REPORT
(Please describe in detail the nature of the malfunction to assist us in performing failure analysis):

TURBO PUMPS AND TURBOCONTROLLERS

Claimed Defect		**Position**	**Parameters**	
❒ Does not start	❒ Noise	❒ Vertical	Power:	Rotational Speed:
❒ Does not spin freely	❒ Vibrations	❒ Horizontal	Current:	Inlet Pressure:
❒ Does not reach full speed	❒ Leak	❒ Upside-down	Temp 1:	Foreline Pressure:
❒ Mechanical Contact	❒ Overtemperature	❒ Other	Temp 2:	Purge flow:
❒ Cooling defective	❒ Clogging		Operation Time:	
Describe Failure:				
Turbocontroller Error Message:				

ION PUMPS/CONTROLLERS

❒ Bad feedthrough	❒ Poor vacuum
❒ Vacuum leak	❒ High voltage problem
❒ Error code on display	❒ Other .....
Describe failure:	
Customer application:	

VALVES/COMPONENTS

❒ Main seal leak	❒ Bellows leak
❒ Solenoid failure	❒ Damaged flange
❒ Damaged sealing area	❒ Other .....
Describe failure:	
Customer application:	

LEAK DETECTORS

❒ Cannot calibrate	❒ No zero/high background
❒ Vacuum system unstable	❒ Cannot reach test mode
❒ Failed to start	❒ Other .....
Describe failure:	
Customer application:	

INSTRUMENTS

❒ Gauge tube not working	❒ Display problem
❒ Communication failure	❒ Degas not working
❒ Error code on display	❒ Other .....
Describe failure:	
Customer application:	

ALL OTHER VARIAN, INC.

❒ Pump doesn't start	❒ Noisy pump (describe)
❒ Doesn't reach vacuum	❒ Overtemperature
❒ Pump seized	❒ Other .....
Describe failure:	
Customer application:	

DIFFUSION PUMPS

❒ Heater failure	❒ Electrical problem
❒ Doesn't reach vacuum	❒ Cooling coil damage
❒ Vacuum leak	❒ Other .....
Describe failure:	
Customer application:	

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