



# ANDERSON GREENWOOD SERIES 96A VACUUM BREAKER

## INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

Before installation, these instructions must be fully read and understood.



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The intent of these instructions is to acquaint the user with the storage, installation and operation of this product. Please read these instructions carefully before installation.

### SAFETY PRECAUTIONS

- When the safety valve is under pressure never place any part of your body near the outlet of the valve.
- The valve outlet and any separate drains should be piped or vented to a safe location.
- Always wear proper safety gear to protect hands, head, eyes, ears, etc. anytime you are near pressurized valves.
- Never attempt to remove the safety valve from a system that is pressurized.
- Never make adjustments to or perform maintenance on the safety valve while in service unless the valve is isolated from the system pressure. If not properly isolated from the system pressure, the safety valve may inadvertently open resulting in serious injury.

- Remove the safety valve prior to performing any pressure testing of the system.
- The safety of lives and property often depends on the proper operation of the safety valve. The valve must be maintained according to appropriate instructions and must be periodically tested and reconditioned to ensure correct function.

### WARNING

- This product is a safety related component intended for use in critical applications. The improper application, installation or maintenance of the valve or the use of parts or components not manufactured by Emerson may result in a failure of the valve.
- Any obstruction due to polymerization, solidification or solid deposit will affect the safety performance of this valve. Methods to reduce such risk should be taken.
- A vacuum breaker should be used only to protect a system from underpressure during a vacuum upset. It should not be used as a control valve that is required to operate continuously or as a block valve to isolate portions of the system. It should not be used as a pipe fitting or transition piece in a piping system.
- The protection and safety of equipment, property and personnel depends on the proper operation of the safety valves described in this manual.
- All Emerson safety valves should be kept in proper working condition in accordance with the manufacturer's written instructions. Periodic testing and maintenance by the user of this equipment is essential for reliable and safe valve operation.
- All installation, maintenance, adjustment, repair and testing performed on safety valves should be done by qualified technicians having the necessary skills and training adequate to perform such work. All applicable Codes and Standards, governing regulations and authorities should be adhered to when performing safety valve repair. No repair, assembly, adjustment or testing performed by other than Emerson or its authorized assemblers and representatives shall be covered by the warranty extended by Emerson to its customers.

The user should use only original, factory supplied OEM parts in any maintenance or repair activity involving this product.

- This Maintenance Manual is provided as a general guide for the repair and maintenance of the safety valves described herein. It is not possible to describe all configurations or variations with such equipment. The user is advised to contact Emerson or its authorized assemblers and representatives for assistance in situations that are not adequately covered or described in this manual.
- Before removing a safety valve for maintenance, ensure that the system pressure has been fully depressurized. If an isolation block valve is used ensure that any trapped fluid between the block valve and the safety valve is safely vented.
- Before disassembling the safety valve ensure that the valve has been decontaminated from any harmful gasses or fluids and that it is at a safe temperature range for handling. Fluids can be trapped in the dome space of pilot operated safety valves.
- The information, specifications and technical data (the "Specifications") contained in this document are subject to change without notice. Emerson does not warrant that the Specifications are current and assumes no responsibility for the use or misuse thereof. The purchaser should verify that there have been no changes to the Specifications prior to use.

Service technicians are available to assist with your installation or other field problems. Call your nearest Emerson representative.

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## INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

### 1 GENERAL

The intent of these instructions is to acquaint the user with the storage, installation and operation of this product.

This safety valve should only be used in accordance with the applicable operating instructions and within the application specifications of the purchase order.

These valves have been tested and adjusted at the factory. Contact the factory or a Emerson authorized representative before making any changes to the settings.

### 2 GENERAL DESCRIPTION AND OPERATION

The Anderson Greenwood Series 96A Vacuum Breaker is designed to provide vacuum relief and access for a positive pressure relief valve, with one tank penetration (refer to Figure 1). The outlet to the positive pressure relief valve is available with a flange size equal to the tank size connection and one equal to the next smaller size. A capped outlet is also available where a relief valve is not required.

Construction of the vacuum breaker is of aluminum and/or stainless steel with elastomer seats and seals. NBR is the standard elastomer with EPDM and FKM optional. The seat plate is designed to have a dead weight loading such that opening begins at ½ oz. (0.22 kpag) vacuum with full lift occurring at 1 oz. (0.43 kpag) vacuum. Higher vacuum openings are available.

Under positive pressure tank conditions, the seat plate is held tightly against the seat due to positive pressure acting against the inside surface of the seat plate. As tank pressure decreases and goes negative with respect to the ambient pressure, the seat plate lifts in accordance with the pressures noted above.

The elastomer seat consists of two parts: an O-ring for sealing at high positive pressures, greater than 2 psig (13.8 kpag), and a closed cell sponge seat for sealing at low pressures, less than 2 psig (13.8 kpag). Only the sponge seat is retained in place with an adhesive.

A protective screen, 1" x 1" (25.4 mm x 25.4 mm), mesh is provided as standard at the vacuum inlet to prevent foreign particles from being ingested into the breaker when the seat plate is open, relieving tank vacuum.

### 3 STORAGE AND HANDLING

Because cleanliness is essential to the satisfactory operation and tightness of a safety valve, precautions should be taken during storage to keep out all foreign materials. Inlet and outlet protectors should remain in place until the valve is ready to be installed in the system. Take care to keep the valve connections absolutely clean. It is recommended that the valve be stored indoors in the original shipping container away from dirt and other forms of contamination.

Safety valves must be handled carefully and never subjected to shocks. Rough handling may alter the vacuum setting, deform valve parts and adversely affect seat tightness and valve performance.

When it is necessary to use a hoist, use the lifting eye(s) on the main valve body. If there are no lifting eyes a chain or sling should be placed around the main valve body in a manner that will ensure that the valve is in a vertical position to facilitate installation.

### 4 INSTALLATION

Many valves are damaged when first placed in service because of failure to clean the connection properly when installed.

Before installation flange faces on both the valve and the vessel and/or line on which the valve is mounted must be thoroughly cleaned of all dirt and foreign material.

Because foreign materials that pass into and through safety valves can damage the valve, the systems on which the valves are tested and finally installed must also be inspected and cleaned. New systems in particular are prone to contain foreign objects that inadvertently get trapped during construction and will destroy the seating surface when the valve opens.

The system should be thoroughly cleaned before the safety valve is installed.

Foam padding is sometimes used to protect the main valve seat during shipping. Check for any foam padding inside the main valve and remove before installation.

The vacuum inlet screen is covered and the pallet is secured to the plastic protective cover with lockwire to prevent damage during shipment. Remove the plastic cover and wire. Install the safety valve. Refer to Figure 1. The gaskets used must be dimensionally correct for the specific flanges. The inside diameters must fully clear the safety valve vessel or line connection openings so that the gasket does not restrict flow. Make sure that the safety valve is installed with sufficient air flow clearance around the vacuum inlet. Draw down all connection studs or bolts evenly to avoid possible distortion of the valve body. The maximum torque for flange bolting for valves with aluminum bodies should not exceed the values shown in the following table.

NPS 4	NPS 6	NPS 8	NPS 12	NPS 16
18 ft-lb	32 ft-lb	32 ft-lb	51 ft-lb	76 ft-lb
24 Nm	43 Nm	43 Nm	69 Nm	103 Nm

Safety valves are intended to open and close within a narrow pressure range.

Valve installations require accurate design as to vessel piping. Refer to International, National and Industry Standards for guidelines.

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### 5 INLET PIPING

No inlet piping is required. The 96A vacuum breaker is a weighted pallet vent designed to breathe in atmospheric air.

### 6 DISCHARGE PIPING

Connect this valve as direct and close as possible to the vessel being protected. The valve should be mounted vertically in an upright position either directly on a nozzle from the pressure vessel or on a short connection fitting that provides a direct, unobstructed flow between the vessel and the valve. Refer to Figure 1. Installing a safety valve in other than this recommended position will adversely affect its operation.

The valve should never be installed on a fitting having a smaller inside diameter than the vessel or line connection of the valve. Fittings or pipe having a smaller inside diameter than the valve outlet connections must not be used. This piping should be designed to carry the weight of the valve and should be properly braced to withstand reactive thrust forces when the valve relieves. The valve should also be supported to withstand any swaying or system vibrations.

After installation, there must be positive pressure at this piping to establish a differential force across the moving member and "load" the valve in the closed position. On normal start-up, the vent loads itself without incident as pressure increases.

### 7 VACUUM BREAKER REPAIR (See Figure 2)

#### 7.1 Disassembly

- 7.1.0 Remove the retainer ring bolts, retainer ring and inlet screen. Remove the seat ring and seat plate/guide tube assembly, being careful not to damage the sealing surfaces.
- 7.1.1 To disassemble the seat plate/guide tube assembly, insert a .250 [6.35 mm] diameter or smaller rod through the cross drilled hole in tube to prevent it from rotating while removing the lower nut. Remove the nut, weight if used, and spacer. Remove retainer and O-ring from seat plate bolt. The guide tube may be removed from the seat plate bolt by placing the tube in a "VEE" block and driving out the spring pin with a 1/8" [3.17 mm] diameter punch for 4"-12" valves or a 3/16" [4.76 mm] diameter punch for 16" valves.
- 7.1.2 Remove the guide rod bolt, guide rod, and guide rod seal. To facilitate disassembly insert a .250 [6.35 mm] diameter rod through the cross drilled hole.
- 7.1.3 Remove sponge seat from seat ring. (The sponge seat is cemented in place with an adhesive)
- 7.1.4 Remove O-ring seat from seat ring.
- 7.1.5 Discard all soft goods (seats, seals and gaskets).

#### 7.2 Repair and assembly

- 7.2.1 Clean all metal parts. Any particles of elastomer adhering to the metal parts should be removed to facilitate proper seating and adhesion of the new seats.
- 7.2.2 Inspect seat plate sealing surface for scratches. If damaged, replace seat plate. It may be polished with fine sandpaper and crocus cloth, but it must be recoated with PTFE to prevent adhesion of the plate to the elastomer seat.
- 7.2.3 Inspect guide tube for wear at spring pin holes. If holes are excessively worn, replace tube.

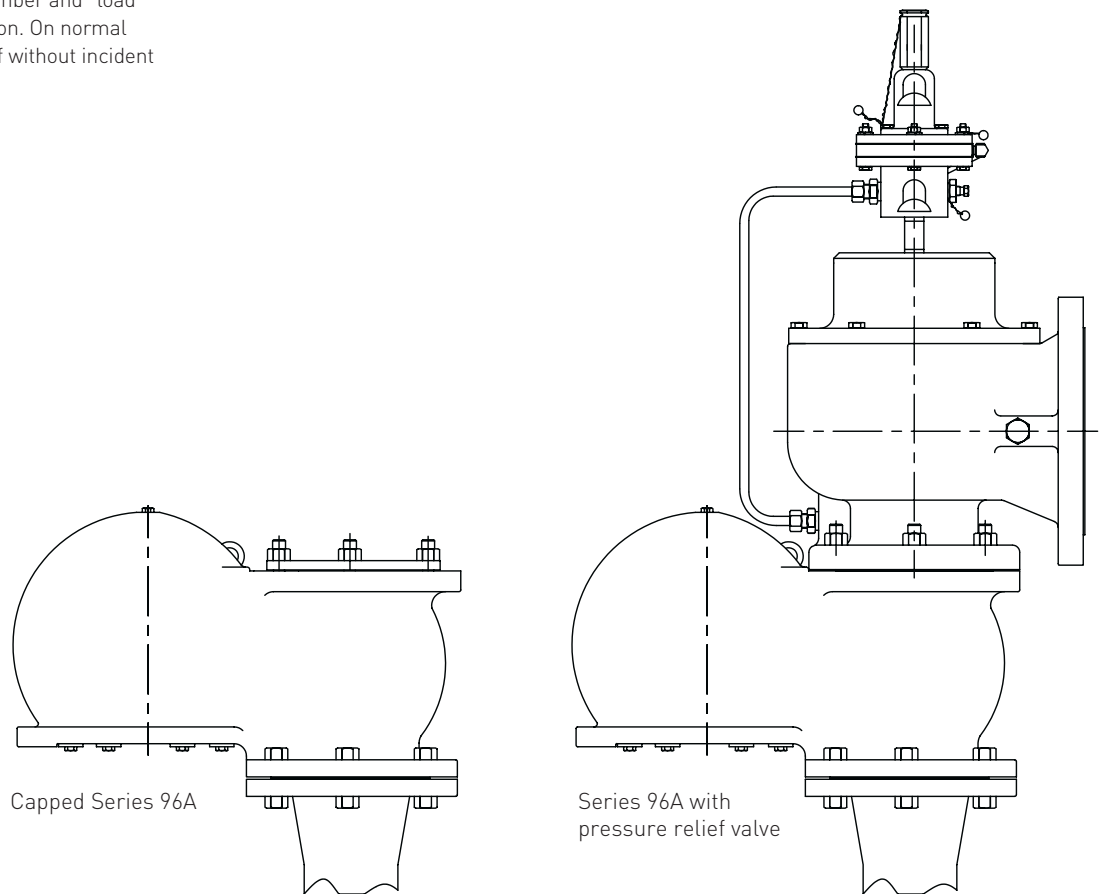


Figure 1

# ANDERSON GREENWOOD SERIES 96A VACUUM BREAKER

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7.2.4 For non-lox clean valves, cement new sponge seat to seat ring using Resiweld Adhesive #7004, manufactured by H. B. Fuller Co. The adhesive is a two component epoxy base that will cure at room temperature. Blending ratio by weight or volume is one to one, "Part A" with "Part B", and will be supplied in the kit as a syringe type applicator. The seat ring and sponge seat should be cleaned with acetone, alcohol, or other suitable solvent compatible with the elastomer such that no residual dried epoxy is left. Any leftover cleaning solvent should be wiped off completely. Apply adhesive to seat ring sparingly and spread uniformly in thin layer, approximately .001 to .003 (.025 to .076 mm) thick, with acid brush or spatula. Before cementing the sponge seat onto the seat ring, additionally apply epoxy to the side of the sponge seat that will mate with the seat ring. Place sponge seat on seat ring and press in place, smoothing out all ripples. Avoid stretching the sponge seat. Any excess epoxy that squeezed out should be cleaned with no traces of the epoxy on the top side of the sponge seat. Allow to cure at room temperature for 24 hours.

For lox clean valves, cement the seat to seat ring using Fluorelastomer Solution, PLV-2000 with accelerator #4, manufactured by Pelmor Laboratories Inc. This is a two component cement consisting of a base material and accelerator. It can be mixed by weight or volume. By weight, use 44 parts base material to 6 parts accelerator. By volume, use 1/2 pint (0.24 liter) base material to 225 drops accelerator. Allow to cure for 24 hours at room temperature.

**Note:** PLV-2000 Fluorelastomer can be obtained in an aerospray can with the accelerator added, so no mixing is necessary.

- 7.2.5 Install new O-ring seat into seat ring following the sequence depicted in Figure 3.
- 7.2.6 Assemble seat plate bolt to guide tube. Place tube in "Vee" block, align holes and insert spring pin.
- 7.2.7 Assemble guide tube to seat plate in the reverse order from that described in 7.1.1. Torque locknut for snug fit. Make sure the retainer and O-ring are in place for a seal around bolt shank.
- 7.2.8 Assemble guide rod to body in reverse order from that described in 7.1.2, torque bolt 18-24 ft-lb (24.4 -32.5 Nm).
- 7.2.9 Assemble internal parts and inlet screen in reverse order from that described in 7.1.0 and 7.1.1. Be careful not to damage the PTFE surface on the guide rod. Apply a light coat of lubricant to all threads before assembly.

### 8 LEAK AND VACUUM SET VERIFICATION TESTING

- 8.1 Pressurize vacuum breaker to 150% of the positive working pressure.
- 8.2 Apply leak test solution around all bolts and sealing surfaces.
- 8.3 Reduce positive pressure to 10% of the positive working pressure and check for seat leaks using leak test solution. If seat leakage occurs the probable cause is the sponge seat not being cemented flat to the seat ring. If leakage is unacceptable, sponge seat must be replaced.
- 8.4 Reduce pressure to vacuum region and note negative pressure at which seat plate begins to lift. It should crack open, and potentially rattle slightly, at set pressure.

### 9 SOFT GOODS REPAIR KIT

The kits listed below are available from stock. To order, specify the number indicated in the following table. To ensure the purchase of correct soft goods kits, the order should specify the valve model number and serial number. Kits received should be stored in a controlled environment, with proper protection. Each kit contains the two-part adhesive used to cement the sponge seat, and must be used within one year of receipt due to expiration. If epoxy has expired, a new epoxy can be ordered under the referenced part number in the table below.

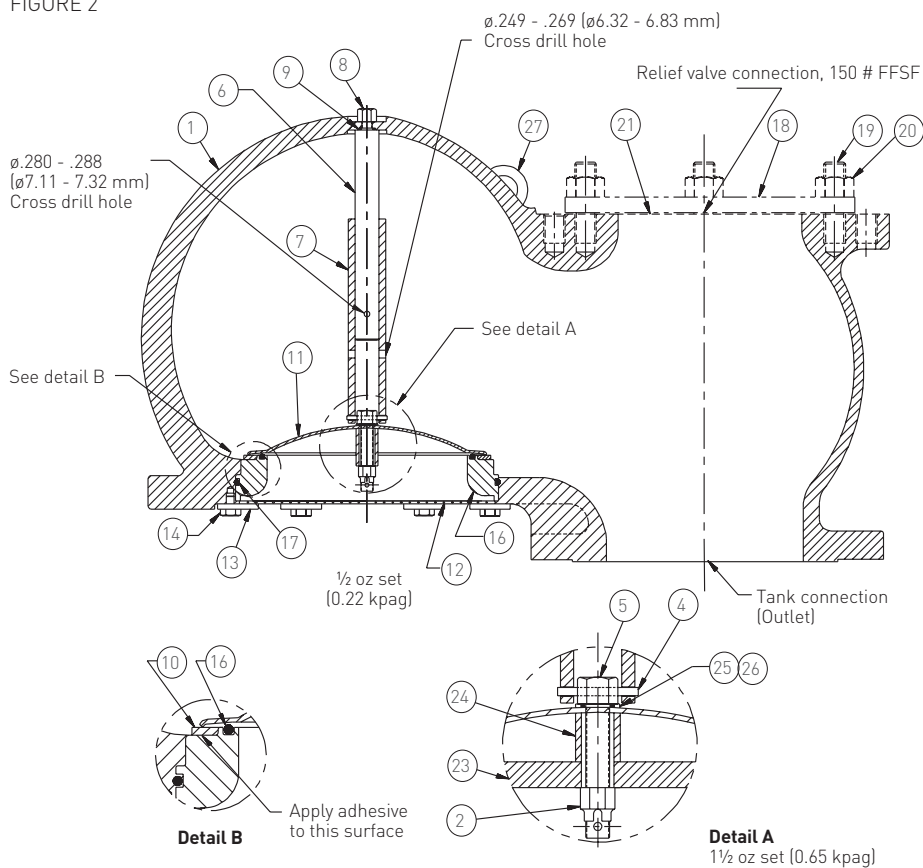
#### SERIES 96A VACUUM BREAKER SOFT GOODS KIT (REFERENCE DOCUMENT 04-4744)

Material	Tank connection				
	4"	6"	8"	12"	16"
NBR	04-4744 - 112	04-4744 - 113	04-4744 - 114	04-4744 - 115	11115086
FKM	04-4744 - 116	04-4744 - 117	04-4744 - 118	04-4744 - 119	11115086
EPR	04-4744 - 906	04-4744 - 907	04-4744 - 908	04-4744 - 905	11115086
Epoxy (Syringe Applicator)	05-1501-044				

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FIGURE 2



### PARTSLIST

Item	Description
1	Body
2	Nut-lock
4	Pin-spring
5	Bolt-seat bolt
6	Rod-guide
7	Tube-guide
8	Bolt-guide rod
9	O-ring
10	Seat-sponge
11	Plate-seat
12	Screen-inlet
13	Retainer-seat ring
14	Bolt-retainer
15	Ring-seat
16	O-ring, Seat plate
17	O-ring, Seat ring
18	Cap-outlet
19	Stud
20	Nut
21	Gasket
23	Weight-ring
24	Spacer
25	Retainer-O-ring
26	O-ring
27	Eyebolt

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## INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

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A



B



C



D



E



F

FIGURE 3

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