ANDERSON GREENWOOD CROSBY

tyco flow control

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INSTRUCTIONS – MAINTENANCE FOR TYPE 93 POSITIVE PRESSURE POSRV'S

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.**

WARNING

Removal of the seal wires in an attempt to adjust and/or repair this product by unauthorized or unqualified persons voids the product warranty and may cause damage to equipment and serious injury or death to persons.

The product is a safety related component intended for use in critical applications. The improper application, installation or maintenance of the product or the use of parts or components not manufactured by Anderson Greenwood Crosby may result in a failure of the product.

Any installation, maintenance, adjustment, test, etc. performed on the Product must be done in accordance with the requirements of all applicable Anderson Greenwood Crosby Procedures and Instructions as well as applicable National and International Codes and Standards.

SAFETY PRECAUTIONS

When the pressure relief valve is under pressure never place any part of your body near the pilot exhaust nor the outlet of the main valve.

The main valve outlet should be piped or vented to a safe location.

Always wear proper safety gear to protect head, eyes, ears, etc. anytime you are near pressurized valves.

Never attempt to remove the pressure relief valve from a system that is pressurized.

Never make adjustments to or perform maintenance on the pressure relief valve while in service unless the valve is isolated from the system pressure. If not properly isolated from the system pressure, the pressure relief valve may inadvertently open resulting in serious injury.

Remove the pressure relief valve prior to performing any pressure testing of the system.

The safety of lives and property often depends on the proper operation of the pressure relief valve. The valve must be maintained according to appropriate instructions and must be periodically tested and reconditioned to ensure correct function.

STORAGE AND HANDLING

Pressure relief valve performance may be adversely affected if the valve is stored for an extended period without proper protection. Rough handling and dirt may damage, deform, or cause misalignment of valve parts and may alter the pressure setting and adversely affect valve performance and seat tightness. It is recommended that the valve be stored in the original shipping container in a warehouse or as a minimum on a dry surface with a protective covering until installation. Inlet and outlet protectors should remain in place until the valve is ready to be installed in the system.

TABLE OF CONTENTS

1.0 GENERAL VALVE DESCRIPTION & START-UP

1.1 OPERATION

The AGCO Pilot Operated Safety Relief Valves utilize the principle of back-loading the top of a differential area diaphragm with line pressure to hold the diaphragm closed up to set pressure. At set pressure the pilot valve relieves,

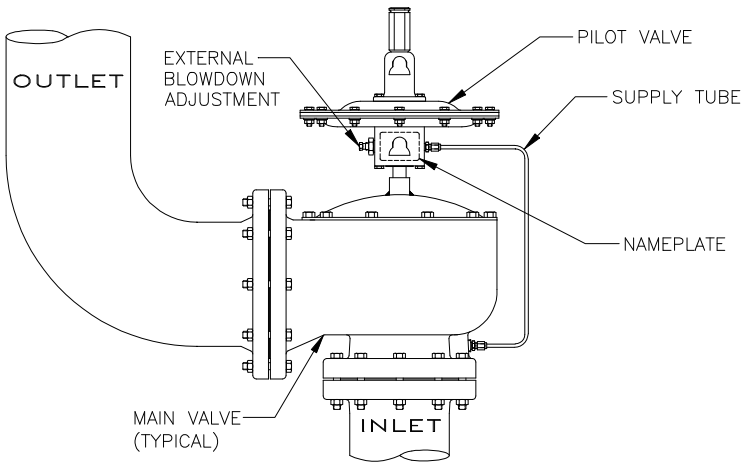


FIGURE 1

05-9040-081-FIG1.DWG

partially evacuating the dome (volume above the diaphragm) and the seat assembly lifts permitting discharge from the main valve. When the pilot reseats, line pressure is diverted to the dome closing the main valve.

1.2 INSTALLATION

Both inlet and outlet may be standard ANSI or DIN flange connections and are to be installed in accordance with accepted piping practices.

The installed position of the safety valve should be in the upright position as shown in Figure 1.

When remote pressure pick-up is used the pilot supply tube is connected to a remote location rather than to the inlet neck of the valve. If a block valve is used in the remote pilot supply line, be sure it is opened before pressurizing the system.

NOTE: Remote pressure pick-up piping must have the equivalent flow area of 1/2″ tubing for lengths up to 20 feet. For lengths greater than 20 feet, larger tubing or pipe should be used.

1.3 START-UP

There must be pressure at the valve inlet to establish a differential in force across the diaphragm and “load” it in the closed position. Pressure must pass through the pilot supply tube and pilot and exert force on the diaphragm. On normal start-up the valve loads itself without incident as pressure increases.

Block valves are often used under safety valves in order to isolate them when maintenance is required. When putting the safety valve in service be sure the block valve is fully opened. If the block valve is opened after system start-up, the safety valve may briefly vent to the atmosphere before the dome gets pressurized. It will then close.

2.0 MAIN VALVE MAINTENANCE (Refer to Figures 2 & 2A)

2.1 Valve Configuration

Two different valve internals are used in the main valve, depending on set pressure. The sponge seat is used for the set pressures shown below. The O-Ring seat with guide is used for all pressures above these values. For some applications, a guide may be used in place of Item 11 with a sponge seat.

SET PRESSURES WHERE SPONGE SEAT IS USED

VALVE SIZE	2 X 3	3 X 4	4 X 6	6 X 8	8 X 10	10 X 12	12 X 16
SET PRESSURE (PSIG)	BELOW 2.5 PSIG	BELOW 1.5 PSIG	BELOW 1.0 PSIG				

2.2 DISASSEMBLY

Disconnect the supply tube from the pilot, remove the cap bolts, lift the cap from the valve body and lift the diaphragm, seat and guide (where used) from the valve. Remove the seat bolt(s) to separate the diaphragm from the seat, guide, and retainer plates.

2.3 REPAIR

Inspect the nozzle seating area for nicks or scratches. If they cannot be removed with crocus cloth or fine sandpaper, the nozzle must be remachined. On steel valves the nozzle may be removed from the body. Machining of the nozzles should be limited to .06” material removal.

2.4 ASSEMBLY

Reassemble the diaphragm, seat guide, and pilot supply tube in the reverse order of disassembly. Apply a light film of lubricant to all threaded parts. Care should be taken to adequately tighten the seat bolt(s) on those valves with guides to prevent the diaphragm from pulling away from the bolt under pressure.

On valves with sponge seats (no guide), the seat bolt need not be tightened as much since these valves are used at lower pressures and excessive tightening will distort the seat.

Carefully insert the guide (where used) squarely into the nozzle and lower the diaphragm assembly into place. Align the holes on the diaphragm O.D. with those on the body.

The guide spring, Item 3, is used to create frictional drag to prevent valve chatter caused by excessive inlet piping pressure losses. The tension of these springs is correct when the diaphragm/guide assembly slowly free falls to the closed position. If the assembly will not do this, adjust the spring tension by bending the tail or lower half of the spring.

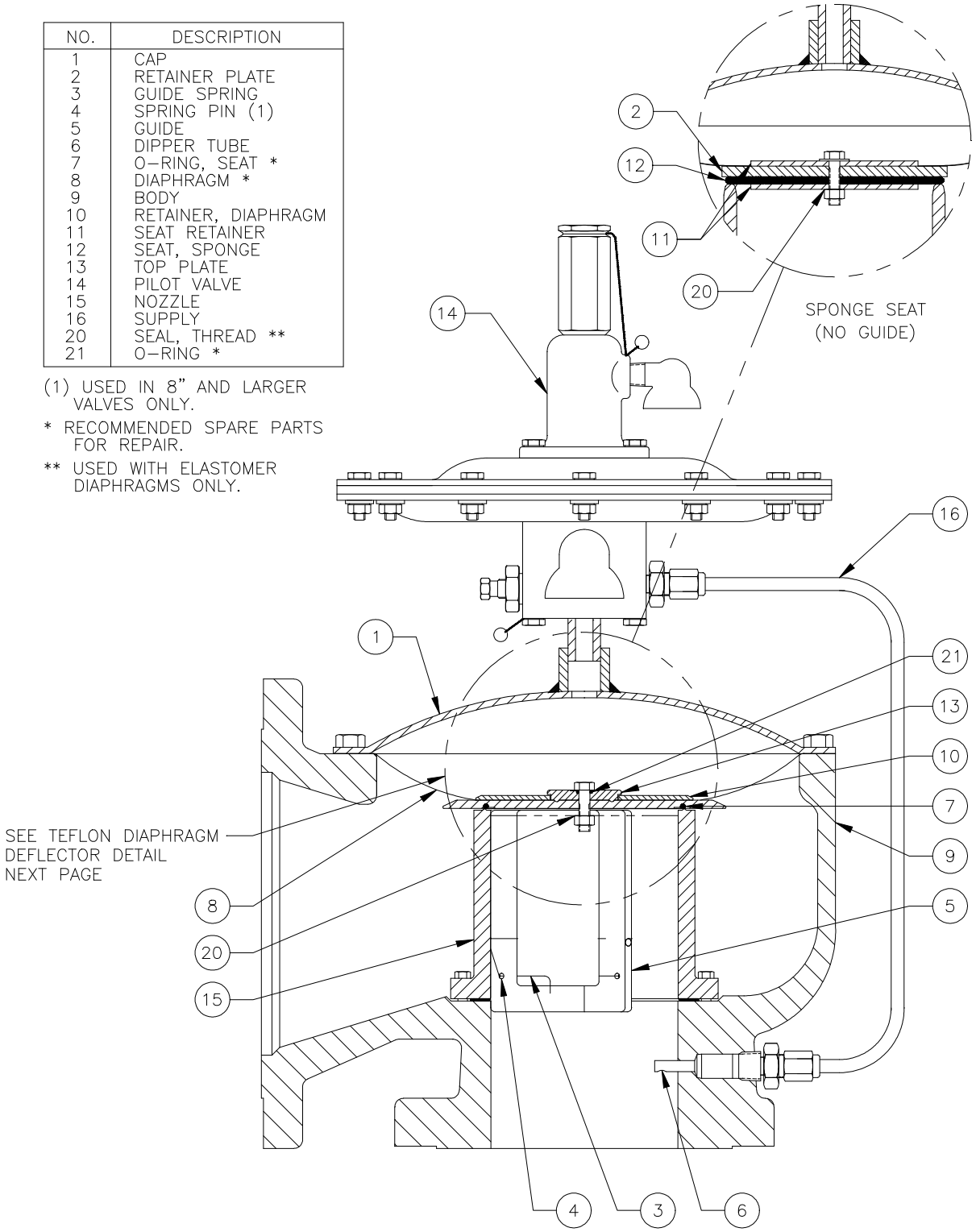
Refer to Page 20 for Soft goods Repair Kits.

NO.	DESCRIPTION
1	CAP
2	RETAINER PLATE
3	GUIDE SPRING
4	SPRING PIN (1)
5	GUIDE
6	DIPPER TUBE
7	O-RING, SEAT *
8	DIAPHRAGM *
9	BODY
10	RETAINER, DIAPHRAGM
11	SEAT RETAINER
12	SEAT, SPONGE
13	TOP PLATE
14	PILOT VALVE
15	NOZZLE
16	SUPPLY
20	SEAL, THREAD **
21	O-RING *

(1) USED IN 8" AND LARGER VALVES ONLY.

* RECOMMENDED SPARE PARTS FOR REPAIR.

** USED WITH ELASTOMER DIAPHRAGMS ONLY.

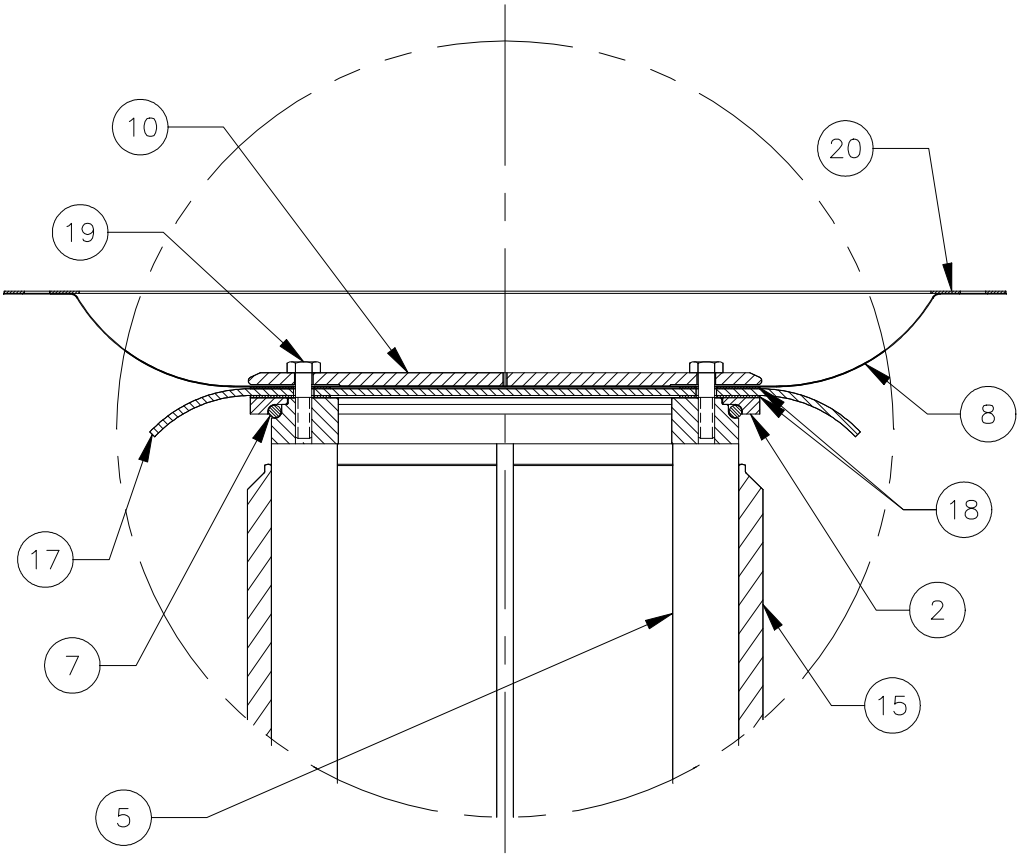


05-9040-081-FIG2.DWG

FIGURE 2

ITEM	DESCRIPTION
2	RETAINER PLATE
5	GUIDE
7	O-RING, SEAT *
8	DIAPHRAGM *
10	RETAINER, DIAPHRAGM
15	NOZZLE
17	DEFLECTOR
18	GASKET, DEFLECTOR *
19	GUIDE BOLT
20	GASKET CAP *

* RECOMMENDED SPARE PARTS FOR REPAIRS.



TEFLON DIAPHRAGM
WITH DEFLECTOR
FIGURE 2A
8", 10", & 12" SIZES

05-9040-081-FIG2A.DWG

3.0 PILOT MAINTENANCE (Refer to Figures 3 & 4)

3.1 DISASSEMBLY

To facilitate assembly, place all parts removed in an orderly arrangement so the correct parts are assembled in the proper sequence. Refer to Figure 3 for parts description and location.

3.1.1 Begin by removing spring bonnet (Remove the spring compression before attempting to removing bonnet). Remove case bolts and upper case. Loosen tube fittings on boost tube at lower case and body. Remove spindle nut while holding hex spacer. Remove diaphragms, sense and boost plates and spacers. Remove lower case and spindle/seat assembly. Remove blowdown adjustment screw and supply port tube fitting.

Note: Shim washers (33) may be in assembly to accomplish proper stack height. If so, note location and quantity.

3.1.2 Clean all parts and replace all soft goods. The spindle/seat assembly is factory assembled and must be replaced as a unit. If the nozzle is nicked or scratched, it should be replaced. To remove it, use a deep socket.

3.2 ASSEMBLY

Assembly is done in the reverse order of disassembly. Lubricate all screw threads and end of spring adjusting screw that bears against spring washer. Use Down Corning No. 33 Silicone grease or equivalent. When assembling pilot, the following should be observed:

3.2.1 Place seat/spindle assembly (11) into pilot body. Install spindle spacer (32) on top of shim washers. Lay straight edge across pilot body (14) and check gap between spindle spacer and straight edge. Add or remove shim washers (33) as required to have top of spindle spacer (32) even with top of body (14).

3.2.2 The holes in spindle diaphragm must be aligned with all holes in the body. The small hole in lower case must be aligned with hole in the body. Two of the six case bolts for the medium pressure pilot (Figure 4) must be assembled though holes in the lower case before it is attached to the body. After attachment there is insufficient clearance to do so.

3.2.3 For the medium pressure pilot the hole in the boost (lower) diaphragm and spacer ring must be aligned with boost tube port in lower case. The hole in the upper diaphragm must be positioned away from boost tube part.

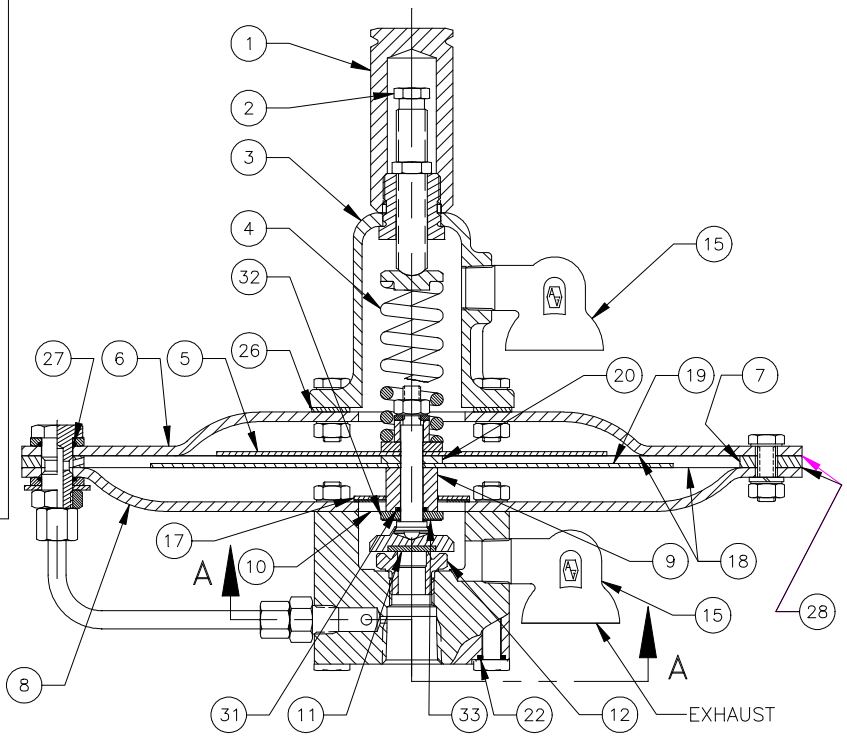
3.2.4 Before tightening spindle nut, align holes in lower case, spacer ring and diaphragms with case bolts.

Tighten spindle nut snugly but not excessively. Three diaphragms are sandwiched/stack assembly and excessive tightening will damage them. Hold the hex spacer when tightening spindle nut to prevent the stack from rotating.

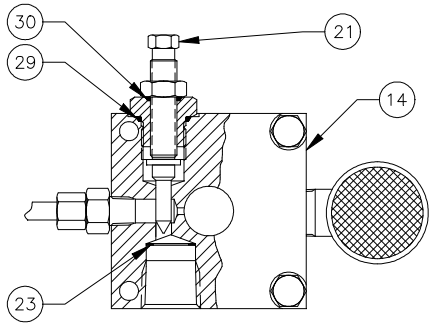
Refer to Page 21 for Soft Goods Repair Kits.

NO.	DESCRIPTION
1	CAP
2	PRESSURE ADJ. BOLT
3	BONNET
4	SPRING
5	SENSE PLATE
6	UPPER CASE
7	SPACER RING
8	LOWER CASE
9	BOOST SPACER
10	SPINDLE DIAPHRAGM *
11	SEAT/SPINDLE *
12	NOZZLE
14	BODY
15	VENT
17	CHECK PLATE
18	PILOT DIAPHRAGM *
19	BOOST PLATE
20	SENSE SPACER
21	BLOWDOWN NEEDLE
22	SEAL, BODY BOLT *
23	FILTER SCREEN
26	BONNET GASKET *
27	BOOST TUBE SEAL *
28	DIAPHRAGM GASKETS *
29	BUSHING SEAL *
30	BLOWDOWN SEAL *
31	SPINDLE SEAL *
32	SPINDLE SPACER
33	SHIM WASHER

*Recommended spare parts for repair.



TYPE 93
(RUBBER SEAT)



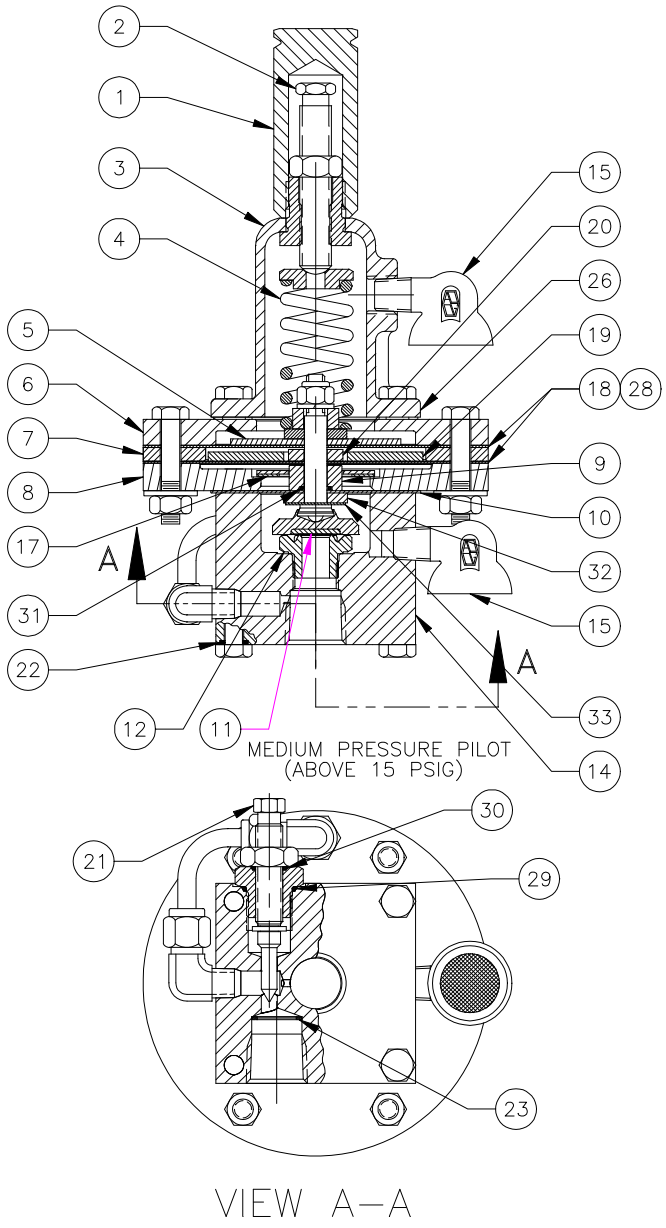
VIEW A–A

FIGURE 3

05–9040–081–FIG3.DWG

NO.	DESCRIPTION
1	CAP
2	PRESSURE ADJ. BOLT
3	BONNET
4	SPRING
5	SENSE PLATE
6	UPPER CASE
7	SPACER RING
8	LOWER CASE
9	BOOST SPACER
10	SPINDLE DIAPHRAGM *
11	SEAT/SPINDLE *
12	NOZZLE
14	BODY
15	VENT
17	CHECK PLATE
18	PILOT DIAPHRAGM *
19	BOOST PLATE
20	SENSE SPACER
21	BLOWDOWN NEEDLE
22	SEAL, BODY BOLT *
23	FILTER SCREEN
26	BONNET GASKET *
28	DIAPHRAGM GASKETS *
29	BUSHING SEAL *
30	BLOWDOWN SEAL *
31	SPINDLE SEAL *
33	SHIM WASHER

*Recommended spare parts for repair.



VIEW A–A

FIGURE 4

05–9040–081–FIG4.DWG

4.0 PILOT ADJUSTMENT

4.1 GENERAL

Two adjustments are provided; one for varying the pressure at which the pilot opens and one for varying the pressure at which the pilot closes. The first adjustment controls the “set” or “popping” pressure, the second the “reseat” or “blowdown” pressure. To adjust set pressure, a test set-up similar to that shown in Figure 5 should be used.

4.2 SET PRESSURE

This adjustment is obtained by turning the pressure adjusting bolt, clockwise (in) to increase set pressure and counter-clockwise (out) to decrease set pressure.

4.3 RESEAT PRESSURE

This adjustment is obtained by turning the blowdown needle adjusting screw, clockwise (in) to increase blowdown, counter-clockwise (out) to decrease blowdown. A small interaction between set pressure and reseat pressure adjustments will occur, therefore it may be necessary to readjust the set pressure after setting reseat pressure.

NOTE: If the blowdown adjusting screw has been moved or turned to either extreme, positioning it midway will aid in obtaining the correct blowdown. There are approximately 7 to 8 turns to obtain full travel of the adjustment. Midway from either end should produce a blowdown for “snap action”. For “modulating pilot action”, back the adjustment screw out (counter-clockwise) to obtain the adjustment limits given in paragraph 4.5.

4.4 RANGE OF ADJUSTMENT

All Pilots can be adjusted $\pm$ 10% beyond the nameplate setting.

4.5 ADJUSTMENT TOLERANCES

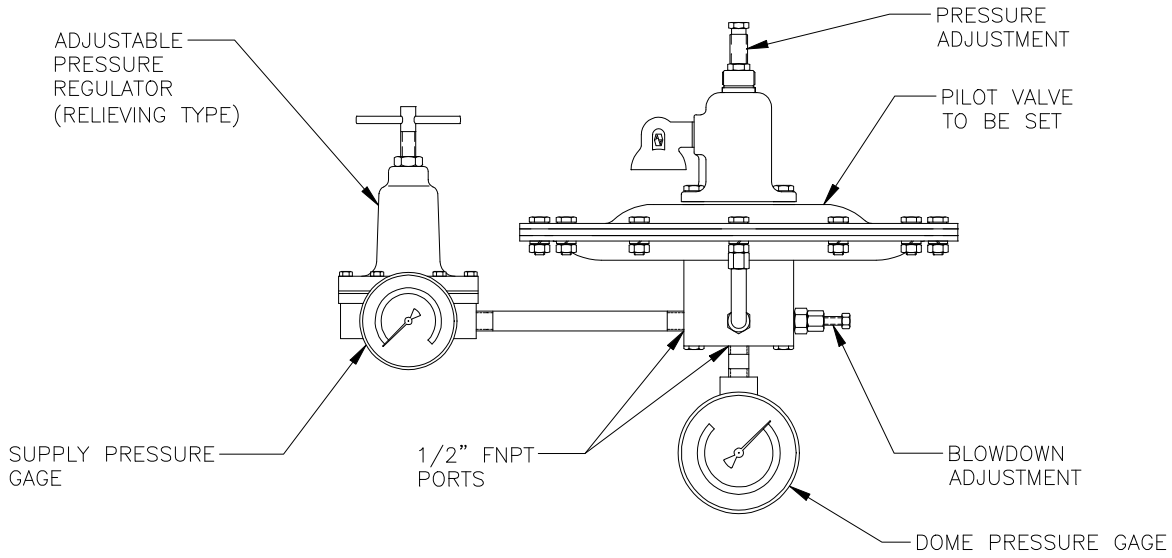
(1) PILOT ACTION	SET PRESSURE	SET PRESSURE TOLERANCE (2)	MINIMUM CRACK PRESSURE AS % OF NAMEPLATE SET	SUPPLY PRESSURE AS % OF SET FOR DOME PRESSURE RECOVERY (3)
SNAP	2″WC TO 7″WC	± .2″WC	75	90 ± 1
	7″WC TO 1.0 PSIG	±3%	90	90 ± 1
	ABOVE 1.0 PSIG	±3%	95	92 1/2 ± 1/2
	-2″WC TO –7″WC	± .2″WC	75	90 ± 1
	-7″WC TO-1.0 PSIG	±3%	90	90 ± 1
	-1 PSI TO –14.7	±3%	95	92 1/2 ± 1/2
MOD-ULATING	2″WC TO 7″WC	± 2″WC	75	100
	7″WC TO 1.0 PSIG	±3%	90	100
	ABOVE 1.0 PSIG	±3%	95	100
	-2″WC TO –7″WC	± .2″WC	75	100
	-7″WC TO –1.0 PSIG	±3%	90	100
	-1.0 PSI TO –14.7 PSIG	±3%	95	100

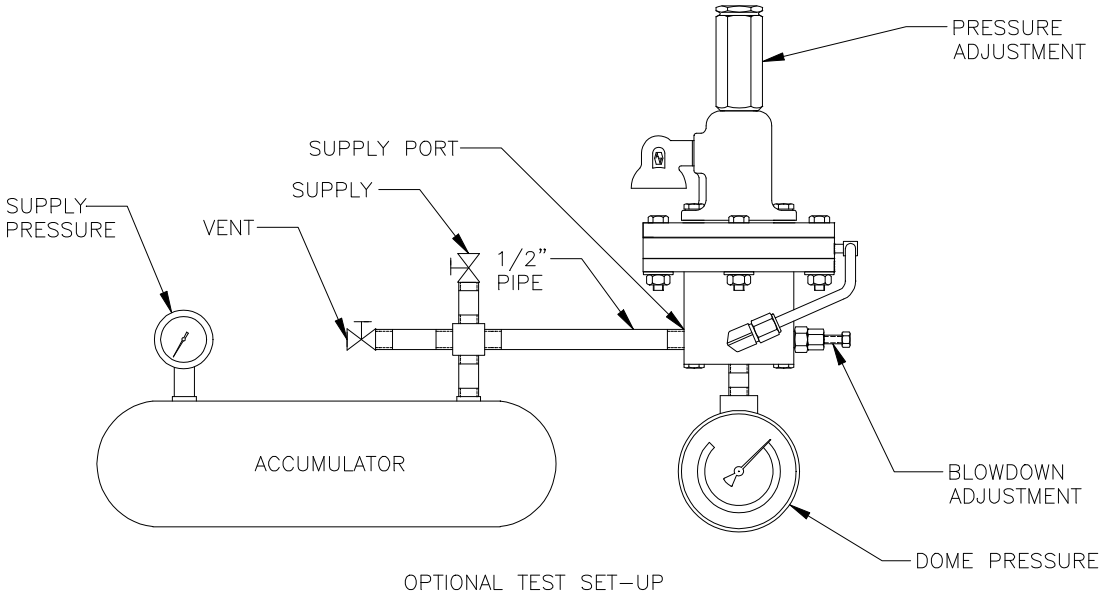
NOTES:

(1) SNAP ACTION – DOME PRESSURE DECREASES RAPIDLY WITH A “SNAP” TO 15% ± 10% OF SET PRESSURE AT SET PRESSURE. PILOT SEAT SHOULD BE BUBBLE TIGHT AT DOME PRESSURE RECOVERY.
MODULATING ACTION – DOME PRESSURE DECREASES SLOWLY TO 30% ± 5% OF SET PRESSURE AND RECOVERS TO 60% ± 10% OF SET PRESSURE AT SET PRESSURE.

(2) ADJUST SET PRESSURE ON TEST STAND TO 101% ± 1% OF NAMEPLATE SETTING TO ALLOW FOR SPRING TENSION RELAXATION CAUSED BY COMPRESSION OF THE ELASTOMER IN THE DIAPHRAGM STACK.

(3) PILOT SEAT SHOULD BE BUBBLE TIGHT AT DOME RECOVERY FOR “SNAP” PILOT ACTION AND AT 90% OF SET PRESSURE FOR “MODULATING” PILOT ACTION FOR VALVES SET ABOVE 7″WC. FOR VALVES SET 7″WC AND BELOW, THE PILOT SEAT SHALL BE BUBBLE TIGHT AT 75% OF SET PRESSURE.





OPTIONAL TEST SET-UP

FIGURE 5

05-9040-081-FIG5.DWG

5.0 ACCESSORY REPAIR

5.1 CHECK VALVE

A check valve is used in the pressure sense line to the pilot when the safety valve is equipped with a field test or backflow preventer accessory. A check valve is also installed between the pilot dome connection and main valve when the safety relief valve is equipped with a backflow preventer.

The check valve used in the pressure sense line is shown in Figure 6. This type of check valve is also used for the backflow preventer accessory between the pilot dome connection and main valve for set pressures below 15 psig. The diaphragm is the only part that should require servicing. If the diaphragm is to be replaced, care should be taken not to scratch or distort it in the center nozzle sealing area. When reassembling the check valve, uniformly tighten the body bolts, first one side, then the opposite side until all are tight. DO NOT OVERTIGHTEN bolts as this will distort the diaphragm and cause leakage. For set pressures below 1.0 psig, a diaphragm gasket, Item 9, may be used between the diaphragm and lower body. If the check valve has one, replace it with a new one. If the check valve is not equipped with one, do not put one in.

ITEM	DESCRIPTION
1	HEX HEAD CAP SCREW
2	UPPER BODY
3	DIAPHRAGM
4	NUT
5	LOWER BODY
6	SPRING PIN
7	LOCKWASHER
8	DIAPHRAGM SUPPORT WASHER
9	DIAPHRAGM GASKET

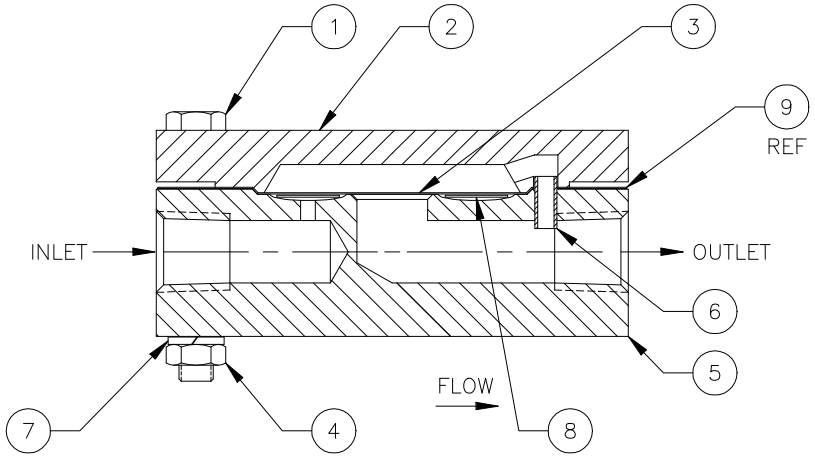


FIGURE 6

05-9040-081-FIG6.DWG

The check valve used for the backflow preventer accessory between the pilot dome connection and main valve for set pressures 15 psig and above is shown in Figure 6A. The O-ring, Item 4, is the only part that should require servicing. Remove Item 1 to replace O-ring.

ITEM	DESCRIPTION
1	BODY
2	SPRING
3	BALL
4	O–RING SEAT
5	TEE

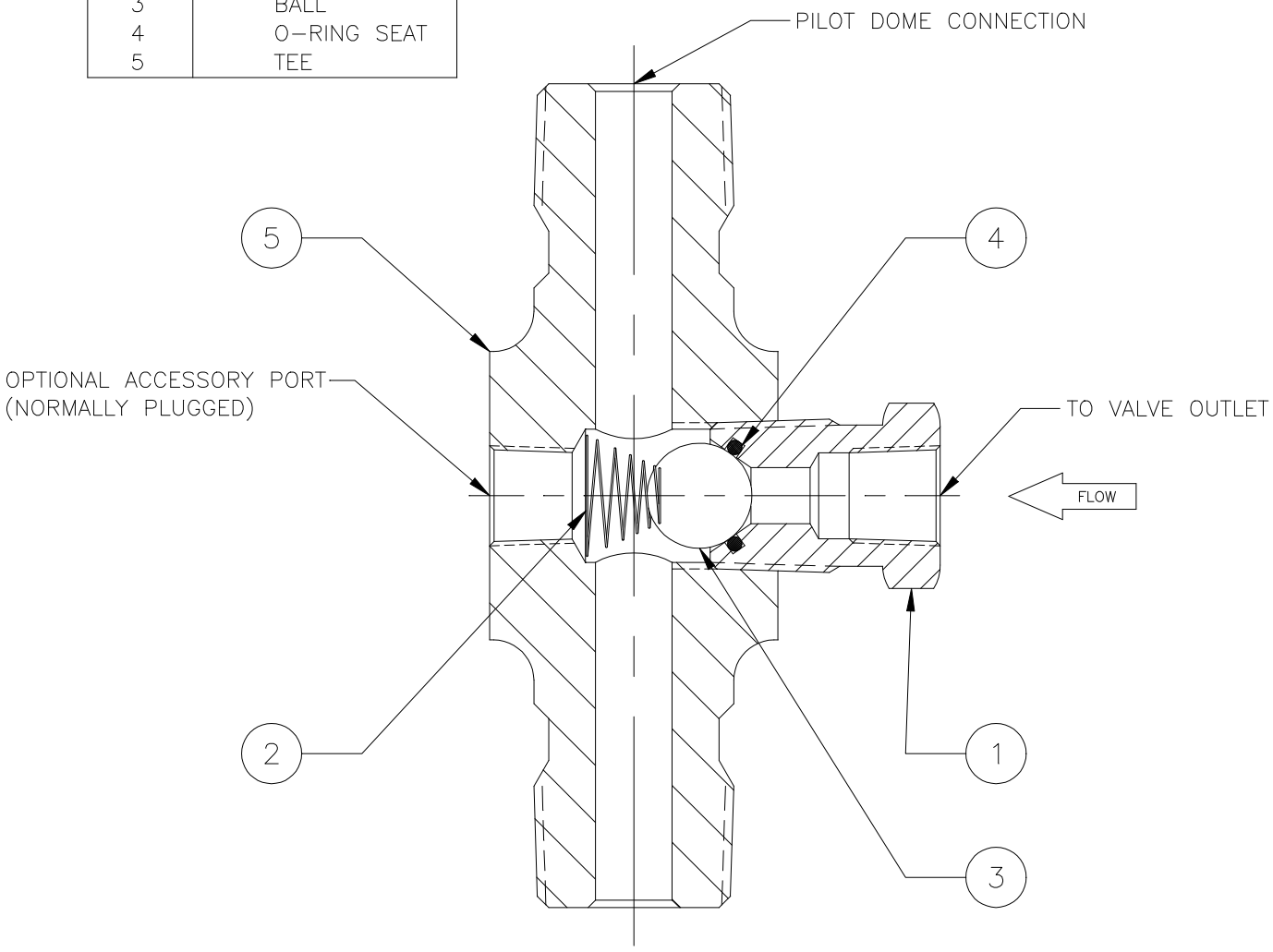


FIGURE 6A

05–9040–081–FIG6A.DWG

6.0 LEAK TESTING ASSEMBLY

6.1 GENERAL

The complete valve assembly should be leak tested for internal and external leaks using a pressure equal to 30% and 90% of set.

6.2 INTERNAL LEAK TEST

Cover valve outlet with wet piece of paper and observe paper for movement. Any outward movement indicates a leak. If leakage is detected, remove paper and spray leak test solution around nozzle/seat to locate leak. Leakage my be caused by damaged seat sealing surface or improper squeeze of O-ring or sponge seat.

6.3 EXTERNAL LEAK TEST

Following the internal leak test, check for external leakage by applying leak test solution to all joints and seals. Tighten bolts or fittings as required.

7.0 PILOT SET PRESSURE FIELD TEST PROCEDURE

7.1 GENERAL

The pilot set pressure can be checked in the field by applying an external test pressure to the pilot through the Field Test Hand Valve as shown in Figure 7.

NOTE: If the process pressure at the time of test is less than approximately 30% of the pilot set pressure, the main valve will not open. If the process pressure is greater than 30% and the main valve must remain closed, temporarily replace the pilot exhaust vent with an orifice plug having an orifice diameter of .040”/.060”. This orifice must be removed on completion of Field Testing as it prevents the Main Valve from opening.

7.2 PROCEDURE

A. Connect test gas bottle as shown in FIGURE 7.
B. Close vent valve “C”.
C. Open Field Test Valve “B”. Test gauge will read process pressure.
D. Open block Valve “A” SLOWLY to increase pressure until pilot “pops”. The set pressure will be the pressure indicated on the test gauge at the time of pop.
E. To remove test set up, close valves “A” and “B”, open valve “C”.

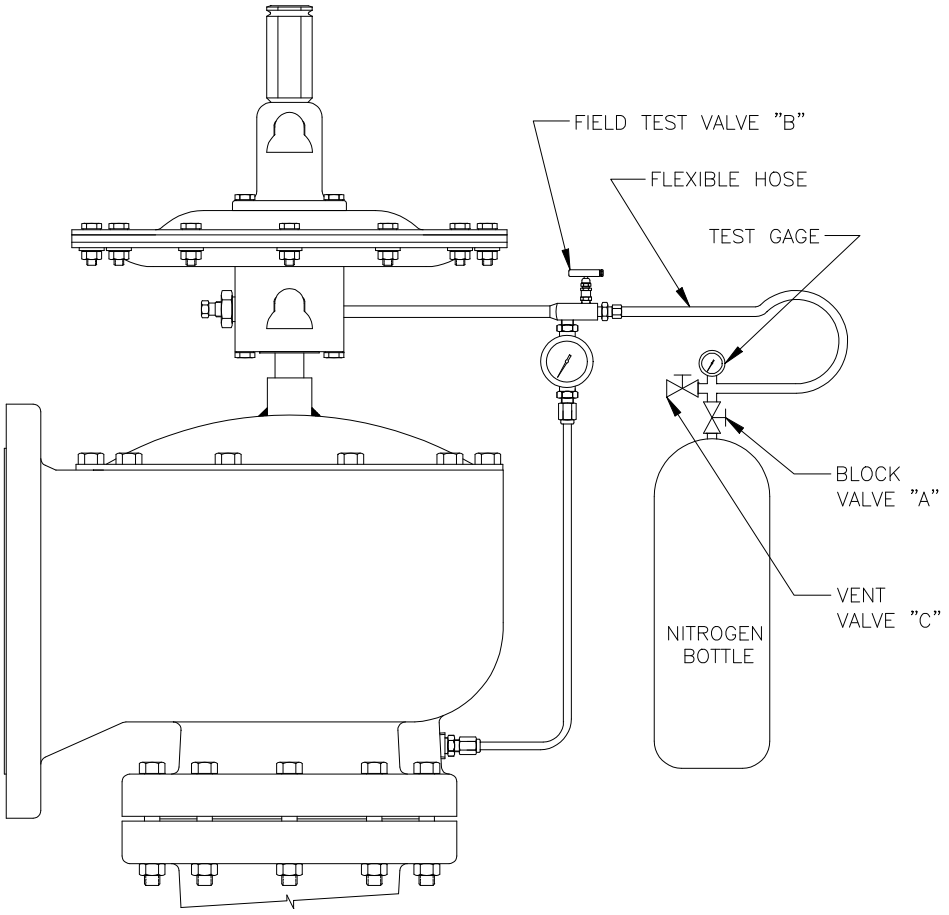


FIGURE 7

05-9040-081-FIG7.DWG

8.0 REPAIR KITS

Soft goods repair kits contain all the seals, seats and diaphragms to repair a valve. To order a kit, specify the base number and select the last three digits from the following tables. To ensure the purchase of the correct repair kit, the order should specify the valve model and serial number.

The external bolts on the main valve and pilot are 300 Series stainless steel. Corrosion of these fasteners may occur however due to local environmental conditions. The bolt kits listed below contain the necessary parts to replace these fasteners.

KIT BASE NUMBER: 04.4744.XXX

MAIN VALVE
SPONGE SEAT

KIT	MATERIAL	2X3	3X4	4X6	6X8	8X10	10X12	12X16
SOFT GOODS	BUNA-N	.232	.242	.252	.262	.272	.282	.292
	VITON	.233	.243	.253	.263	.273	.283	.293
	EPR	.234	.244	.254	.264	.274	.284	.294
	BUNA-N (1)	.235	.245	.255	.265	.275	.285	.295
	VITON (1)	.236	.246	.256	.266	.276	.286	.296
BOLT	SST	.347	.348	.349	.350	.351	.351	.351

(1) TEFLON DIAPHRAGMS.

MAIN VALVE
O-RING SEAT

KIT	MATERIAL	2X3	3X4	4X6	6X8	8X10	10X12	12X16
SOFT GOODS	BUNA-N (5PSI & BELOW)	.237	.247	.257	.267	.277	.287	.297
	BUNA-N (ABOVE 5 PSI)	.542	.543	.544	.545	.546	.547	.548
	VITON	.238	.248	.258	.268	.278	.288	.298
	EPR	.239	.249	.259	.269	.279	.289	.299
	BUNA-N (1)	.240	.250	.260	.270	.280	.290	.300
	VITON (1)	.241	.251	.261	.271	.281	.291	.301
BOLT	SST	.347	.348	.349	.350	.351	.351	.351

(1) TEFLON DIAPHRAGMS.

PILOT

KIT	MATERIAL	LOW PRESSURE (BELOW 15 PSI)		MEDIUM PRESSURE
		VACUUM	PRESSURE	
SOFT GOODS	BUNA-N	.010	.011	.012
	VITON	.013	.014	.015
	EPR	.016	.017	.018
	BUNA-N (6)	.019	.020	.896
	VITON (6)	.021	.022	.897
	EPR (6)	.023	.024	.898
BOLT	SST	.342	.342	.343

(6) TEFLON DIAPHRAGMS.

BACKFLOW PREVENTER CHECK VALVE

KIT	TYPE	MATERIAL	ALL PRESSURE
SOFT GOODS	DIAPHRAGM	TEFLON	.781
	BALL	BUNA	.344
		VITON	.345
		EPR	.346
		KALREZ	.782
BOLT	DIAPHRAGM	SST	.335