ANDERSON GREENWOOD SERIES 200 POSRV

INSTALLATION AND MAINTENANCE INSTRUCTIONS

Before installation these instructions must be fully read and understood

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1 GENERAL VALVE DESCRIPTION AND START-UP

1.1 General

The Anderson Greenwood Series 200 Pilot Operated SRV uses the principle of pressurizing the larger top area of a differential area piston with line pressure to hold the piston closed up to set pressure. At set pressure the pilot valve relieves, depressurizing the volume on top of the piston causing the piston to lift and the main valve to relieve. When the pilot reseats, the volume on top of the piston is repressurized and the main valve closes.
Set pressure range 25 psig to 10.600 psig.

1.2 Installation

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

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

NOTE

Remote pressure pick-up piping must have the equivalent flow area of ⅜" tubing for lengths up to 100 feet. For lengths greater than this, consult the factory.

1.3 Start-up

There must be pressure at the valve inlet to establish a differential in force across the piston and 'load' it in the closed position. Pressure must pass through the pilot supply tube and pilot and exert force on top of the piston. On normal plant start-up, the valve loads itself as pressure increases. It is not uncommon that slight leakage past the main seat occurs until system pressure reaches two or three pounds. This amount of pressure is sometimes needed for the soft seat to form a seal with the nozzle.
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 relieve before the volume on top of the piston is pressurized.

1.4 Maintenance

Anderson Greenwood recommended main valve and pilot maintenance procedures including pilot set pressure adjustment and valve assembly testing are described in the following paragraphs. Following these procedures in a regular pressure relief valve maintenance program appropriate for the specific operating conditions will ensure satisfactory valve performance and provide optimum service life. Should the pressure/media requirements of a pilot operated pressure relief valve be outside the capabilities of the repair facility, contact Anderson Greenwood for specific instructions before starting any maintenance activity.

This manual is provided as a general guide for the maintenance of the safety valves described herein. It does not include procedures covering all valve configurations and variations manufactured by Anderson Greenwood. The user is advised to contact Anderson Greenwood or one of our authorized representatives for assistance with valve configurations and variations not covered in this manual.

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2 MAIN VALVE MAINTENANCE

2.1 Disassembly

Before beginning disassembly, bleed off any pressure trapped in the main valve or pilot. Refer to Figure 1A (piston/seat Type XX3) and Figure 1B (piston/seat Type XX9) for parts description and location.

Remove cap (Item 17) from the body (Item 1). Remove the liner seal (Item 6), liner (Item 5) and piston (Item 10). Remove the soft goods from the piston. If the piston is equipped with a wedge ring (Item 15), clean and retain for use during assembly. The dipper tube (Item 4) is swaged in place and no attempt should be made to remove it. The nozzle (Item 3) should not be removed unless it is damaged or the nozzle seal (Item 2) is leaking.

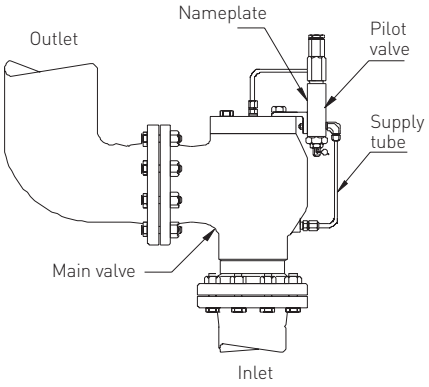
NOTE

Do not remove lock pin and lift adjusting bolt (Items 11 and 12) on valves so equipped unless nozzle is removed. This bolt controls the piston lift and hence the valve's relieving capacity. If either or both the nozzle and lift bolt were removed, then lift must be reset following the procedure of paragraph 2.3.3 (Type XX3) or paragraph 2.3.4 (Type XX9).

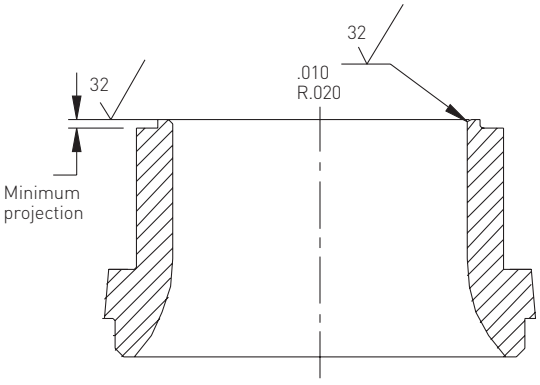
2.1.1 Nozzle and nozzle seal disassembly

Refer to Figure 2 for parts description and location.

1. Remove lock pin and lift adjusting bolt from piston, if applicable.
2. Place liner in body and piston, without seat or seat retainer, into liner and on top of nozzle.
3. Place appropriate spacer (see Table II) on top of piston and then the cap over the spacer.
4. Thread the appropriate number of cap bolts (see Table II) into threaded holes on top of body. If two bolts are used, they should be 180° apart. When using four bolts, they should be 90° apart. Always use the shortest cap bolts supplied with the valve unless all cap bolts are required. For example, the 1" Type 40/50 is equipped with two 1.50" long bolts and two 1.88" long bolts but only the two 1.50" long bolts should be used. However, the 2" Type 40/50 is equipped with two 1.25" long bolts and two 1.62" long bolts and all four bolts are required for nozzle installation.
5. Tighten cap bolts evenly to the torque listed in Table II to compress nozzle seal.
6. Use a punch or bar with a light hammer and tap on the nozzle retainer teeth to loosen the nozzle retainer. Unthread nozzle retainer approximately ½ turn.
7. Loosen cap bolts to remove load from nozzle. Remove components from main valve.



Valve size and type X = Main valve piston/seat Type, 3 or 9	Min. nozzle projection height (in)
1/1.5 x 2 Type 24X/25X (D, E and F orifice)	0.045
1.5 x 2/3 Type 24X/25X (G and H orifice)	0.040
2" Type 24X/25X	0.035
3" Type 24X/25X	0.035
4" Type 24X/25X	0.035
6" Type 24X/25X	0.035
8" Type 24X/25X	0.035
1.5" Type 26X	0.035
2" Type 26X	0.035
3" Type 26X	0.035
4" Type 26X	0.030
6" Type 26X	0.030
8 x 88 Type 26X	0.030
8 x 10 Type 26X	0.030
10" Type 26X	0.030



2.2 Main valve nozzle rework
Should the main valve nozzle seating face become nicked or scratched such that the main valve seat does not seal, the imperfections can be removed by polishing the nozzle face with 400 grit sandpaper on a flat surface plate. Certain critical nozzle dimensions and finishes must be maintained and those are shown in the figure and table below.

2.3 Assembly
2.3.1 Nozzle and nozzle seal installation
1. Place nozzle seal and nozzle in body.
2. Place nozzle retainer over nozzle and thread into body until it stops on nozzle shoulder. Do not lubricate nozzle retainer threads or mating body threads.
3. Repeat steps 3 through 5 of disassembly procedure to compress nozzle seal. Thread nozzle retainer into body as seal is compressed to keep nozzle retainer from binding against piston.
4. Use a punch or bar with a light hammer and tap on the nozzle retainer teeth to snug the nozzle retainer threads.
5. Loosen cap bolts to remove load from spacer.
6. Remove spacer from valve.

2.3.2 Soft goods installation and main valve reassembly
Refer to Figure 1A (piston/seat Type XX3) and Figure 1B (piston/seat Type XX9) for parts description and location.

2.3.3 Type XX3 piston and seat
Replace piston and liner seals. Install piston seals in groove locations shown in Table I. Install new seat and reassemble seat retainer and seat retainer screw or bolts.

NOTE
Over tightening of seat retainer screw or bolts can distort or damage seat and cause leakage. Retainer screw or bolts should be installed until assembly is snug. Then tighten an additional ¼ to ½ turn to secure assembly.

Apply a light coat of lubricant on all threads after cleaning. Lubricate upper portion of liner I.D., piston seal and wedge ring or back up ring with Dow Corning No. 33 or equivalent below 275 psig set pressure. At 275 psig and above use Desco 600, or equivalent. Use lubricant sparingly.

On 1" to 4" Type 43/53 and 1.5" to 3" Type 63 valves, if the nozzle or lift bolt were removed, then lift needs to be set. If lift setting gages are available, use lift setting procedure 06.3349, otherwise use procedure 05.2284.

When installing the cap, make sure it is seated squarely into body. Torque capbolts uniformly so as not to 'cock' cap. See Table III for torque values. Such a condition may result in leakage at the liner seal or cause the piston and liner to bind.

2.3.4 Type XX9 piston and seat
Install new piston seal and snap ring along with original wedge ring (if so equipped). Install new seat and reassemble seat retainer and seat retainer screw. Do not apply any lubricant to any of the soft goods.

NOTE
Over tightening of seat retainer screw or bolts can distort or damage seat and cause leakage. Retainer screw or bolts should be installed until assembly is snug. Then tighten an additional ¼ to ½ turn to secure assembly.

On 1" to 4" Type 49/59 and 1.5" to 3" Type 69 valves, if the nozzle or lift bolt were removed, then lift needs to be set. If lift setting gages are available, use lift setting procedure 06.2284, otherwise use procedure 05.2284.

Install new liner seal and apply a light coat of lubricant to cap bolt threads. When installing the cap, make sure it is seated squarely into body. Torque cap bolts uniformly so as not to 'cock' cap. See Table III for torque values. Such a condition may result in leakage at the liner seal or cause the piston and liner to bind.

TABLE I

Valve size	Valve type	Piston seal location	Back-up ring	Wedge ring
1" to 2"	Type 243/253	Top groove	Yes	No
1½"	Type 263	Top groove	Yes	No
3" to 8"	Type 243/253	Bottom groove	No	Yes
2" to 10"	Type 263	Bottom groove	No	Yes

TABLE II

Valve size and type X = Main valve seat type, 3 or 9	Spacer P/N	Cap bolt thread	# Cap bolts to use	Cap bolt torque (ft·lb)
1/1.5 x 2 Type 24X/25X (D, E and F orifice)	06.5612.001	.500-20 UNF	2	31
1.5 x 2/3 Type 24X/25X (G and H orifice)	06.5612.002	.500-20 UNF	2	41
1.5 x 2/3 Type 24X/25X (G and H orifice)	06.5612.002	.625-18 UNF	2	51
2" Type 24X/25X	06.5612.004	.500-20 UNF	4	27
2" Type 24X/25X	06.5612.004	.625-18 UNF	4	34
3" Type 24X/25X	06.5612.006	.500-20 UNF	4	35
3" Type 24X/25X	06.5612.006	.625-18 UNF	4	44
4" Type 24X/25X	06.5612.008	.750-16 UNF	4	130
4" Type 24X/25X	06.5612.008	.875-14 UNF	4	151
6" Type 24X/25X	06.5612.009	.750-16 UNF	2	82
6" Type 24X/25X	06.5612.009	.875-14 UNF	2	95
8" Type 24X/25X	06.5612.010	.875-14 UNF	4	123
8" Type 24X/25X	06.5612.010	1.000-14 UNS	4	140
1.5" Type 26X	06.5612.004	.500-20 UNF	2	19
2" Type 26X	06.5612.006	.500-20 UNF	2	31
2" Type 26X	06.5612.006	.625-18 UNF	2	39
3" Type 26X	06.5612.008	.750-16 UNF	2	113
4" Type 26X	06.5612.011	.625-18 UNF	2	63
6" Type 26X	06.5612.012	.750-16 UNF	2	88
8 x 88 Type 26X	06.5612.013	.875-14 UNF	4	119
8 x 10 Type 26X	06.5612.014	1.125-12 UNF	10	89
10" Type 26X	06.5612.015	1.125-12 UNF	10	90

TABLE III

Bolt size	Torque value (ft·lbs)
¼	7
5/16	12
⅜	21
7/16	33
½	45
9/16	59
⅝	97
¾	130
⅞	202
1	271
1⅛	408

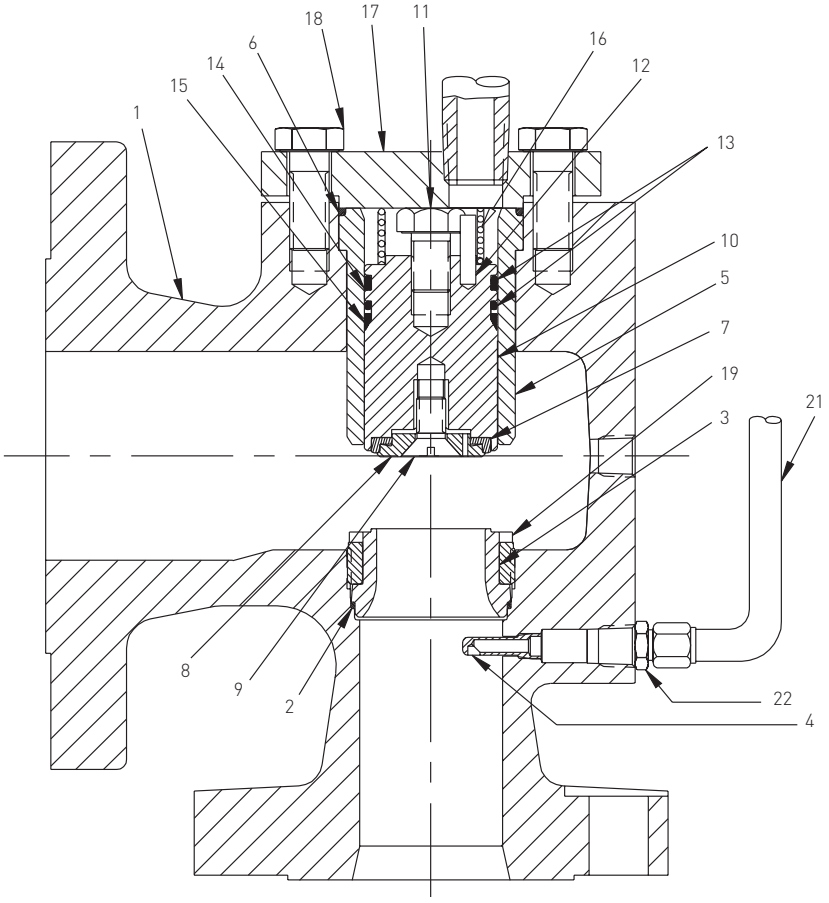


FIGURE 1A - MAIN VALVE

PARTS LIST

Item no.	Part name
1	Body
2	Nozzle seal [1]
3	Nozzle [1]
4	Dipper tube
5	Liner
6	Liner seal [2]
7	Seat [2]
8	Seat retainer
9	Seat retainer screw
10	Piston
11	Lift adj. bolt [4]
12	Lock pin [4]
13	Piston seal [2]
14	Back-up ring [2]
15	Wedge ring [3]
16	Dome spring
17	Cap
18	Cap bolt
19	Nozzle retainer
21	Supply tube
22	Tube connector

NOTES

1. Field replaceable only if required.
2. Recommended spare parts for repair.
3. Used in place of item 14 on 3" and larger Type 243/253 and 2" and larger Type 263.
4. Not used on 6", 8" Type 243/253 and 4" and larger Type 263.

Refer to Section 7.1 for soft goods repair kit part numbers.

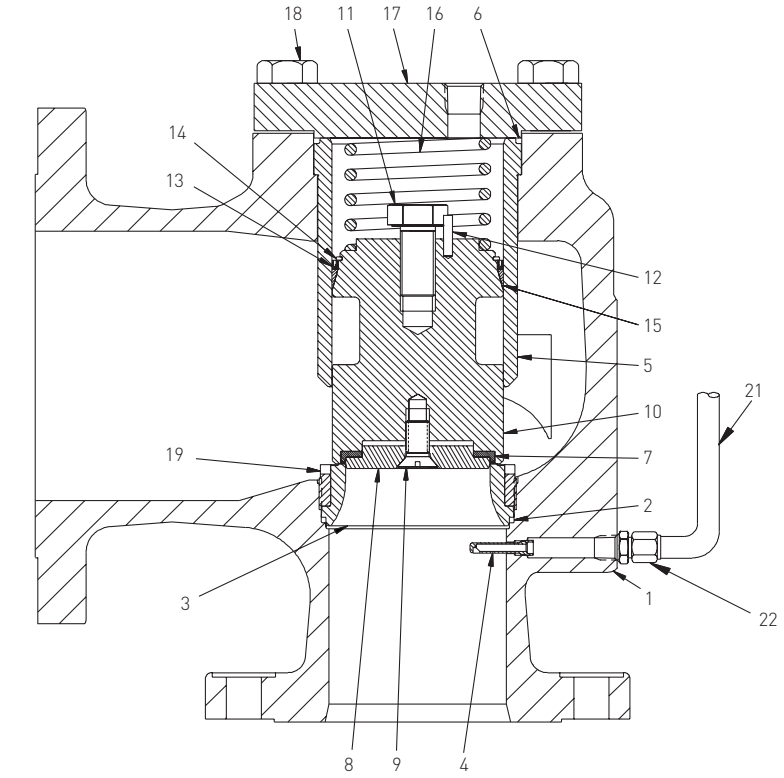


FIGURE 1B - MAIN VALVE

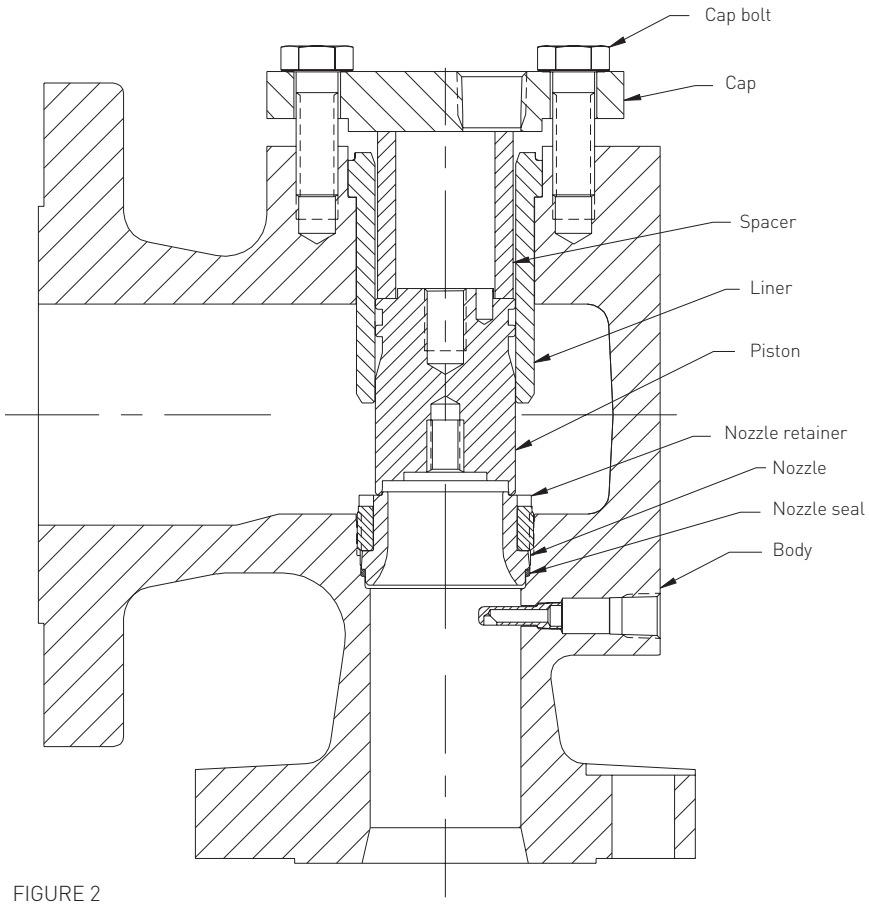


FIGURE 2

PARTS LIST

Item no.	Part name
1	Body
2	Nozzle seal [1]
3	Nozzle [1]
4	Dipper tube
5	Liner
6	Liner seal [2]
7	Seat [2]
8	Seat retainer
9	Seat retainer screw
10	Piston
11	Lift adj. bolt [4]
12	Lock pin [4]
13	Piston seal [2]
14	Snap ring [2]
15	Wedge ring [3]
16	Dome spring
17	Cap
18	Cap bolt
19	Nozzle retainer
21	Supply tube
22	Tube connector

NOTES

1. Field replaceable only if required.
2. Recommended spare parts for repair.
3. Used on 1"/1½" (D, E, F orif. liq. only), 2" (liq. only) and 4" and larger Type 249/259; and 1½" (liq. only), and 3" and larger Type 269.
4. Not used on 6", 8" Type 249/259 and 4" and larger Type 263.

Refer to Section 7.1 for soft goods repair kit part numbers.

3 PILOT MAINTENANCE

3.1 Disassembly

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

Remove spring compression by backing out adjusting screw. Remove bonnet, being careful to catch spring and spring washers when they disengage. Turn pilot upside down to remove internals parts from upper half of body.

Loosen bushing, Item 20, at bottom of pilot and remove blowdown adjustment screw. Remove seat, Item 18, from blowdown adjustment screw and O-ring seated shuttle located inside.

3.1.2 For pilots equipped with a field test assembly (Figure 5) remove the assembly from the pilot body (Figure 5). Unscrew the bushing from the assembly and remove the spring and shuttle.

3.2 Assembly

Assemble valve in reverse order of disassembly. Lubricate all screw threads and bearing ends of spring washers. Use Dow Corning No. 33 Silicone grease, or equivalent. A small amount of lubricant should also be applied to the bonnet seal (Item 8) the blowdown screw seal (Item 24), the bushing seal (Item 19) and the blowdown seal (Item 21). Torque blowdown seal jam nut to 50-55 ft·lbs. The shaft seal (Item 28), nut seal (Item 26) and cam bearing points should also be lubricated on the lift lever pilot.

NOTE

1. Do not lubricate or get any lubricant on the spindle or seat. Lubricant on these surfaces will collect dirt during normal relieving cycles and cause erratic pilot action.
2. If Items 14, 20 and 32 are removed, make sure all the shims, Item 31, have been replaced. Be sure that the smooth unmarked face of jam nut, Item 32, is against the adjacent blowdown bushing face when assembling. If any internal metal parts are replaced, check and adjust the lift of the spindle, Item 6. Refer to Figure 6 for the lift adjustment procedure.
3. On field test assemblies and backflow preventers, lubricate bushing seal(s) only. Do not get any lubricant on the shuttle, shuttle seat(s) and or bushing seat

Refer to Section 7 for soft goods repair kit part numbers.

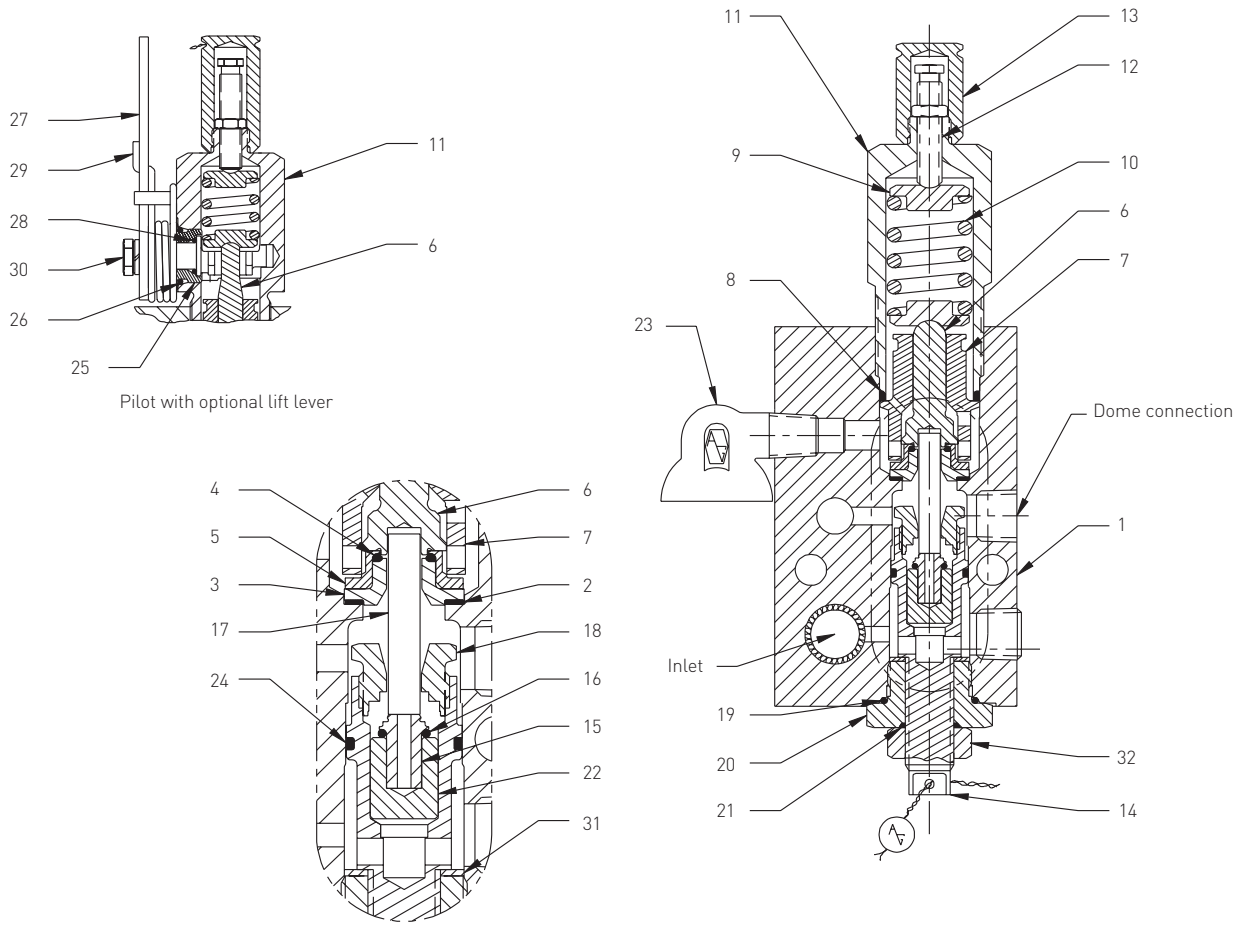


FIGURE 3

PARTS LIST

Item no.	Part name	Item no.	Part name
1	Body	17	Spacer
2	Nozzle seal*	18	Reseat seat
3	Nozzle	19	Bushing seal*
4	Seat*	20	Bushing
5	Retainer	21	Blowdown seal*
6	Spindle	22	Piston
7	Guide	23	Vent
8	Bonnet seal*	24	Blowdown seal*
9	Spring washer	25	Gland nut
10	Spring	26	Nut seal*
11	Bonnet	27	Lever
12	Pressure adjustment screw	28	Shaft seal
13	Cap	29	Lever spring
14	Blowdown adjustment screw	30	Cam and shaft
15	Retainer	31	Shim, spindle lift
16	Piston seal*	32	Jam nut

NOTE

* Recommended spare parts for repair.

4 PILOT SET PRESSURE 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.

4.2 Set pressure
To adjust set pressure, a test set-up similar to that shown in Figure 4 should be used. The set pressure adjustment screw should be turned IN most of the way and the blowdown adjustment screw should be turned out most of the way. Increase the supply pressure to the nameplate setting and slowly back the adjustment screw out until the pilot 'pops' at the desired set pressure. Lock the adjusting screw with the jam nut and cycle the pilot several times to make sure the setting is correct.

NOTE
When the pilot 'pops', the dome pressure decreases to zero and no flow of gas should be detected at the pilot vent after pop. If gas continues to flow through the vent, the blowdown screw is turned in too far.

4.3 Reseat pressure (blowdown)
To adjust reseat, decrease the pressure in the accumulator to the desired reseat pressure and turn the blowdown adjustment screw in until the pilot actuates. When this happens, the dome pressure will immediately increase to the supply pressure level. If the pilot reseats above the desired pressure, turn the blowdown adjustment screw out. Lock the blowdown adjusting screw with the jam nut with the recommended torque of 50-55 ft·lbs and cycle the pilot several times to make sure the setting is correct.

4.4 Range of adjustment
All pilots can be adjusted ± 5% beyond the nameplate setting.

4.5 Adjustment tolerances
Cracking pressure: 95% or more of specified set pressure
Set pressure: ± 3% of specified set pressure above 70 psig set ± 2 psig for 70 psig and below
Reseat pressure: 90-92% of specified set pressure for internal pressure sense 94-96% of specified set pressure for remote pressure sense

5 LEAK TESTING ASSEMBLY

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

5.2 Internal leak test
Nozzle: use a piece of wide masking tape to cover the lower part of the main valve outlet, taped across the opening 2" to 3" high. Pour in enough water to cover just the base of the nozzle. If bubbles are detected, the nozzle seal is leaking. Replacement of the seal involves removal of the nozzle. See paragraph 2.1.1 for the nozzle removal procedure.

Main seat: pour in enough water to just cover the bottom of the piston. If bubbles are detected, the main seat is leaking. The nozzle or seat may be damaged or the piston may not be seating squarely on the nozzle. For improper piston seating on low pressure valves (less than 275 psig set), pressurize dome of main valve to 275 psig to align seat. Improper piston seating may also be due to incorrect assembly of cap to body. Refer to Section 2.

Piston seal: if no bubbles are detected at main seat, increase the water level to cover the lower part of the liner. More masking tape may be used. If bubbles are detected, the piston seal at the top part of the piston is leaking; the piston seal may be defective due to excessive molding flash or the liner may be scratched.

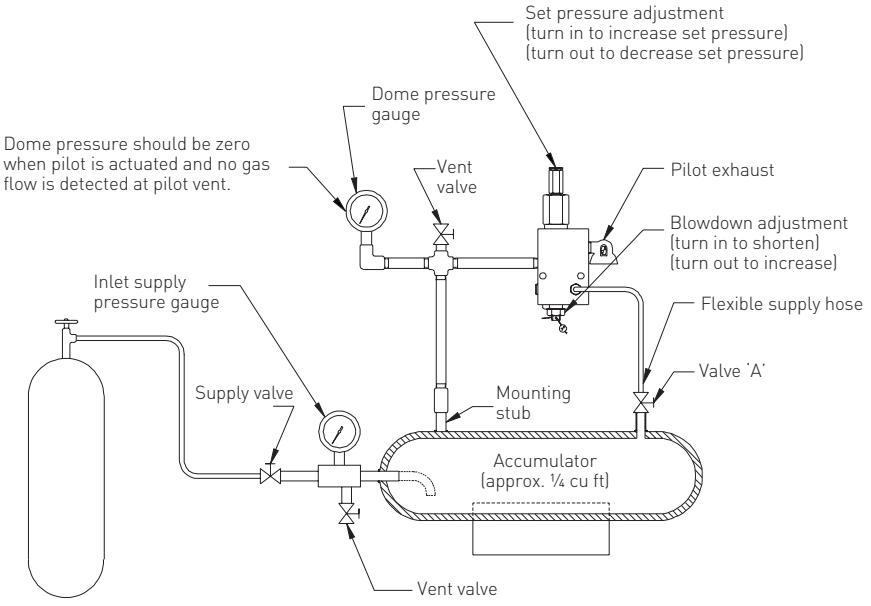


FIGURE 4

5.3 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. If a leak is observed between the cap and body, be sure the cap has been assembled squarely against the liner before tightening cap bolts.

6 PILOT SET PRESSURE FIELD TEST PROCEDURE

CAUTION
It is not necessary to remove the pressure relief valve from service to check the set pressure; however, if the pressure relief valve is not isolated from the process media while performing this test, the main valve will open if there is process pressure at the valve inlet.

6.1 General
The set pressure of valves equipped with a field test accessory can be checked with the valve installed, in operation. The field test accessory consists of a check valve in the pilot supply line through which test pressure from an external source can be supplied to the pilot. A test set-up similar to that shown in Figure 2 and procedure similar to the following should be used.

6.2 Procedure
a. Remove dust plug from field test port and connect flexible hose from test gas bottle.
b. Close vent valve 'C'.
c. Open block valve 'A' slowly to increase pressure until pilot 'pops' (with process pressure at inlet, main valve opens). The set pressure will be the pressure indicated on the test gauge at the time the pilot 'pops'.
d. Close valve 'A' and slowly open valve 'C' to reduce the pressure until the pilot actuates as shown by a sudden drop of pressure indicated on the test gauge (with process pressure at inlet, main valve closes). The indicated pressure at the time the pilot actuates is pilot reseat pressure and will be approximately 4% lower than actual reseat pressure if the pilot is equipped for internal pressure pick-up. If remote pressure pick-up is used, the pressure indicated will be the actual reseat pressure.
e. To remove test set-up, close block valve 'A', open vent valve 'C', remove flexible hose from field test port, and replace dust plug.

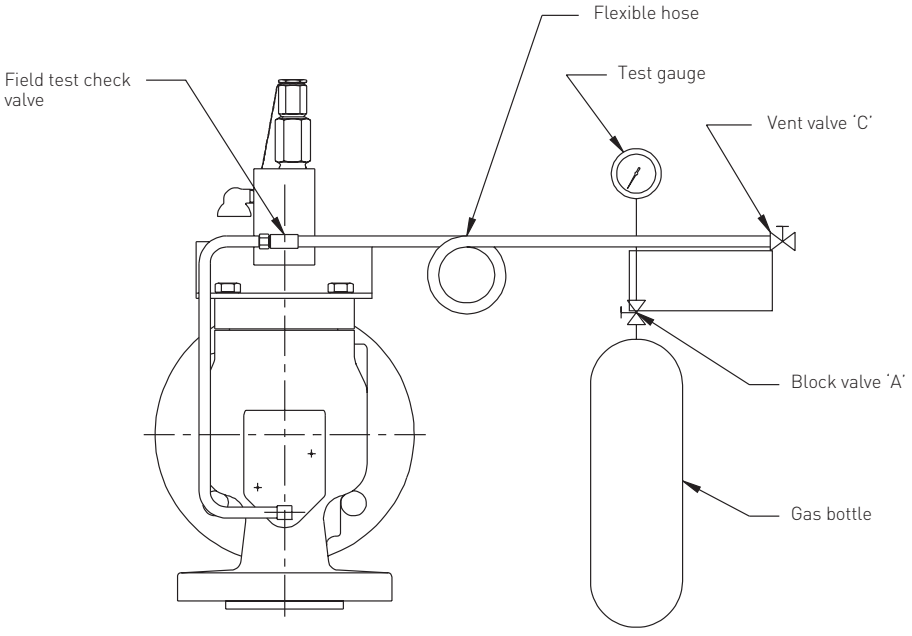


FIGURE 5

7 SOFT GOODS REPAIR KITS

The kits listed below are available from stock. To make sure the correct soft goods kits are purchased the order should specify the valve model and serial number.

7.1 Main valve

To order soft goods kits specify the base number and select the last three digits from the table.
Kit base number: 06.3365.XXX

TYPE 243/253

Material	1 x 2 1½ x 2	1½ x 3*	2 x 3	3 x 4	4 x 6	6 x 8	8 x 10
Urethane and NBR seats, NBR seals	001	002	003	004	005	006	007
Urethane and FPM seats, FPM seals	012	013	014	015	016	017	018

Note: 1" to 4" includes back-up ring. Wedge rings are not included. 'DESCO' lubricant included.
* Also 1½ x 2 threaded valve with G and H orifice.

TYPE 263

Material	1½ x 2	2 x 3 2 x 3 x 3	3 x 4 3 x 4 x 4	4 x 6 4 x 6 x 6	6 x 8 6 x 8 x 8	8 x 8 x 8	8 x 10 8 x 10 x 10	10 x 14
Urethane and NBR seats, NBR seals	003	004	005	008	009	010	011	357
Urethane and FPM seats, FPM seals	014	015	016	019	020	021	022	358

Note: 1½" through 4" includes back-up ring. Wedge rings are not included. 'DESCO' lubricant included.

TYPE 249/259

Material	1 x 2 1½ x 2	1½ x 2 1½ x 3*	2 x 3	3 x 4	4 x 6	6 x 8	8 x 10
PTFE seat/seal	200	201	202	203	204	205	206
(set press., psig)	(15-600)	(15-600)	(15-400)	(15-400)	(15-400)	(15-275)	(15-275)
PTFE seat/seal	211	212	213	214	215	216	217
(set press., psig)	(601-1480)	(601-1480)	(401-1480)	(401-1480)	(401-1480)	(276-1480)	(276-1480)

* Also 1½ x 2 threaded valve with G and H orifice.

TYPE 269

Material	1½ x 2	2 x 3 2 x 3 x 3	3 x 4 3 x 4 x 4	4 x 6 4 x 6 x 6	6 x 8 6 x 8 x 8	8 x 8 x 8	8 x 10 8 x 10 x 10	10 x 14
PTFE seat/seal	202	203	204	207	208	209	210	362
(set press., psig)	(15-400)	(15-400)	(15-400)	(15-400)	(15-275)	(50-275)	(15-275)	(50-275)
PTFE seat/seal	213	214	215	218	219	220	221	363
(set press., psig)	(401-1480	(401-1480)	(401-1480)	(401-1480)	(276-1480)	(276-1480)	(276-1480)	(276-1480)

7.2 PILOT - (Includes seals for BFP and FT) Type 243/253, 263

Material	Kit
NBR	04.4749.064
FPM	04.4749.065

7.3 ACCESSORIES - (Supply filter kit includes filter screen)

Accessory	Material	Kit
Spike snubber	NBR	04.6419.012
Spike snubber	FPM	04.6419.013
Supply filter	PTFE/SST	04.6419.014

8 PILOT CONVERSION KITS

8.1 Lift lever conversion kits	
Pilot set pressure	**Kit part no.**
Std. and NACE 25-120 psig	06.3416.003
Std. 121-275 psig and NACE 121-182 psig	06.3416.004
Std. 276-1480 psig and NACE 183-1480 psig	06.3416.005
Std. and NACE above 1480 psig	06.3416.006

Procedure

1. With pilot assembled as shown without cap, spring, spring washers and adjusting screw, back blowdown adjustment stem all the way out.
2. Pressurize inlet to 25 psig and measure travel of spindle. Travel must be .010" to .025"
3. Add shims between bushing and blowdown stem to obtain correct lift. To add shims, lower portion of valve must be disassembled.

Shim	Thickness
03.4010.001	.025"
03.4010.002	.063"
03.4010.004	.012"

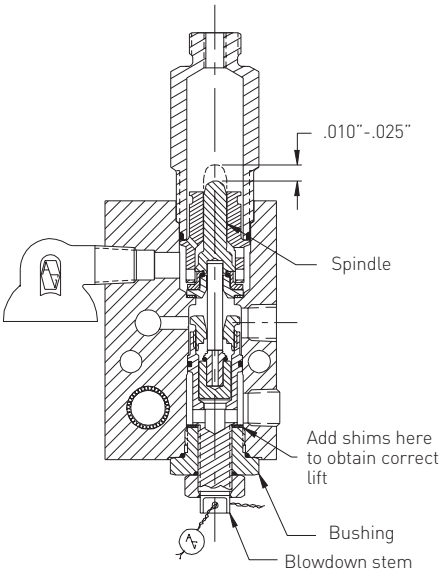
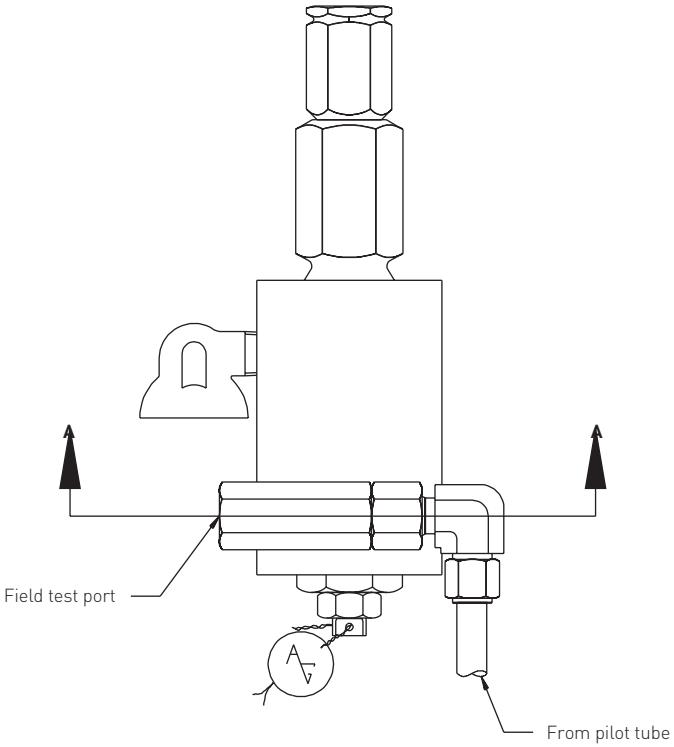
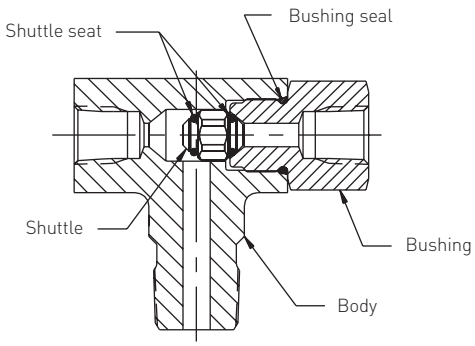


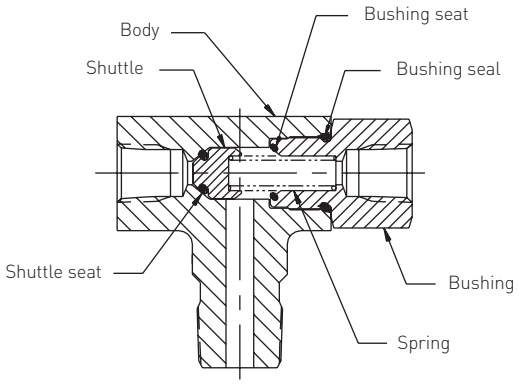
FIGURE 6



Field test assembly



(Standard prior to September 2002)



With bias spring
(Standard beginning in September 2002)

FIGURE 7