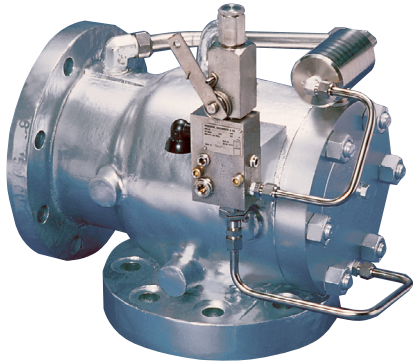




ANDERSON GREENWOOD SERIES 727 PILOT OPERATED SAFETY RELIEF VALVES

MAINTENANCE INSTRUCTIONS

Series 727 Pilot Operated Safety Relief Valves (POSRV) for single pilot manifold steam service
 Before installation these instructions must be fully read and understood



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.

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.

Maintenance Instructions Series 727 Pilot Operated Safety Relief Valves (POSRV) for single pilot manifold steam service. The intent of these instructions is to acquaint the user with the maintenance of 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.

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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. Before installation, the Installation and Operational Safety Instructions should be fully read and understood.

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.

WARNING

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.

ANDERSON GREENWOOD SERIES 727 PILOT OPERATED SAFETY RELIEF VALVES

MAINTENANCE INSTRUCTIONS

1 GENERAL VALVE DESCRIPTION

Operation

The Series 727 Pilot Operated Safety Valves uses the principle of loading the larger area of a differential area piston with line pressure to hold the piston closed up to set pressure.

On rising system pressure, the pilot actuates at set pressure, venting pressure from the main valve dome chamber. When the main valve dome pressure is reduced to 40% of system pressure, the main valve disk lifts off the nozzle seat, thereby venting system pressure through the outlet.

When system pressure drops by 5 to 7% of set, the pilot closes, allowing system pressure to recharge the main valve dome causing the disk to reseat on the nozzle.

When operating below set pressure, the inlet and main valve dome pressures are equal so that the seating force on the main valve seat is equal to the system pressure times the seating area. Since the seat load increases with system pressure, the main valve maintains premium seat tightness up to set pressure.

Refer to Anderson Greenwood Pilot operated safety relief valves 05-9040-372 (VICOM-03099 Winterization Guidelines) and 05-9040-352 for more information regarding Winterization requirements.

1.1 Service configurations

(See Figure 1)

The 727 assembly is shipped in one of two main valve configurations depending upon whether it is to be applied to steam or air/gas service.

The pilot assembly is identical for both services.

1.1.1 Steam service configuration

Valves for steam service are externally identified by the presence of tubing connecting the unloader valve in the manifold assembly to the main valve outlet. When the pilot actuates, it vents the small volume of steam in the dome of the unloader causing the unloader to open. The unloader is connected directly to the main valve dome chamber and allows the pressure in the dome chamber to vent into the outlet of the main valve.

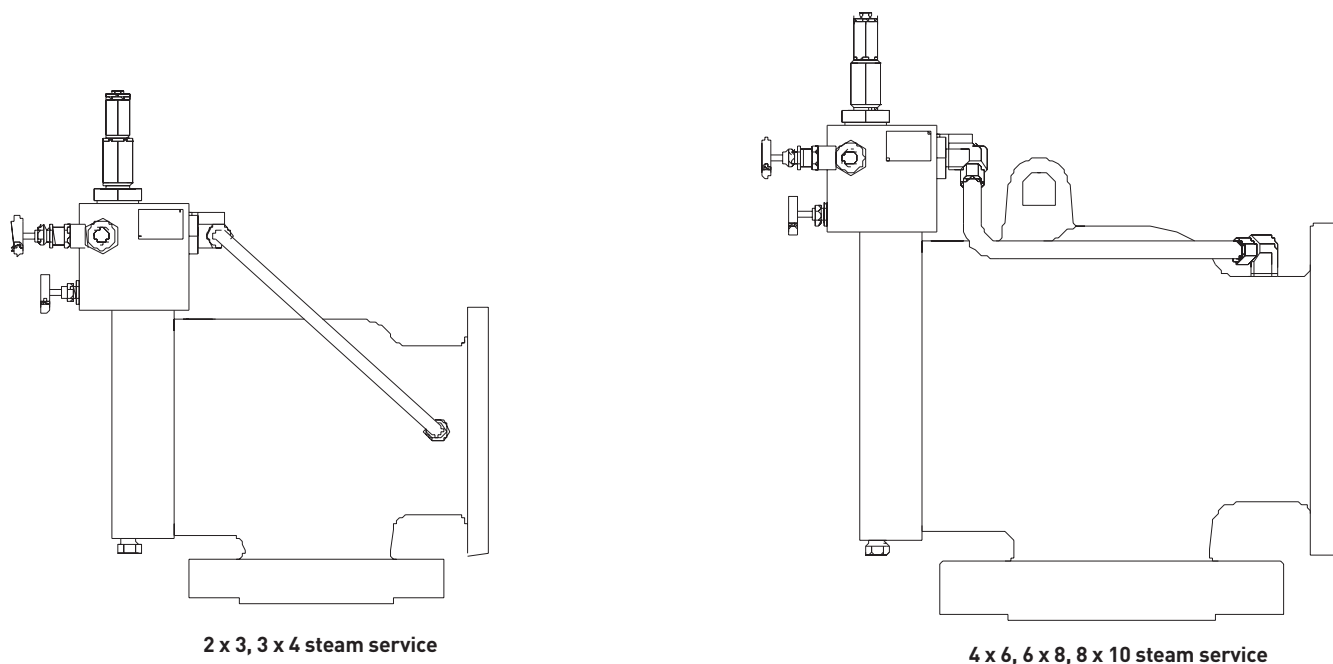


FIGURE 1

ANDERSON GREENWOOD SERIES 727 PILOT OPERATED SAFETY RELIEF VALVES

MAINTENANCE INSTRUCTIONS

2 MAIN VALVE MAINTENANCE

2.1 Disassembly

(Refer to Figures 2 and 3)

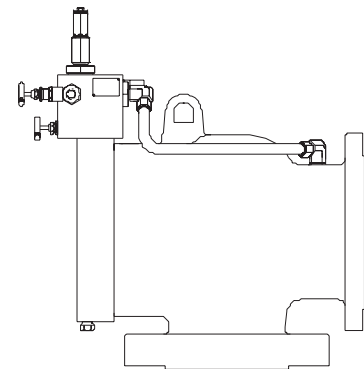
- 2.1.1 **Note:** for ease of repair, the tools and repair kits specified in Section 12 and Section 13 should be used.
- 2.1.2 Disconnect tubing from unloader to outlet flange.
- 2.1.3 Reposition main valve with the cap (2) up. Remove the cap nuts (7). If the cap is stuck to the valve body, free it by tapping around the cap edge with a brass hammer. Carefully raise the cap about 1 inch from the body and determine whether the damper (8) has moved upward while remaining in contact with the underside of the cap. If the damper did not rise freely, proceed with extreme caution in removing the cap. The dome spring (10) is under compression and the spring loaded damper may be stuck in the piston. The damper could suddenly release after the cap is removed possibly causing personal injury. Remove the cap and manifold assembly. Eyebolt holes are located on the cap diameter for handling purposes. Remove damper (8), dome spring (10) and filter assembly (19). Filter may be removed by grabbing sleeve with pliers. Set filter assembly aside for cleaning and inspection. Re-use if not damaged. Remove and discard seal (20) at filter port on both cap and body. Remove plug (18) in cap (2) and remove drain plunger (17) and spring (16). For valves in vapor service with a pressure snubber (93C) (see detail C in Figure 2), remove and visually inspect pressure snubber for blockage. Clean snubber if blocked. For valves in vapor service with remote sense options, (see Detail D in Figure 2) visually inspect remote sense fitting (93D) for blockage. Remove and clean fitting if blocked.
- 2.1.4 Remove piston assembly. For sizes 6 x 8 and 8 x 10, a 1/2 -13 UNC eye bolt can be threaded into back of piston to aid in removal. The weight of 6" and 8" pistons may require use of a lift assist device. Protect disk seat face from damage.
- 2.1.5 Before removing liner (5), remove and discard compacted liner seal (13) being careful not to damage metal surfaces. Remove liner (5).
- 2.1.6 Use only a 12 point socket to remove nozzle retaining screws (9), and spring washers (23). To remove nozzle (3), reinstall two screws 180 degrees apart without the spring washers. Tap lightly on screws and drive nozzle (3) free of seal (15). Remove screws, nozzle (3), nozzle seal (15) and extrusion ring (14).

Discard screws (9), washers (23) and nozzle seal (15). Under no condition re-use items 9, 23, and 15. damper may be stuck in the piston and could suddenly release after the cap is removed. Remove damper (8), dome spring (10) and filter assembly (19). Filter may be removed by grabbing sleeve with pliers. Set filter assembly aside for cleaning and inspection. Reuse if not damaged. Remove and discard seal (20) at filter port on both cap and body. Do not remove unloader (if valve is equipped with one) unless it leaks. Remove pipe plug (18) in cap (2) (See Detail A in Figure 2) and remove drain plunger (17) and spring (16) if valve is so equipped (see detail A in Figure 2).

2.2 Repair

(Refer to Section 12 for repair kits and Section 13 for repair tools.)

- 2.2.1 Inspect the nozzle (3) and disk (29) seat surfaces for nicks or scratches. Restoration of disk and nozzle seat surfaces should only require lapping and polishing. If the seat surfaces are damaged more extensively, machining may be required. Refer to Section 14.
- 2.2.2 Inspect piston rings (11 and 12) for scratches or galling. If replacement is required refer to ring kits listed in Section 12. To replace rings, remove rings and centralizer springs (21 and 22). Discard rings and springs. Assemble new rings and centralizers on piston following the instructions supplied in each kit. If piston ring expanders described in Section 13 are not available, both rings can be hand installed on the piston. Carefully expand correct ring over piston OD. Place brass shim stock under ring gap end to prevent scratching piston. Slide ring into groove.
- 2.2.3 Inspect liner (5) interior for damage or foreign deposits. Replace liner if damaged. Chemical and/or oxide deposits may be removed by polishing with 600 grit paper.



ANDERSON GREENWOOD SERIES 727 PILOT OPERATED SAFETY RELIEF VALVES

MAINTENANCE INSTRUCTIONS

2.3 Assembly

- 2.3.1 **Important:** before assembly, thoroughly clean all valve parts with oil free solvent and dry, paying particular attention to all sealing surfaces. Do not bead or sand blast. Check both damper and nozzle for matching orifice "letter" designators before assembling.
- 2.3.2 Install extrusion ring (14) with radius edge into flange corner, fit nozzle seal (15) around bottom of nozzle (3) (see Detail E in Figure 2). Install nozzle in valve body and lightly secure nozzle with new retaining screws (9) and new Belleville washers (23) (see Detail G in Figure 2 for washer stack orientation). Note that all valve sizes use six washers per screw except the 4 x 6 valve size which uses seven washers per screw. Use a 12 point socket to tighten screws in a clockwise pattern, one revolution per screw, until all screws are fully seated. This procedure will ensure proper compression of new nozzle seal. Do not alternately tighten screws as this method could cause seal failure.
- 2.3.3 Stand valve on its outlet flange; install liner (5) in valve body. Lubricate 45° step in liner with silicone grease.
- 2.3.4 If a piston installation sleeve is used, (see Section 13 for details) place sleeve on top of liner. Lubricate ID of sleeve with silicone grease. Wipe both piston and nozzle sealing surfaces with a clean, lint free, cloth or rag wetted with clean degreasing fluid. Insert piston into sleeve to compress rings with radial hole in piston toward valve inlet (Refer to Figure 2). Insert and center a wooden or plastic dowel into piston and lightly tap piston into liner approximately half way. Remove installation sleeve and press piston down to nozzle. Install spring (10), damper (8) and liner seal (13).
If an installation sleeve is not used, lubricate the ID of liner at both top and mid point with silicone grease. Carefully insert piston with the radial hole toward valve inlet (Refer to Figure 2). Insert and center a wooden or plastic dowel into piston.
Push in top ring with screw driver. Lightly tap piston into liner. Press piston down to nozzle. Install spring (10), damper (8) and liner seal (13).
- 2.3.5 For valves in steam service with standard internal sense, apply Never-Seez to the threads and the sealing edge of the port plug (93A) and screw into the cap by hand and tighten to 35-40 ft-lb torque using a calibrated torque wrench. For valves with remote sense or snubber options, install remote sense/snubber fitting (93, B, C, D) by lightly lubricating the cap bore, the insert's extension barb end, sealing edge and mounting thread. Screw the insert into the cap port as far as possible by hand.
Using a wrench, slowly screw the connector into the cap until it is fully seated.
Finally, using a calibrated torque wrench, tighten the connector to 65-70 ft-lb torque to seat it in the cap body.
- 2.3.6 Insert filter (19) into port in valve body and slide a new dipper tube seal (20) over the filter sleeve (See Figure 2, Detail F).
Note: the manifolded valve requires an 1/8" thick dipper tube seal part. No. 06.0553.002. Do not use the 1/16" thick dipper tube seal part. No. 06.0553.001 in this assembly.
See section 12 for repair kit information.
- 2.3.7 Position mating hole in cap assembly over the filter assembly sleeve and lower onto studs, checking that damper is centered into cap recess before cap seats against valve body. A 1/16" to 1/8" gap must be visible between cap and body. This indicates cap is in proper contact with the liner seal. Alternately tighten opposite cap nuts to maintain parallelism between cap and body until cap is solid against body face. Torque nuts to values in Table I.
- 2.3.8 Reconnect tubing from unloader to outlet flange. If tubing fittings have been removed, coat fitting NPT threads with Never-Seez before reinstalling. Refer to Section 13 for thread seal information.

ANDERSON GREENWOOD SERIES 727 PILOT OPERATED SAFETY RELIEF VALVES

MAINTENANCE INSTRUCTIONS

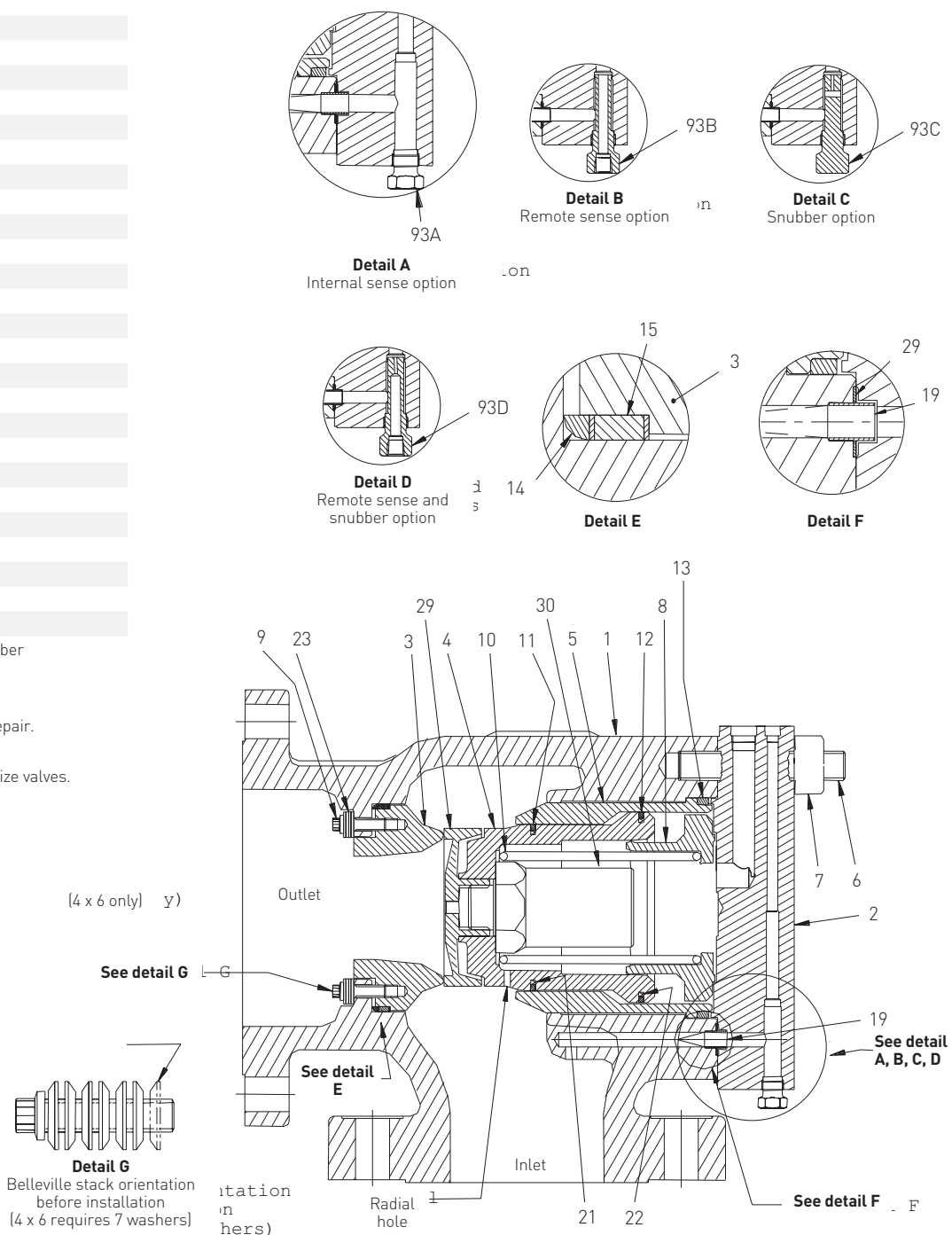
PARTS

Item	Description
1	Body
2	Cap
3	Nozzle
4	Piston
5	Liner
6	Stud
7	Nut
8	Piston damper
9	Retainer screw
10	Dome spring
11	Damper ring
12	Piston seal ring
13	Liner seal
14	Seal extrusion ring
15	Nozzle
19	Filter assembly
20	Seal dipper tube
21	Centralizer spring
22	Centralizer spring
23	Belleville washer
29	Disk
30	Bolt, disk retainer
31	Screw, disk retainer
93A	Pipe plug, remote sense
93B	Remote sense fitting
93C	Pipe plug, snubber
93D	Remote sense fitting/snubber

NOTES

- * Recommended spare parts for repair.
- 1. Used above 15 psig (103 kpag).
- 2. Used in 6" (150 mm) and larger size valves.

FIGURE 2

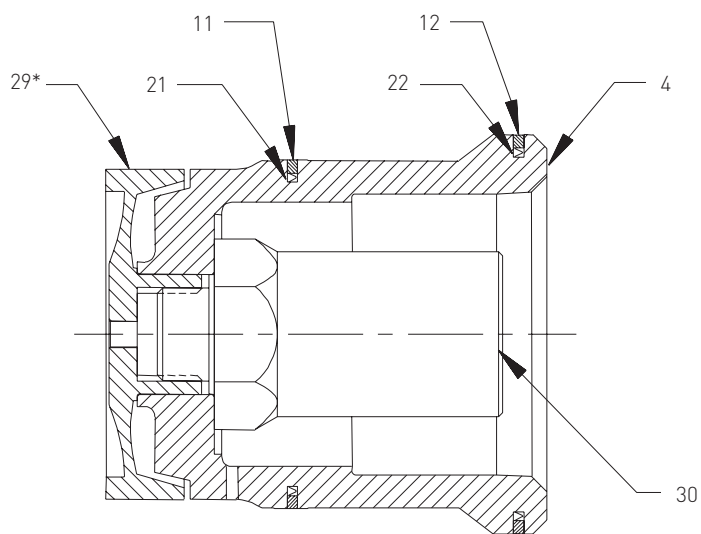


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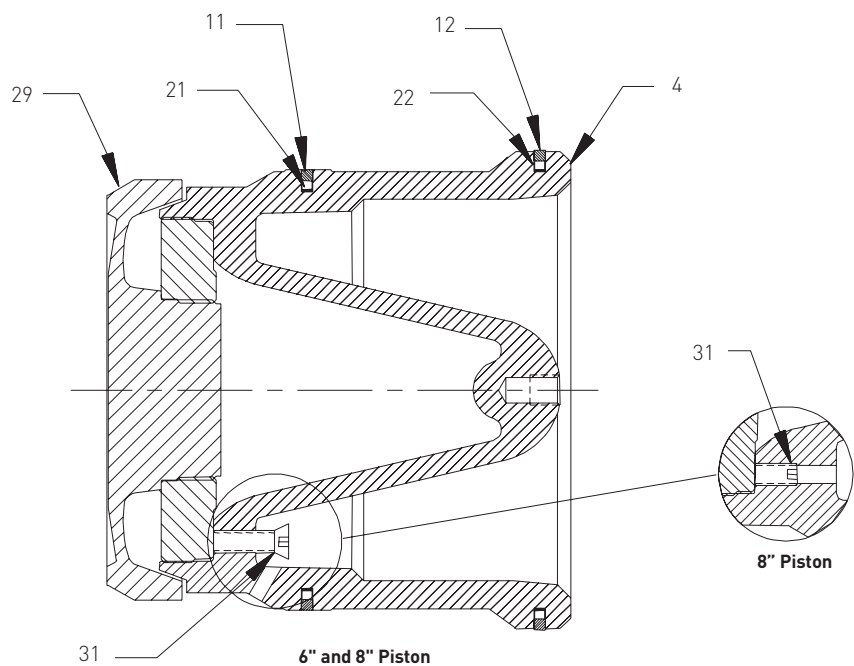
MAINTENANCE INSTRUCTIONS

TABLE 1 - Torque values for valve assembly

Bolt size	Carbon steel
1/4	9
5/16	18
3/8	31
5/16	50
5/16	75
5/16	110
5/16	150
5/16	250
5/16	378
1 (8" 150/300 CL)	405
1 (8" 600 CL)	450



2", 3" and 4" Piston
*Non-removable



6" and 8" Piston

8" Piston

ANDERSON GREENWOOD SERIES 727 PILOT OPERATED SAFETY RELIEF VALVES

MAINTENANCE INSTRUCTIONS

3 UNLOADER MAINTENANCE

3.1 Unloader disassembly

(See Figure 4)

For size 4 x 6 and larger main valves, the unloader piston fits directly into the unloader cavity in the manifold. For 3 x 4 and smaller main valves, a reduced size unloader piston and adapter sleeve fit into the unloader cavity.

3.1.1 Disconnect tubing and remove unloader nozzle bushing (60) and bushing seal (61).

3.1.2 Remove unloader piston (59 or 63) and adapter sleeve (62) if present.

3.2 Unloader repair

Inspect the bushing and piston seat surfaces for nicks or scratches. Restoration of bushing and piston seat surfaces should only require lapping and polishing. If the seat surfaces are damaged more extensively, a new bushing and piston will have to be installed. If replacement is required, refer to kits in Section 13.

3.3 Unloader assembly

(2 x 3 and 3 x 4 main valves, See Figure 4)

The unloader assembly used for these valve sizes is basically an assembly for adapting the standard larger main valve unloader cavity in the manifold to operate with the reduced size unloader piston and nozzle required for proper operation of the two small valve sizes. This assembly consists of an adapter sleeve (62), small unloader piston (63), nozzle bushing (60) and bushing seal (61). Install this assembly as follows:

3.3.1 Clean and degrease all of the unloader components taking special care to protect the unloader piston and nozzle seat faces from contact with any surface.

Note: these lapped and polished surfaces should not be touched at any point in handling except for careful wiping with a soft clean lint free rag wetted with clean degreasing fluid.

3.3.2 Insert the unloader piston (63) into the adapter sleeve (62) as shown in Figure 4 and check the piston movement in the adapter bore. The piston should fit closely in the bore but move freely without binding at any point.

3.3.3 Lightly lubricate adapter sleeve's end face that engages the unloader nozzle bushing with Never-Seez and insert the adapter sleeve, with the piston in place, into the manifold unloader socket until it seats against the back face of the bore as shown in Figure 4.

3.3.4 Place the bushing seal (61) on to the unloader nozzle bushing and lightly lubricate the bushing thread with Never-Seez. Screw the bushing into the manifold socket until a quick rise in bushing turning resistance is felt indicating that the bushing has seated against the adapter sleeve.

3.3.5 Continue tightening the unloader nozzle bushing into the manifold until the bushing's back face seats metal to metal against the manifold face.

3.3.6 Install and align tubing adapter fitting on unloader bushing and reinstall unloader discharge tubing section. Lightly lubricate fitting NPT threads with Never-Seez.

3.4 Unloader assembly

(4 x 6, 6 x 8 and 8 x 10 main valves, See Figure 4)

The unloader piston for these main valve sizes fits directly into the unloader socket bore in the manifold body. This assembly consists of an unloader piston assembly (59), nozzle bushing (60) and bushing seal (61). Install these items as follows:

3.4.1 Clean and degrease all of the unloader components taking special care to protect the unloader piston face and nozzle seat from contact with any surface.

Note: these lapped and polished surfaces should not be touched at any point in handling except for careful wiping with a soft clean lint free rag wetted with clean degreasing fluid.

3.4.2 Insert the unloader piston assembly (59) into the manifold unloader socket until it seats against the back face of the piston bore as shown in Figure 4. During insertion the piston ring (59A) may have a tendency to hang on the front edge of the piston bore section of the unloader socket; if so, a slight wobbling of the piston while lightly pushing on the depressed center of the piston disc should compress the ring into the bore. Once the piston ring is in the piston bore the piston should move freely without binding at any point.

3.4.3 Place the bushing seal (61) on to the unloader nozzle bushing (60), lightly lubricate the bushing thread with Never-Seez and screw the bushing into the manifold socket until the bushing seal is seated in the manifold counterbore. Using a wrench, tighten the unloader nozzle bushing into the manifold until the bushing's back face seats metal to metal against the manifold face.

3.4.4 Install and align tubing adapter fitting on unloader bushing and reinstall unloader discharge tubing section. Lightly lubricate fitting NPT threads with Never-Seez.

3.4.5 Continue tightening the unloader nozzle bushing into the manifold until the bushing's back face seats metal to metal against the manifold face.

3.4.6 Install and align tubing adapter fitting on unloader bushing and reinstall unloader discharge tubing section. Lightly lubricate fitting NPT threads with Never-Seez.

ANDERSON GREENWOOD SERIES 727 PILOT OPERATED SAFETY RELIEF VALVES

MAINTENANCE INSTRUCTIONS

4 HAND VALVE MAINTENANCE

The manifold block hand valves are intended to function for the life of the valve with no maintenance. During POSRV maintenance, both the field test and the manual blowdown hand valves should be removed and checked for debris. Damaged hand valves should be replaced with new assemblies. When re-installing hand valves be sure to orient handles as shown in Figure 10. (See Section 12 for hand valve part no.)

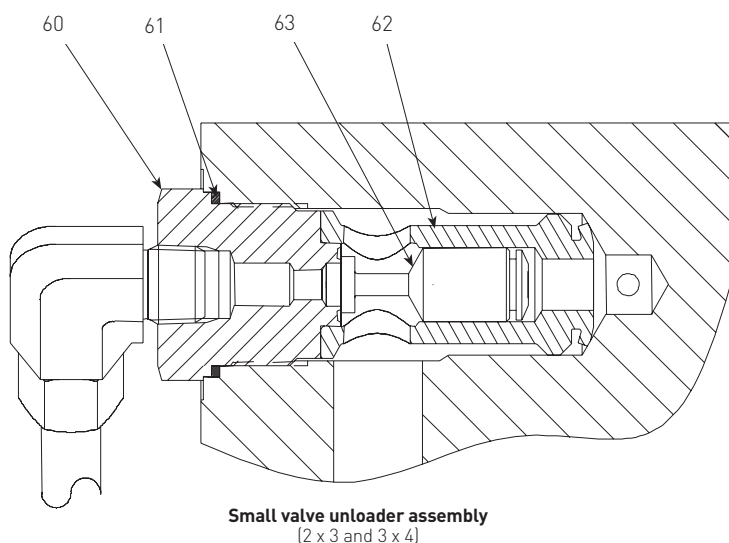
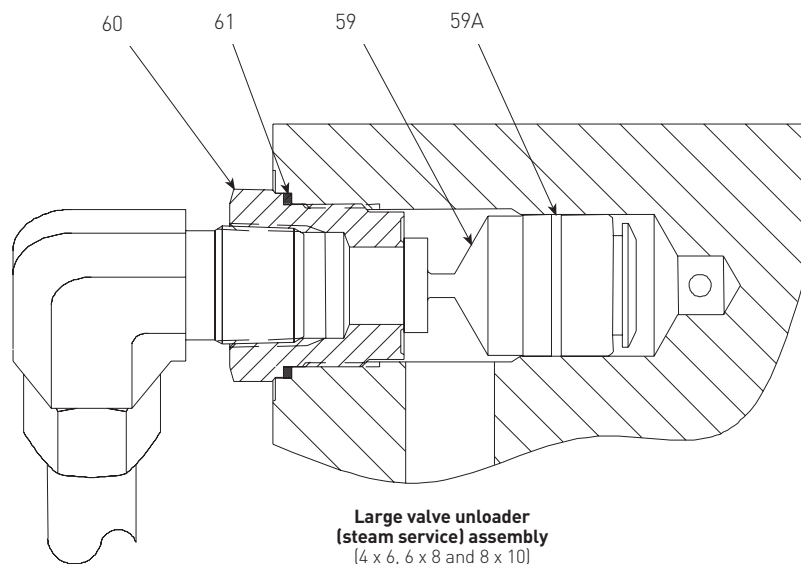


FIGURE 4

ANDERSON GREENWOOD SERIES 727 PILOT OPERATED SAFETY RELIEF VALVES

MAINTENANCE INSTRUCTIONS

5 FIELD TEST ASSEMBLY MAINTENANCE

(See Figure 5)

The manifold field test connection possesses a spring loaded piston assembly for isolating the pilot from the main valve inlet or remote sense connection pressure during pilot field testing. This assembly is metal seated and should not require field servicing other than inspection and cleaning.

NOTE

Fine finishes are required for proper performance of the field test piston and for the metal to metal sealing of the field test bushing and the manifold. No sandblasting, wire brushes or coarse abrasive materials should be utilized for cleaning any of the field test components or the manifold field test port surfaces.

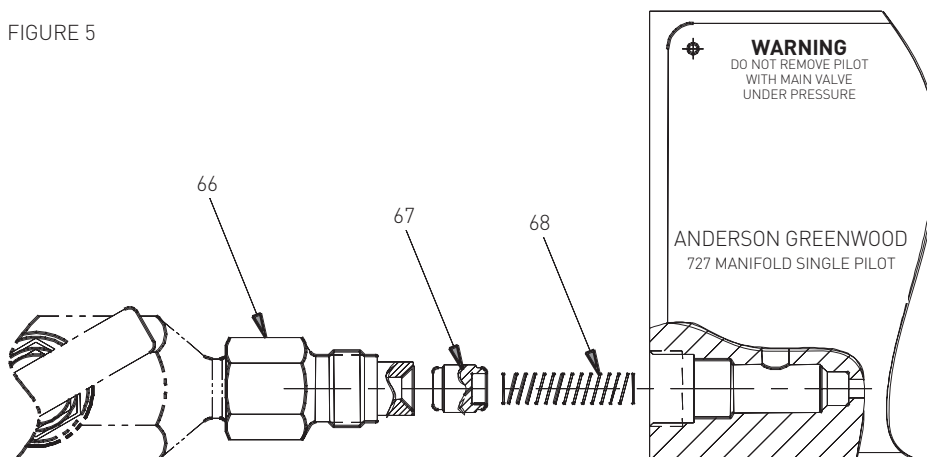
5.1 Field test disassembly

- 5.1.1 Using a 7/8" open end wrench loosen and remove field test bushing (66) from the manifold port. At this time, the field test hand valve may also be removed from the field test bushing for ease of inspection and cleaning or replacement, if required.
- 5.1.2 The piston bias spring (68) should push piston (67) out as the field test bushing is removed, if not, use a shop air hose to gently blow into the open port at the bottom of the pilot manifold socket to eject the piston.
- 5.1.3 Gently remove the piston bias spring from the field test port.

5.2 Field test cleaning and assembly

- 5.2.1 Check and clear the bushing and hand valve port of debris by opening the hand valve to its full open position and applying a compressed air jet to the hand valve NPT port. Use a soft cloth and solvent to clean the field test bushing tapered seat face.
- 5.2.2 With the field test assembly removed, the main valve cap and manifold inlet porting and field test port cavity may be cleared by removing fitting 93A, C, or D located on the main valve cap (See Figure 2) and applying a compressed air jet to the opening (Air can be applied directly through remote sense fitting 93B).
- 5.2.3 The field test port bore and back seat may be cleaned with solvent and a soft cloth or fiber bottle brush inserted into the port. Do not use a wire bottle brush to clean the field test port or back seat as this will damage the backseat surface finish and result in excessive leakage and test gas usage when field testing in service.
- 5.2.4 Use a soft cloth and solvent clean the field test piston.
- 5.2.5 Reassemble bias spring (68), and piston (67) into manifold making sure that the spring is seated in the piston spring pocket, and check piston for freedom of movement. Do not lubricate the piston.
- 5.2.6 Apply a light coating of Never-Seez to the threads and the sealing edge of the field test bushing and screw bushing into the manifold by hand and tighten to 35-40 ft lb torque using a calibrated torque wrench. If removed, install field test hand valve with bonnet oriented as shown in Figure 10.

FIGURE 5



ANDERSON GREENWOOD SERIES 727 PILOT OPERATED SAFETY RELIEF VALVES

MAINTENANCE INSTRUCTIONS

6 PILOT MAINTENANCE

6.1 Pilot disassembly

(See Figure 6)

While disassembling the pilot valve, place all parts in an orderly arrangement to facilitate reassembly in the proper sequence.

Before beginning disassembly, have the correct tools and repair kits specified in sections 12 and 13 available.

- 6.1.1 Use a 2" open end wrench to loosen the pilot valve bushing (501) and remove the pilot valve from the manifold.
- 6.1.2 Use a 1 $\frac{1}{8}$ " wrench to hold bonnet (509) and remove bonnet cap (512). Loosen locknut (510) and back out adjusting screw (511) to relieve pilot spring compression.
- 6.1.3 Remove bonnet (509), being careful to catch spring (507) and spring washers (506 and 508) when they disengage. Turn pilot upside down on a soft surface to remove remaining internal parts from upper half of body. Discard disk (520). Remove nozzle (515) and seal (504) with a pair of needle nosed pliers and discard.
- 6.1.4 Loosen and remove locknut (525). Place blowdown adjustment bushing (523) in a soft jaw vise. Using a 1 $\frac{5}{16}$ " wrench on the flats provided on the pilot body (500), loosen and remove the blowdown assembly. Loosen and remove the blowdown adjustment screw (522) from the bushing. Remove shims (527) from adjustment screw.
- 6.1.5 Place reseat seat (521) in a vise. Using an allen wrench on the blowdown adjustment screw (522), loosen and remove seat. Remove reseat piston (524) located inside. Discard both reseat seat (521) and reseat piston (524).

6.2 Pilot repair

Replace discarded parts with new nozzle (515), seal (504), reseat seat (521), and reseat piston (524). Refer to repair kits in section 13.

6.3 Upper pilot assembly

(See Figure 7)

Before assembly, thoroughly clean all parts with solvent and dry. In particular, the nozzle seal counterbore in the pilot body must be inspected and cleaned of any residual graphite flakes. The lapped and polished metal seats are the key to proper pilot operation and care must be taken in handling these components. This is particularly important for the pilot main seat disc and nozzle.

NOTE

These lapped and polished surfaces should not be touched at any point in handling except for careful wiping with a soft clean lint free towel wetted with clean degreasing fluid.

- 6.3.1 Assemble pilot nozzle, disc, disc spring washer, disc ball, spindle and guide shown in Figure 7 by the following steps:
 - A. Remove pilot nozzle (515) from protective wrapping and using a lint free cloth and clean degreasing fluid gently clean oil from nozzle seat and set nozzle on its base on a flat clean surface.
 - B. Remove pilot disc (520) from its wrapping, clean as above, and gently place it face down on nozzle seat.
 - C. Insert Belleville spring washer (519) with cone upward into recess in top of disc and place ball (518) into center of washer as shown.
 - D. Place spindle (516) on top of disc and nozzle assembly.
Note: if all components are correctly in place the spindle will sit in this position without support.
 - E. Center guide (517) over spindle/nozzle assembly and slide it down over spindle and nozzle until it seats on nozzle step
- 6.3.2 While gripping both nozzle and guide pick up guide/nozzle subassembly, flip subassembly upside down, and install nozzle seal (504) onto bottom step of nozzle.
- 6.3.3 While holding guide/nozzle subassembly upside down in one hand and pilot body (500) upside down in the other, insert the guide/nozzle subassembly into the pilot body until the nozzle seats in the body's nozzle seal counterbore and flip the completed assembly right side up.
- 6.3.4 Install the special lift test dial indicator housing as shown in Figure 8, flip assembly upside down, clamp indicator housing hex in soft jaw vise and using the 1 $\frac{5}{16}$ " wrench flats provided on pilot body tighten body to indicator housing sufficiently to compress pilot nozzle seal.
Note: failure to tighten housing may result in a change of pilot lift setting when the pilot spring bonnet is installed during final pilot assembly.
- 6.3.5 Compressing of the nozzle seal during step 4 will sometimes result in extrusion of particles of GRAFOIL® seal material between the bottom projection on the nozzle and the pilot body. Check for this condition by turning the pilot body upside down and visually inspecting the joint between the bottom of the pilot nozzle and the pilot body bore. If any loose seal material is seen remove it with a jet of compressed air.

ANDERSON GREENWOOD SERIES 727 PILOT OPERATED SAFETY RELIEF VALVES

MAINTENANCE INSTRUCTIONS

6.4 Assembly and installation of blowdown assembly

(Figures 6 and 7)

- 6.4.1 Clean polished seat surface of reseal piston (524) and insert it into the blowdown adjustment screw (522) with lapped face turned toward internally threaded opening.
- 6.4.2 Clean polished seat surface of reseal seat (521), lubricate threads lightly with fluorolube to prevent galling and screw it into the blowdown adjustment screw.
- 6.4.3 Turn blowdown screw assembly upside down, clamp reseal seat hex in vise and securely tighten seat into adjustment screw with a 1³/₁₆" Allen wrench.
Note: do not insert allen wrench so far into socket that it presses the reseal piston against the reseal seat during tightening as this could cause scoring of the piston's and reseal seat's polished surfaces.
- 6.4.4 Lubricate external threads of blowdown adjustment screw (522) with Fluorolube and screw it into blowdown adjustment bushing (523).
- 6.4.5 Install a shim stack (527) of approximately .100 inches height onto the blowdown adjustment screw. This initial shim stack height may require adjustment later to set the minimum pilot lift as explained in Figure 8. Multiple C-washer shims of 0.012, 0.025, and 0.063 inches thickness are supplied to be used as required.
- 6.4.6 Hand tighten the blowdown adjustment screw into the blowdown adjustment bushing until the shim stack seats against top of the bushing. Lightly lubricate blowdown bushing mounting threads.
- 6.4.7 Insert spacer rod (503), round conical end first, into the blowdown assembly, install the blowdown assembly into the lower end of the pilot body (500) and, using the wrench flats on the pilot body, lightly tighten the bushing. Do not over tighten bushing since it may have to be removed for shim height adjustment performed below.

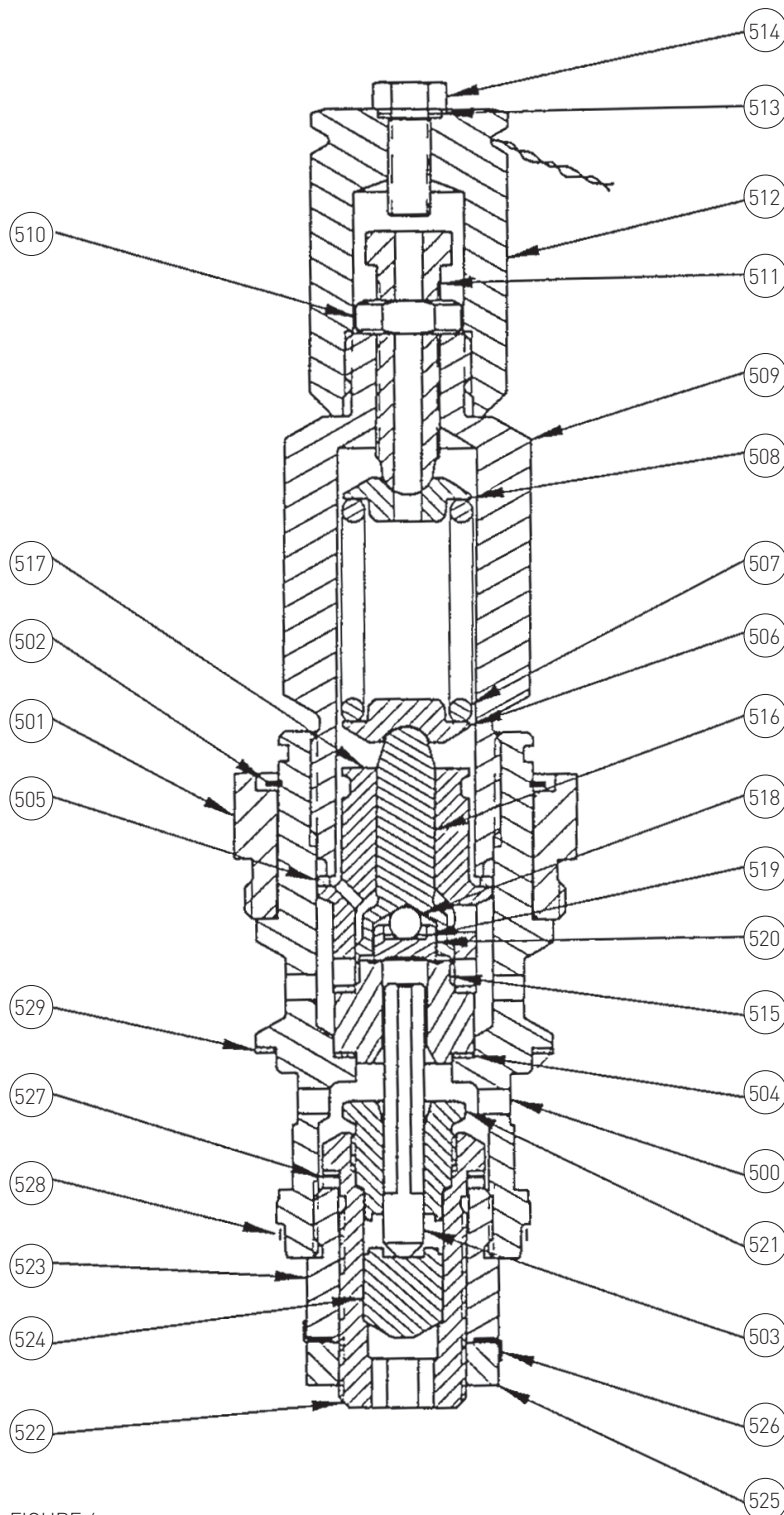


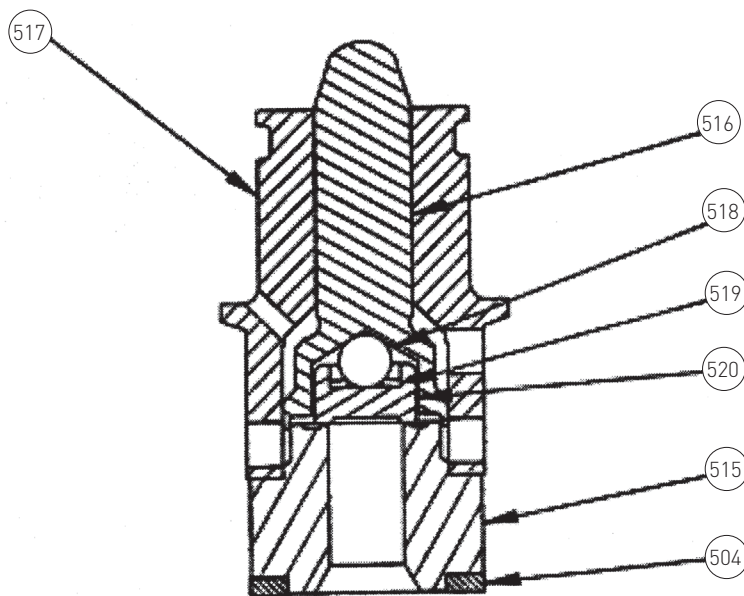
FIGURE 6

ANDERSON GREENWOOD SERIES 727 PILOT OPERATED SAFETY RELIEF VALVES

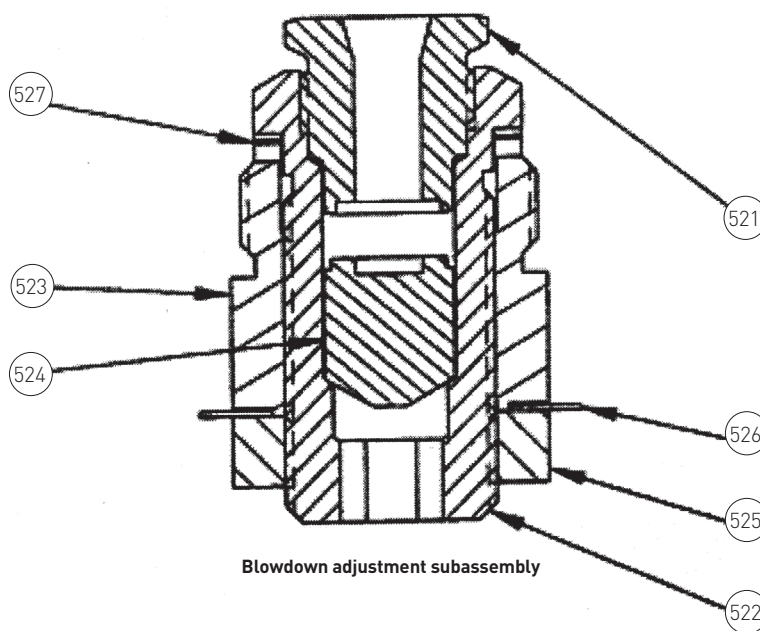
MAINTENANCE INSTRUCTIONS

7 PILOT MINIMUM LIFT ADJUSTMENT AND PRESSURE SETTING PREPARATION

- 7.1.1 Install dial gage in top of indicator housing.
- 7.1.2 The pilot assembly is now ready for setting of the minimum pilot lift as described in Figure 8. This procedure will require Anderson Greenwood pilot setting fixture assembly Part no. 06.3036.002 and test tank installation (see Figures 8 and 9).
- 7.1.3 After installing shims to set minimum pilot lift to the specified range, clamp the blowdown bushing hex in a soft jawed vise and, using the 1^{5/16}" wrench flats provided on the pilot body, tighten the blowdown bushing.
- 7.1.4 Using the pilot test fixture, verify the minimum lift setting and adjust the blowdown adjustment screw in until pilot lift is approximately .050". This will put the blowdown near the normal range for final adjustment.
- 7.1.5 Install blowdown locking seal (526) around shoulder ring on bottom of blowdown bushing (523). Install blowdown lock nut (525) hand tight. (See Figures 6 and 7)
- 7.1.6 Remove the special housing and dial indicator
- 7.1.7 Insert top spring washer w/hole (508), spring (507) and bottom spring washer (506) into bonnet. Place bonnet spring washer (505) over guide (517) and screw bonnet assembly into pilot body. Install adjustment screw (511) with locknut (510). (See Figures 6 and 7)
Note: apply a very light coat of fluorolube to adjustment screw and bonnet mounting threads before assembly).
- 7.1.8 Turn pilot assembly upside down, clamp bonnet hex in soft jaw vise and using the 1^{5/16}" wrench flats provided on pilot body tighten body to bonnet securely to completely seat the nozzle gasket.
- 7.1.9 The pilot is now ready to be adjusted for set pressure and reseal pressure.



Guide nozzle subassembly



Blowdown adjustment subassembly

FIGURE 7

ANDERSON GREENWOOD SERIES 727 PILOT OPERATED SAFETY RELIEF VALVES

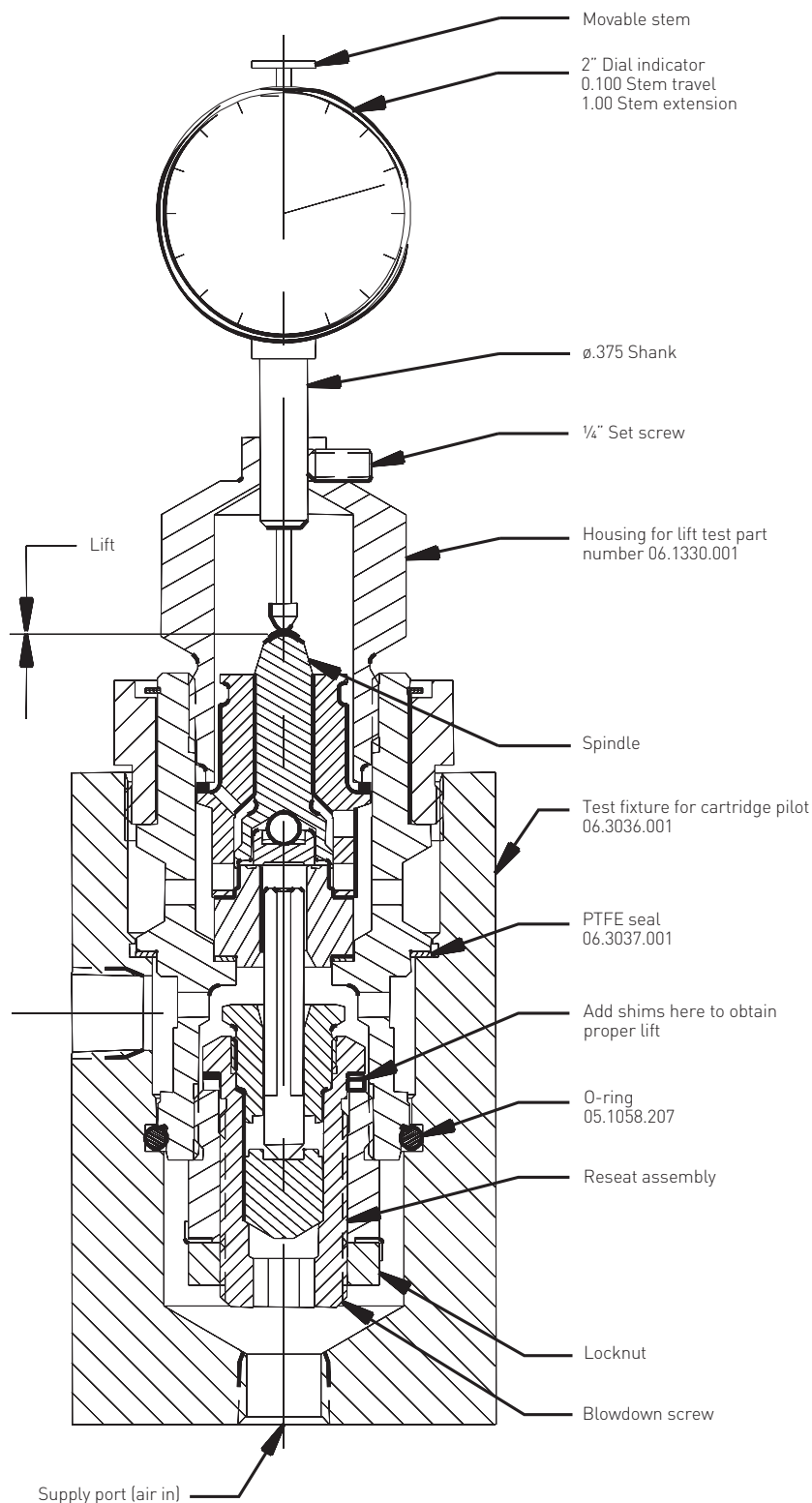
MAINTENANCE INSTRUCTIONS

Shim	Thickness
06.2819.003	.063
06.2819.002	.025
06.2819.001	.012

Lift	Air	Steam
	.005 - .015	.010 - .025

1. Install pilot on test stand.
2. With pilot assembled as shown, without spring, spring washer and adjusting screw, back blowdown adjustment stem all the way out (downward position). Full counterclockwise position.
3. Pressurize inlet to 25 psig and measure lift of spindle. Lift must be .010 to .025. Physically cycle dial indicator up and down to measure pilot lift.
4. Add shims between bushing and blowdown stem to obtain correct lift. To add shims, the reseal assembly must be removed from body. Shims are "C" washers, therefore disassembly of lower unit is not required. Snap shims on or off and combine as required to meet lift requirements. Measure shim thickness before removal so thickness adjustments can be made as required.

FIGURE 8



ANDERSON GREENWOOD SERIES 727 PILOT OPERATED SAFETY RELIEF VALVES

MAINTENANCE INSTRUCTIONS

8 PILOT SET AND RESEATING PRESSURE ADJUSTMENT

Two pilot adjustments are provided; one for adjusting the pressure at which the pilot opens (set pressure) and one for varying the pressure at which the pilot closes (reseating pressure).

8.1 Definitions

Definitions of test pressures: (unless otherwise specified on the procurement document).

- 8.1.1 Set pressure - the pressure at which the pilot reduces the main valve dome to 40% or less of supply. Also referred to as nameplate set.
- 8.1.2 Cold differential test pressure - the pressure at ambient temperature which the pilot is adjusted to open on the test stand and which includes corrections for certain service conditions such as high temperature. This pressure is also included on the main valve nameplate.
- 8.1.3 Cracking pressure - the point at which with increasing pressure the pilot exhibits 60 bubbles per minute air leakage or first visible steam leakage.
- 8.1.4 Reseating pressure - the pressure at which the pilot valve closes.
- 8.1.5 Dome pressure - the pressure which is present, at any given time, in the main valve "dome" area.
- 8.1.6 Blowdown - the difference between the set pressure and the reseating pressure, expressed as a percent of set pressure, or in psig.

8.2 Test procedures

The ASME Section VIII and Section XIII Pressure Vessel Code requires the pilot on pilot operated valves for steam service be set using steam except those pilots which have set pressure beyond the capability of the test facility. These pilots may be set using air. Current Anderson Greenwood procedures require all steam valves to be set on air and verified on steam as described in the following sections of this report. All pilots for vapor service are required only to be set on air using the pilot test stand. A pilot's air set pressure is defined as the cold differential test pressure and is indicated as such on the main valve nameplate.

- 8.2.1 Test set up - install the pilot valve on the test drum similar to that shown in Figure 9. The "dome" connection is a blind connection with a pressure gauge to indicate the dome pressure reduction achieved while the pilot actuates at set pressure. The test drum must be equipped with cartridge pilot field test fixture assembly Anderson Greenwood part no. 06.3036.002.

- 8.2.2 Set pressure adjustment (Refer to Figure 6) - to adjust pilot set pressure remove pilot cap (512), loosen locknut (510) and rotate spring adjusting screw (511) clockwise to raise set pressure or counter clockwise to lower set pressure, as required.

Note: to ensure an accurate pilot action tighten locknut and replace pilot cap after each adjustment is made.

- 8.2.3 Reseat adjustment - to adjust the reseating pressure, depressurize the pilot test fixture and remove pilot from the fixture. Loosen the blowdown locknut, rotate blowdown screw clockwise to shorten blowdown or counter clockwise to increase blowdown as required, and tighten locknut.
- 8.2.4 Performance check - reinstall pilot on pilot test fixture and cycle the pilot valve a minimum of three times after the above adjustments to verify it is relieving and reseating at consistent pressures. Increase and decrease the pressure slowly during these cycles to obtain an accurate reading of the test pressures and to expose any erratic pilot performance.

8.3 Pilot performance

- 8.3.1 Slowly increase the pressure at the inlet port until leakage is detected at the pilot exhaust port. Check for leakage with a bubble tester. This pressure shall be recorded as the cracking pressure.
- 8.3.2 Further increase the pressure at the inlet port until the pilot actuates or "pops." This pressure shall be recorded as the set pressure.
- 8.3.3 Shut off the inlet pressure to the test accumulator and bleed inlet pressure to allow the pilot to reseal. This pressure shall be recorded as the reseating pressure. Check the valve for leakage at the exhaust port with a bubble tester.
- 8.3.4 Repeat steps 1 through 3 a minimum of three times. The cracking pressure, set pressure and reseating pressure shall be within the limits specified in the applicable performance requirements for three consecutive cycles. The valve action shall be consistent.
- 8.3.5 Slowly increase the inlet pressure until the crack test pressure specified in the applicable valve specification sheet is reached. Maintain this pressure for one minute and check for leakage at the exhaust port with a bubble tester.
- 8.3.6 Tighten locknut (525) and bend tabs of blowdown locking seal (526) as shown in Figure 6. Replace cap (512) and tighten.

ANDERSON GREENWOOD SERIES 727 PILOT OPERATED SAFETY RELIEF VALVES

MAINTENANCE INSTRUCTIONS

8.4 Performance requirements

Cold differential test pressure is the increase in specified set to compensate for the change in spring force with increased temperature.

Cold differential test is the air test bench setting pressure. Specified set is the nameplate set pressure used to determine relief capacity.

Cold differential test Pressure

Operating temperature

Below 295°F	100% of specified set
296°F to 400°F	101% of specified set
401°F and above	103% of specified set

Set pressure tolerance ⁽¹⁾

Above 70 psig	± 3% of specified cold differential test
70 psig and below	± 2 psig of specified cold differential test

Crack pressure

50 psig to 1000 psig	90% +10%/-0% of specified cold differential test
----------------------	--

Reseat pressure

50 psig to 1000 psig	94% ±2% of specified cold differential test
----------------------	---

Leakage test

Steam service - air on pilot test stand	Not to exceed 60 bubbles per minute at 90% of set pressure
Steam test	No visible condensate on metal rod at pilot outlet for 10 seconds when tested 3 minutes after reseal

NOTE

1. ±3% or 2 psig is ASME specified performance tolerance.

ANDERSON GREENWOOD SETTING TOLERANCE

Setting tolerance

Above 70 psig	Set 0% to 2% above specified cold differential test
70 psig and below	0 to 1 psig above specified cold differential test

ANDERSON GREENWOOD SERIES 727 PILOT OPERATED SAFETY RELIEF VALVES

MAINTENANCE INSTRUCTIONS

9 PILOT INSTALLATION

(See Figure 10)

This valve assembly requires the installation of two cartridge pilots assembled as instructed in Section 5. The pilot installation requires two seals: a metal O-ring dome isolation seal (528) and a main pilot metal wedge seal (529). Install the pilot and its seals as follows:

WARNING

The metal O-ring used on this pilot is a thin walled hollow tube and therefore should be handled with some care when installing to prevent bending or denting that may reduce its sealing ability. Similarly, the main metal wedge seal depends on its sharp inner and outer edges for sealing and therefore these edges must be protected from denting and/or nicks during the seal's handling and installation.

- 9.0.1 Lightly lubricate the metal O-ring (528) with Fluorolube and install it on the pilot body (500) using O-ring installation tool (Anderson Greenwood Part No 06.2978.001) to expand it over the tapered ring expander section and onto the pilot body sealing diameter.
- 9.0.2 Inspect the valve manifold pilot socket to insure that its pilot mounting threads are clean and free of burrs, its seal bores are clean and it is clear of debris.

CAUTION

Do not use any sharp edged tools to clean or deburr sealing surfaces in the manifold pilot socket.

- 9.0.3 Insert the metal wedge seal (529) into the manifold pilot socket's seal counterbore with the conical taper upward.
- 9.0.4 Insert the cartridge pilot into the manifold socket until its mounting bushing engages socket thread and then tighten the bushing by hand as far as possible.
 - Note:** the pilot bushing threads are coated with a baked-on high temperature friction-reducing coating and therefore do not require additional lubrication but may be lightly lubricated if preferred.
- 9.0.5 The pilot bushing tightening procedure during pilot installation is performed using a 2" open end wrench. To perform this step, slowly tighten the pilot bushing until a sharp rise in bushing turning resistance indicates that the pilot and seal are fully seated metal to metal with the manifold and the wedge seal is fully engaged. The maximum torque required to accomplish this tightening step is approximately 70 to 80 ft-lb.
 - Note:** during this tightening process there may be two initial increases in turning resistance felt prior to final seating of the pilot. These increases are caused first, by the engagement of the metal O-ring with the manifold body and second as the wedge seal initially engages and then deforms as it seals with the manifold.

Dome pressure should be zero when pilot is actuated and no gas flow is detected at pilot vent.

This valve must be closed when setting pilots above 600 psig

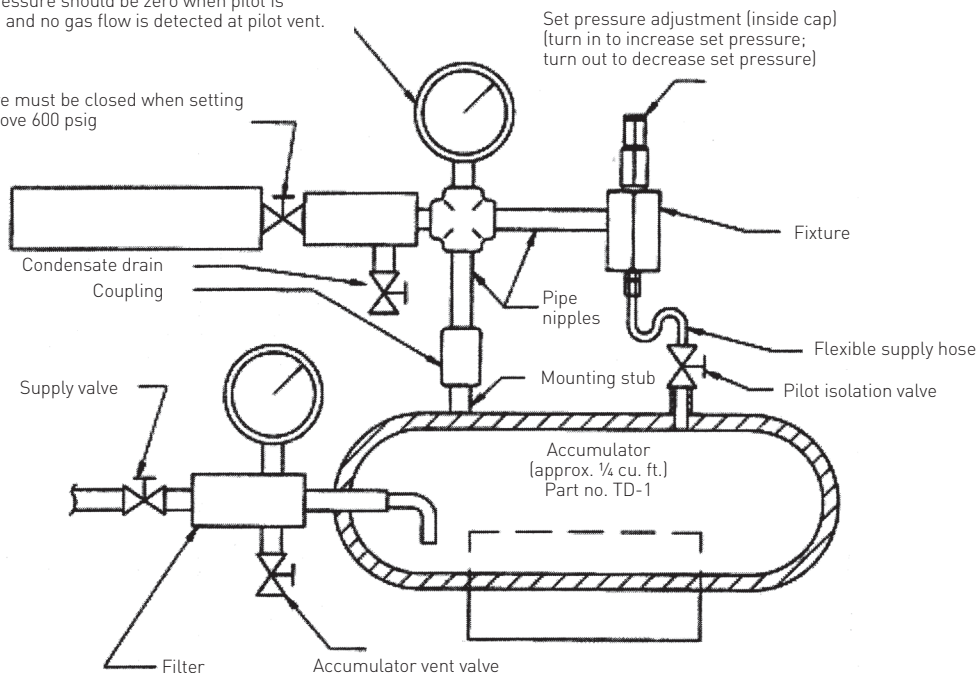
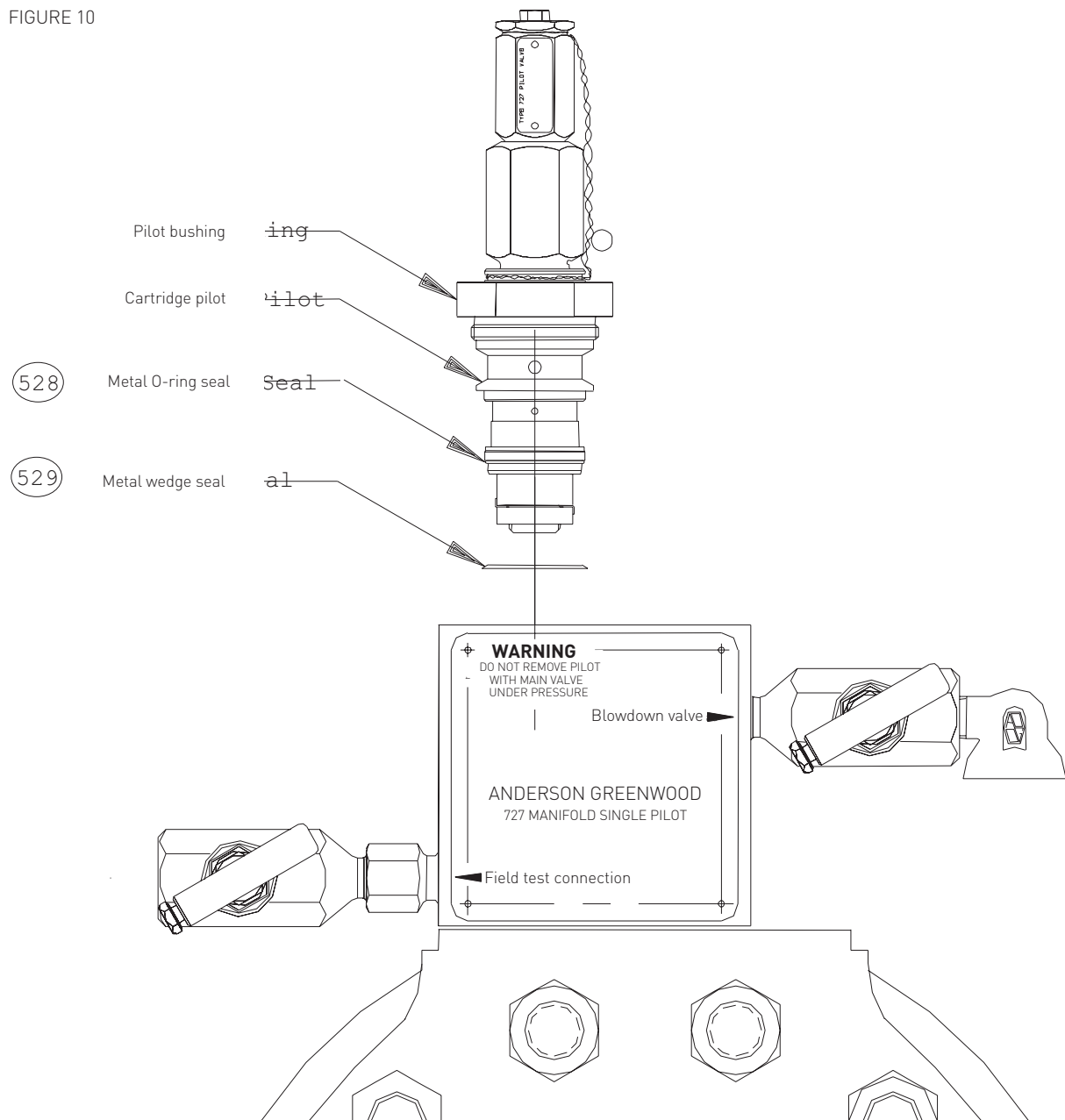


FIGURE 9

ANDERSON GREENWOOD SERIES 727 PILOT OPERATED SAFETY RELIEF VALVES

MAINTENANCE INSTRUCTIONS

FIGURE 10



ANDERSON GREENWOOD SERIES 727 PILOT OPERATED SAFETY RELIEF VALVES

MAINTENANCE INSTRUCTIONS

10 VALVE ASSEMBLY LEAK TESTS

Air test (See Figure 11)

For the start of this test, insure that the field test hand valve and manual blowdown hand valve on the manifold are closed.

10.1 Internal leak test

Apply pressure to the inlet equal to 90% of the set pressure. Perform the following:

- 10.1.1 Check for nozzle seal leakage by applying leak test solution to the nozzle screws and the nozzle body joint. No leakage is permitted from this seal.
- 10.1.2 Perform a bubble rate leakage test at the main valve outlet. Maximum observed valve leakage shall not exceed 20 bubbles in one minute.
- 10.1.3 If excessive leakage is observed check the main valve seat for leakage by applying leak check fluid to the seat perimeter at the top of the nozzle bore. If this is the source of the leakage, disassembly of the valve and relapping of the piston disc is required. During reassembly replace the nozzle screw Belleville washers, liner seal and dipper tube port seal as these items are not reusable.

10.2 External leak test

- 10.2.1 After completing the internal leak test, check all external joints, seals, and hand valve bonnets for external leakage by applying leak test solution. Give particular attention to the manifold/main valve cap joint. If a leak is observed between the main valve's cap and body, or between the manifold and cap, or around the manifold port plugs, contact the factory.
- 10.2.2 Check the field test and manual blowdown hand valve seats for leakage with a bubble test bottle applied to the field test port and manual blowdown vent fitting discharge.
- 10.2.3 After completing the above test then check the cartridge pilot main wedge seal for tightness with a bubble tester applied to the manifold pilot vent fitting for the pilot. No leakage should be observed (See Note). If leakage is observed depressurize valve and using a 2" wrench on each pilot bushing check that the pilot main wedge seal is fully seated. Then repressurize valve and recheck leakage.

Note: for steam service valves - observed air leakage at each vent should not exceed the values determined from the pilot performance test (see Section 7) for each respective pilot seat.

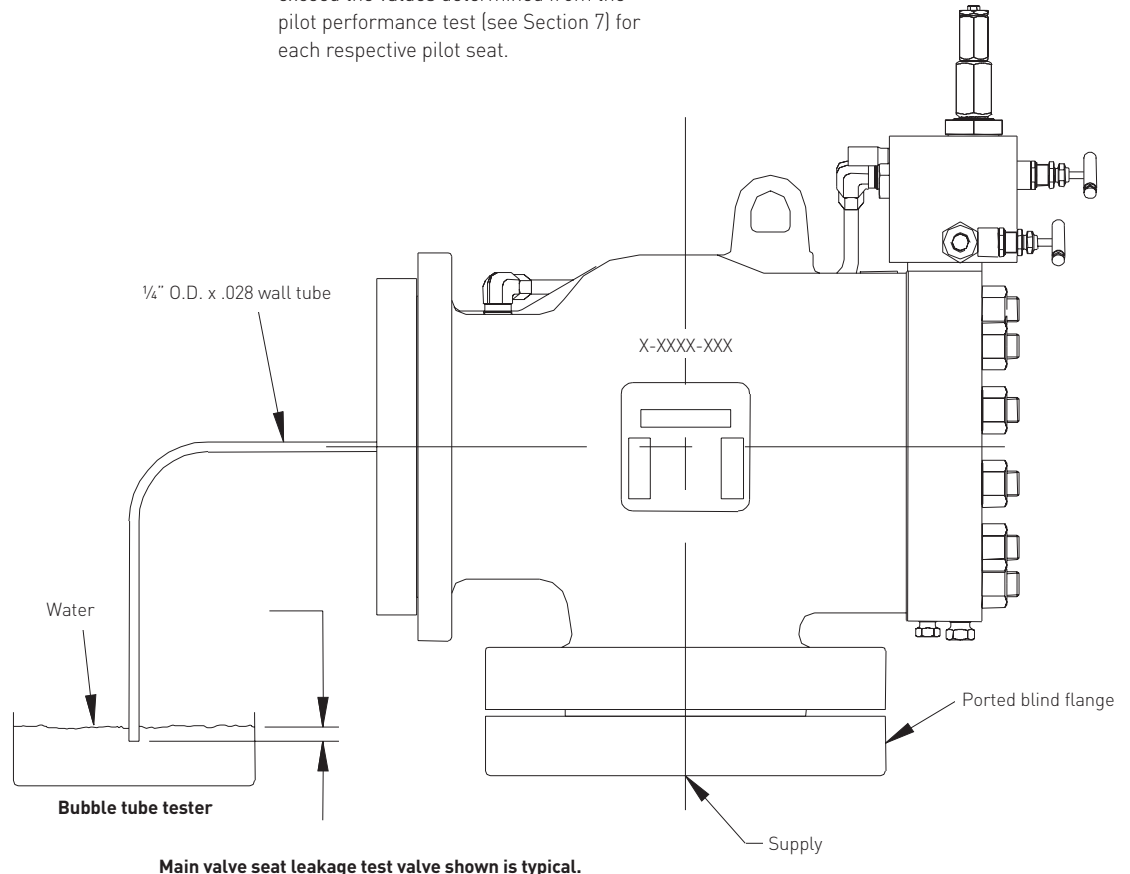


FIGURE 11

ANDERSON GREENWOOD SERIES 727 PILOT OPERATED SAFETY RELIEF VALVES

MAINTENANCE INSTRUCTIONS

11 PILOT SET PRESSURE TESTS

Hot set pressure verification

- A. Hot set pressure verification using steam test tank (steam service only)

General

Mount valve assembly on the steam test stand, close field test and manual blowdown hand valves, pressurize valve to 80% of set pressure followed by a minimum one hour valve assembly "warm-up" period.

11.1 External leakage test

- 11.1.1 After the valve has "warmed-up" check for visible external leakage at all external joints and seals. Give particular attention to the manifold body to main valve cap joint, cap port plug, unloader bushing seal and hand valve bonnet packing.
- 11.1.2 Check pilot discharge vent for indications of pilot main wedge seal leakage. If steam leakage is observed, isolate and depressurize POSRV assembly and using a 2" wrench on the pilot bushing check that the pilot main wedge seal is fully seated. Then open isolation valve to pressurize POSRV and recheck pilot vent for leakage.

11.2 Pilot set pressure test

In order to accurately verify pilot set pressure on steam it is necessary that the valve manifold be adequately heated. Experience has shown that this condition cannot be achieved in a reasonable time at saturated steam temperatures by main valve preheating alone. However, actuation of the main valve on the test tank can assist in achieving an acceptable test temperature. As a result, the following pilot test procedure should be followed.

- 11.2.1 Increase test tank pressure to 90% of pilot nameplate set pressure and hold at this pressure for a minimum of 15 minutes to allow valve temperatures to stabilize.
- 11.2.2 Increase the inlet steam pressure until the pilot pops. Observe pressure at pop. Repeat test as required until three consistent pops are observed.
Note: allow 15 minutes between each test for valve temperatures to stabilize.)
- 11.2.3 The measured pop pressure is the hot set pressure and should be within the nameplate set pressure tolerance. This tolerance is ± 2 psig up to 70 psig, and $\pm 3\%$ above 70 psig.

- B. Hot set pressure verification using Anderson Greenwood Field Test Kit (See Figure 12)

General

Mount valve assembly on the system, close pilot field test and manual blowdown hand valves and pressurize valve to 80% of set pressure followed by a minimum one hour valve assembly "warm-up" period.

WARNING

The main valve will operate if system pressure exceeds set pressure during the following test; therefore appropriate hearing protection should be worn.

11.3 External leakage test

- 10.2.1 After the valve has "warmed-up" check for visible external leakage at all external joints and seals. Give particular attention to the manifold body to main valve cap joint, cap port plug, unloader bushing seal and hand valve bonnet packings.
- 10.2.2 Check pilot discharge vent for indications of pilot main wedge seal leakage. If leakage is observed, isolate and depressure POSRV and using a 2" wrench on each pilot bushing check that both pilot main wedge seals are fully seated. Then pressurize POSRV and recheck pilot vents for leakage.

The following set pressure verification may be performed on either gas/vapor or steam service valves using the Anderson Greenwood Field Test Kit, Part No. 04.4812.001. An accurate check of the set pressure can be made only after the valve has been in service a minimum of 2 hours. System pressure should be 90% or less of set pressure. The main valve will not cycle during this procedure, but will operate should system relief be required during the test. No visible or audible indications of external valve leakage are allowed either prior to or following this test.

1. Connect field test hose to POSRV field test connection on field test hand valve.
2. Slowly open supply pressure valve on test gas bottle and pressurize field test assembly to 90% of POSRV nameplate set pressure.
3. Slowly open POSRV field test connection hand valve to its fully open position.
4. Increase pressure slowly to pilot until pilot pops. Observe pressure at pop. Repeat test as required until three consistent pops are observed.
5. To remove test apparatus, close POSRV field test connection hand valve and supply pressure valve on test gas bottle, vent field test assembly hose pressure and remove test gas bottle.
6. The measured pop pressure is the hot set pressure and should be within the nameplate set pressure tolerance. This tolerance is ± 2 psig up to 70 psig, and $\pm 3\%$ above 70 psig.

ANDERSON GREENWOOD SERIES 727 PILOT OPERATED SAFETY RELIEF VALVES

MAINTENANCE INSTRUCTIONS

11.4 Cold set pressure verification

Before the valve is installed or immediately after bringing the valve on line and before the valve reaches normal operating temperature, the set pressure can be checked using either of the hot set pressure verification test procedures except that the pressure read on the test gage will be the cold differential test pressure on the nameplate. This pressure is established based on the specified temperature during operation and will be greater than the nameplate set pressure to compensate for the reduction in spring force due to temperature. The set pressure tolerances listed above apply.

12 PILOT AND MANIFOLD INTERNAL LEAK TEST

After completion of the above pilot set pressure and main valve function tests, perform the following tests to verify the tightness of all internal pilot and main valve seats. No visual or audible indications of leakage are allowed.

- 12.0.1 For valves mounted on the steam test tank, test tank pressure should be returned to 90% of set pressure. System pressure should be 90% of set pressure or less for system mounted valves.
- 12.0.2 Check at pilot vent for pilot seat tightness.
- 12.0.3 Check manual blowdown vent for manual blowdown hand valve seat leakage.
- 12.1.4 Check field test connection port for field test hand valve seat leakage.

WARNING

Always wear eye, ear and hand protection and never stand in front of the main valve outlet during the following inspections.

- 12.0.5 Check the main valve outlet for nozzle seal and seat tightness.
- 12.0.6 Check the unloader discharge port in the main valve outlet for unloader nozzle seat tightness.

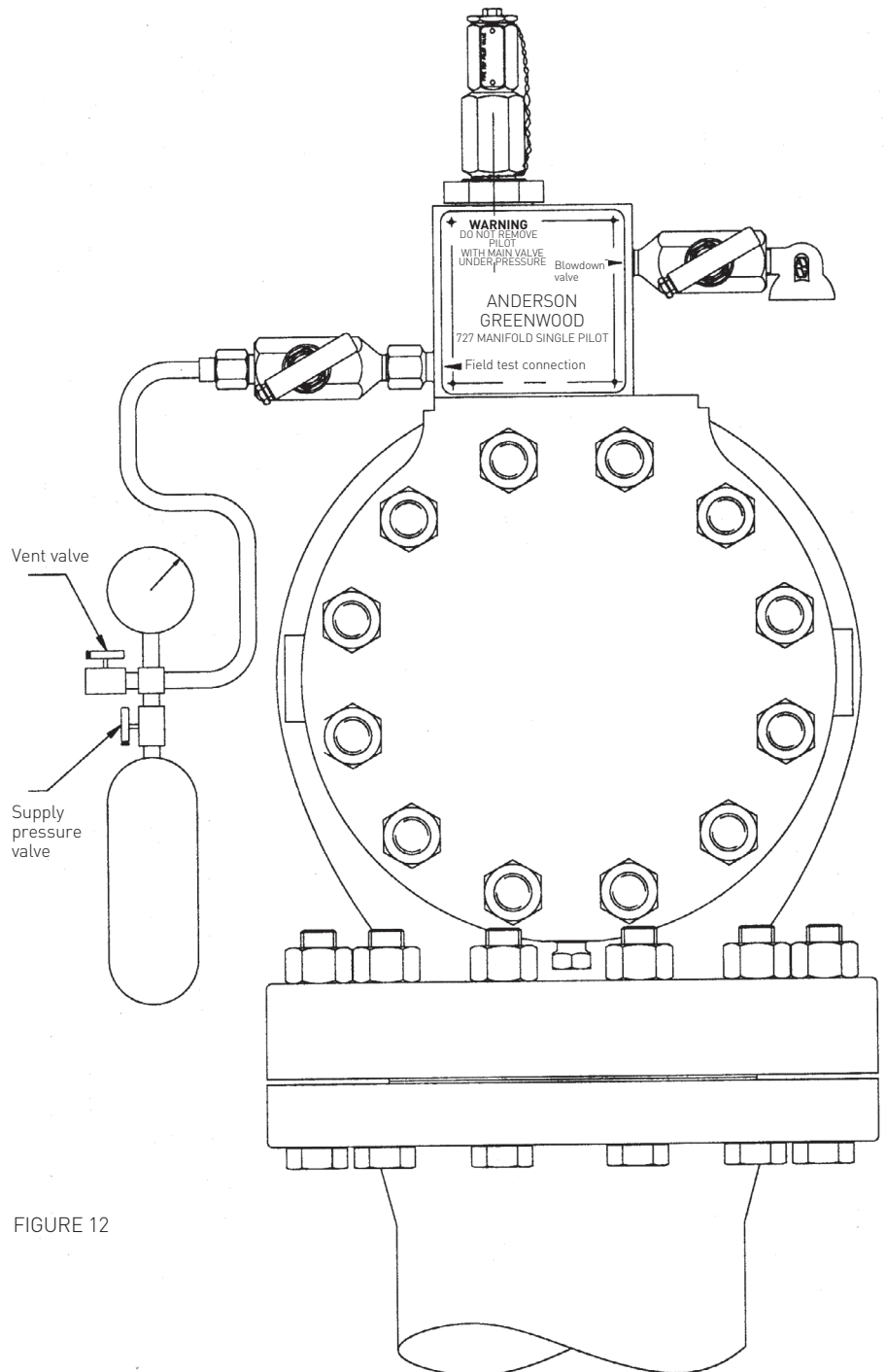


FIGURE 12

ANDERSON GREENWOOD SERIES 727 PILOT OPERATED SAFETY RELIEF VALVES

MAINTENANCE INSTRUCTIONS

13 REPAIR KITS AND PARTS PHILOSOPHY

727 Spare parts philosophy

Maintaining the necessary replacement parts inventory levels provides the end user with three key benefits:

- Minimum downtime
- Reduced cost
- Improved efficiency

RECOMMENDED GUIDELINES FOR INVENTORY LEVELS

Parts priority	Replacement frequency	Time valve will remain available
Class I	Parts replaced each time valve and/or pilot is disassembled	75%
Class II	Parts replaced frequently	85%
Class III	Parts less frequently replaced, but critical to proper valve operation	95%
Class IV	Parts seldom replaced	99%
Class V	Parts practically never replaced	100%

NOTE

For your safety when ordering replacement valve parts, please specify in your purchase order: "All parts must be documented as new and sourced from Anderson Greenwood".

727 RECOMMENDED SPARE PARTS

Parts priority	Parts description	Quantity per each valve size
Class I	1. Main valve seal kit	1/1
	2. Main valve ring kit	1/2
	3. Unloader seal kit	1/1
	4. Pilot seal kit	1/1
	5. Pilot seat kit	1/1
	6. Main valve disc assembly	*1/3
Class II	7. Unloader piston assembly	1/3
Class III	8. Main valve nozzle	1/5
	9. Unloader bushing	1/5
	10. Drain plunger and spring	1/6
Class IV	11. Spring and washers (2)	1/10
	12. Spindle	1/10
	13. Cage guide	1/10
	14. Spacer	1/10
	15. Adjusting screw and nut	1/10
	16. Dome spring	1/10
	17. Liner	1/10
	18. Piston (6" and 8")	1/10
	19. Damper	1/10

* 17-4PH disc for temperatures up to 600°F

Inconel® 718 disc for temperatures 600 - 1000°F

ANDERSON GREENWOOD SERIES 727 PILOT OPERATED SAFETY RELIEF VALVES

MAINTENANCE INSTRUCTIONS

The kits listed below are available from stock. To order kits specify the base number and select the last three digits from the following tables. To make sure correct kits are purchased the order should specify the valve model and serial number.

KIT BASE NUMBER: 06-1237-XXX

MAIN VALVE

Kit	Contents	2 x 3	3 x 4	4 x 6	6 x 8	8 x 10
Seals	Liner seal nozzle seal, dipper tube, seal, filter seal, belleville washers, nozzle retaining screws	-025	-026	-027	-028	-029
Rings	Damper ring, piston ring, and centralizer springs	-020	-021	-022	-023	-024

PILOT

Kit	Contents	All pressures
MNT'G seals	Wedge ring seal, metal O-ring, installation tool	-030
Main seat	Disc, spring washer-disc, ball-disc, nozzle, nozzle seal, gag seal, spring washer-bonnet, blowdown safety seal	-031
Reseat	Reseat seat, reseat piston, blowdown safety seal	-032

UNLOADER

Kit	Contents	2 x 3	3 x 4	4 x 6	6 x 8	8 x 10
Seal	Nozzle bushing seal	-033	-033	-013	-013	-013

FIELD TEST AND MANUAL BLOWDOWN HAND VALVE

Kit	Contents	All sizes
Hand valve	One (1) hand valve assembly	02-4077-019

14 REPAIR TOOLS

Special

The tools listed below are available by special order. Contact Anderson Greenwood's Sales Department for price and delivery.

- 2" Piston ring expander
Snap-On Tools # PRS-8
Anderson Greenwood Part no. 05.1185.054
- 3" and 4" Piston ring expander
Snap-On Tools # PRS-10
Anderson Greenwood Part no. 05.1185.055
- 6" Piston ring expander
Diesel Supply Co.
- 8" Piston ring expander
Diesel Supply Co.
- Cartridge pilot air test fixture assembly
Anderson Greenwood Part no. 06.3036.002
- Hand valve seat resurfacing tool
Model no. SRT-1
Anderson Greenwood Part no. 02.2543.001

Pilot valve

- Field test kit
Anderson Greenwood Part no. 04.4812.001

ANDERSON GREENWOOD SERIES 727 PILOT OPERATED SAFETY RELIEF VALVES

MAINTENANCE INSTRUCTIONS

PISTON INSTALLATION SLEEVE

Size	A	B	C	D	E	F	G
2"	2.700	2.495	2.550	2.882	3.075	.030	1.25
		2.493	2.540	2.880	3.065		
3"	3.750	3.495	3.597	4.138	4.325	.060	1.88
		3.493	3.587	4.136	4.315		
4"	5.188	4.870	4.970	5.267	5.602	.060	1.50
		4.868	4.960	5.265	5.592		
6"	8.340	7.995	8.170	8.722	9.067	.100	1.56
		7.993	8.160	8.720	9.057		
8"	10.940	10.485	10.770	11.222	11.555	.150	2.00
		10.483	10.760	11.220	11.545		

Tolerance: Hundredths = ± 0.03
 Thousandths = ± 0.010
 Angles = ± 10

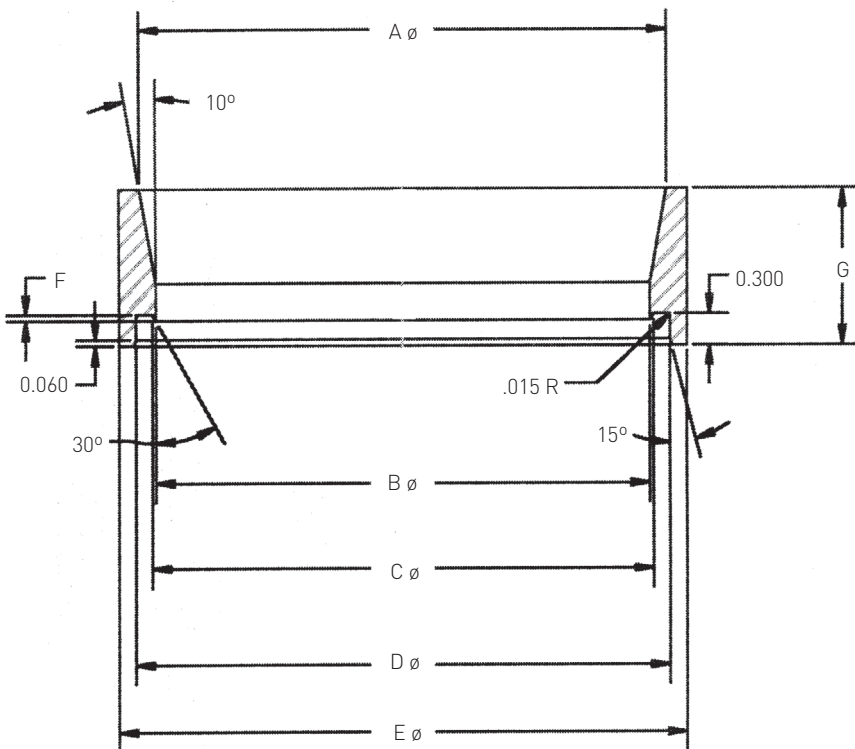


FIGURE 13

General

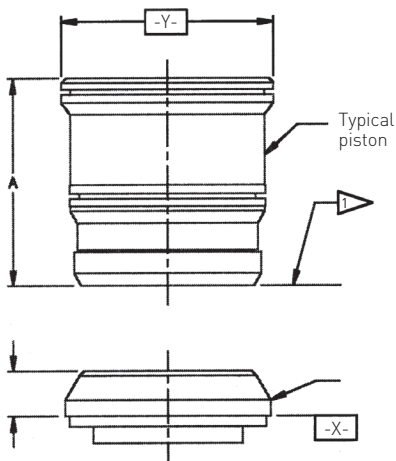
- 12 point sockets, nozzle retaining screw removal/installation
 $\frac{1}{4}$ " for 2 x 3, 3 x 4
 $\frac{5}{16}$ " for 4 x 6
 $\frac{3}{8}$ " for 6 x 8, 8 x 10
- $1\frac{1}{16}$ " and $\frac{5}{8}$ " open end wrench
- $\frac{5}{32}$ " and $\frac{1}{4}$ " Allen wrench
- $\frac{3}{4}$ ", $1\frac{1}{16}$ ", and $\frac{7}{8}$ " crows foot adapter wrench
- Brass hammer
- 2" Crescent wrench
- Wood or plastic dowel rod
- Optional tools
 - Air impact tool w/socket set through $1\frac{7}{16}$ "
 - Over head crane or hoist
 - Strap wrench
- Housing-pilot lift indicator
 Anderson Greenwood Part no. 06-1330-001
- 2" Dial indicator/.001 increments
 - 100 stem travel/1.00 stem extension
- Brass shim stock
- SST sealing tape
 Anderson Greenwood Part no. 05-1124-001
- Needle nosed pliers
- Torque wrench capable of measuring values in Table I.

Lubricant/sealants

- Dow Corning-Silicone-33 grease (or equivalent)
- Hooker Chemical "Fluorolube" LG-16

ANDERSON GREENWOOD SERIES 727 PILOT OPERATED SAFETY RELIEF VALVES

MAINTENANCE INSTRUCTIONS



NOTES

1	Disk face:	\perp	.003	Y
	Nozzle face:	//	.003	X

FIGURE 14

15 PISTON DISK AND NOZZLE SEALING FACE REPAIR

The disk cannot be disassembled from the 2", 3" and 4" valve size piston. The 6" and 8" size disk can be removed for replacement or relapping. Loosen three disk assembly locking screws located inside piston at spring stop. Hold piston and unscrew disk assembly with strap wrench. (See Figure 3)

The piston disk and nozzle seat faces are manufactured to close tolerances and finishes. Care must be exercised in reworking both mating surfaces to insure a tight seat after main valve assembly. Note that a good machined surface finish will reduce lapping time but in no case should the surface be polished to improve the finish as this will affect the flatness of the surface. Refacing of both parts is limited to the "mated" minimum heights and tolerances listed in Table III.

Lapping

The finer points of lapping should be considered a mechanical art. The ability of the average repair person to produce a good lapped seat will require practice. No effort has been made in this manual to establish an exact lapping procedure. However, it is very important to insure that the laps you are using (whether donut laps or flat lapping plates) are flat within 2 light bands. Otherwise an uneven surface will be transferred to the seat sealing area. The following items are required when lapping a piston disk or nozzle.

- One flat lap per valve (See list below.)
- Clover compound "C", 220 grit medium, to remove, grooves, pits, and dents.
- Clover compound, "1A", 320 grit, very fine, for general smoothing of seats.
- Clover compound, "3A", 500 grit, extremely fine, for general smoothing of seats.
- Clover compound, "6A", 1000 grit, micro fine, for final finishing of seat.
- Cotton rags, clean and lint free.

Before lapping, chamfer the leading edge of both disk and nozzle with sand paper. This will break the inner and outer edges and remove any small metal particles that might be attached to the sharp corner surfaces

Remachining disk and nozzle

Removed material from disc or nozzle face shall not exceed .030 inches maximum and height of reworked components must not be less than dimensions shown in Table III.

WARNING

Mated heights less than the dimensions given in Table III will result in seal ring damage and potential failure of main valve function.

LAP PART NUMBERS FOR ORDERING LAPS

Valve size	Part numbers
2 x 3	06.1595.001
3 x 4	06.1595.002
4 x 6	06.1595.003
6 x 8	06.1595.004
8 x 10	06.1595.005

NOTE

Laps are pre-surfaced at Anderson Greenwood and optically checked for flatness. Reconditioning of the lap may be accomplished with an optically flat lapping plate with all lap work verified through use of an optical flat and monochromatic light source.

TABLE III - Minimum remachined piston and nozzle dimensions

Valve size	2 x 3	3 x 4	4 x 6	6 x 8	8 x 10
"A"	3.54	4.89	5.305	7.72	11.13
"B"	0.88	0.89	1.31	1.64	2.17

ANDERSON GREENWOOD SERIES 727 PILOT OPERATED SAFETY RELIEF VALVES

MAINTENANCE INSTRUCTIONS

Lathe set-up for nozzle machining

Grip nozzles with a four jaw independent chuck as shown being careful not to damage clamped sealing surface. True up the work so that surface B runs flat $\pm.001$ on indicator.

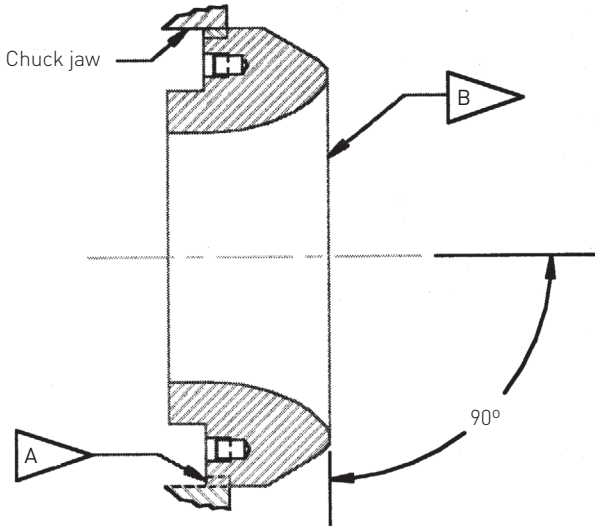


FIGURE 15

Lathe set-up for machining piston/disk - 2" through 4"

Grip piston and disk with a four-jaw independent chuck as shown. True up the work so that surface B runs flat $\pm.001$ on indicator.

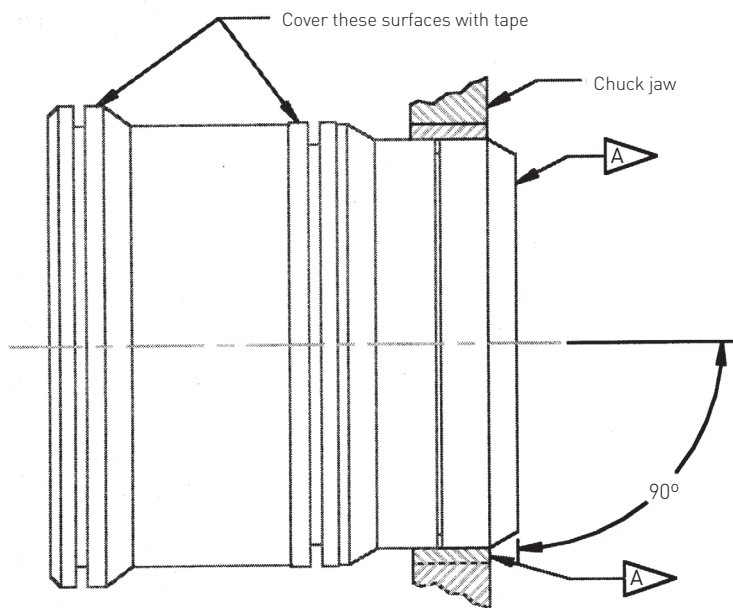


FIGURE 16

ANDERSON GREENWOOD SERIES 727 PILOT OPERATED SAFETY RELIEF VALVES

MAINTENANCE INSTRUCTIONS

Lathe set-up for machining 6" and 8" disk

Grip disk assembly with a four-jaw independent chuck as shown. True up work so that surface B runs flat ± 0.001 on indicator.

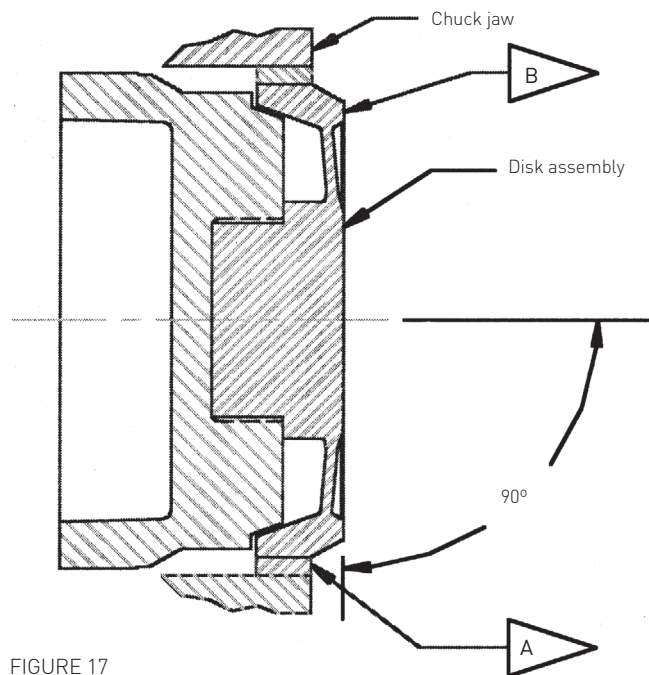


FIGURE 17

NOTE A

Use a piece of soft metal such as copper between jaws and clamped surface.

NOTE B

Take light cuts using a fine feed to achieve a 32 to 64 RMS machined finish. Do not polish with emery cloth or sand paper as the result will affect flatness. Observe the dimensions and tolerances in Table III.

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