



Electrically Modulated Relief Valve

(F3)-CGE-06-3(V)-2* (S*)

(F3)-CGE-10-3(V)-2* (S*)

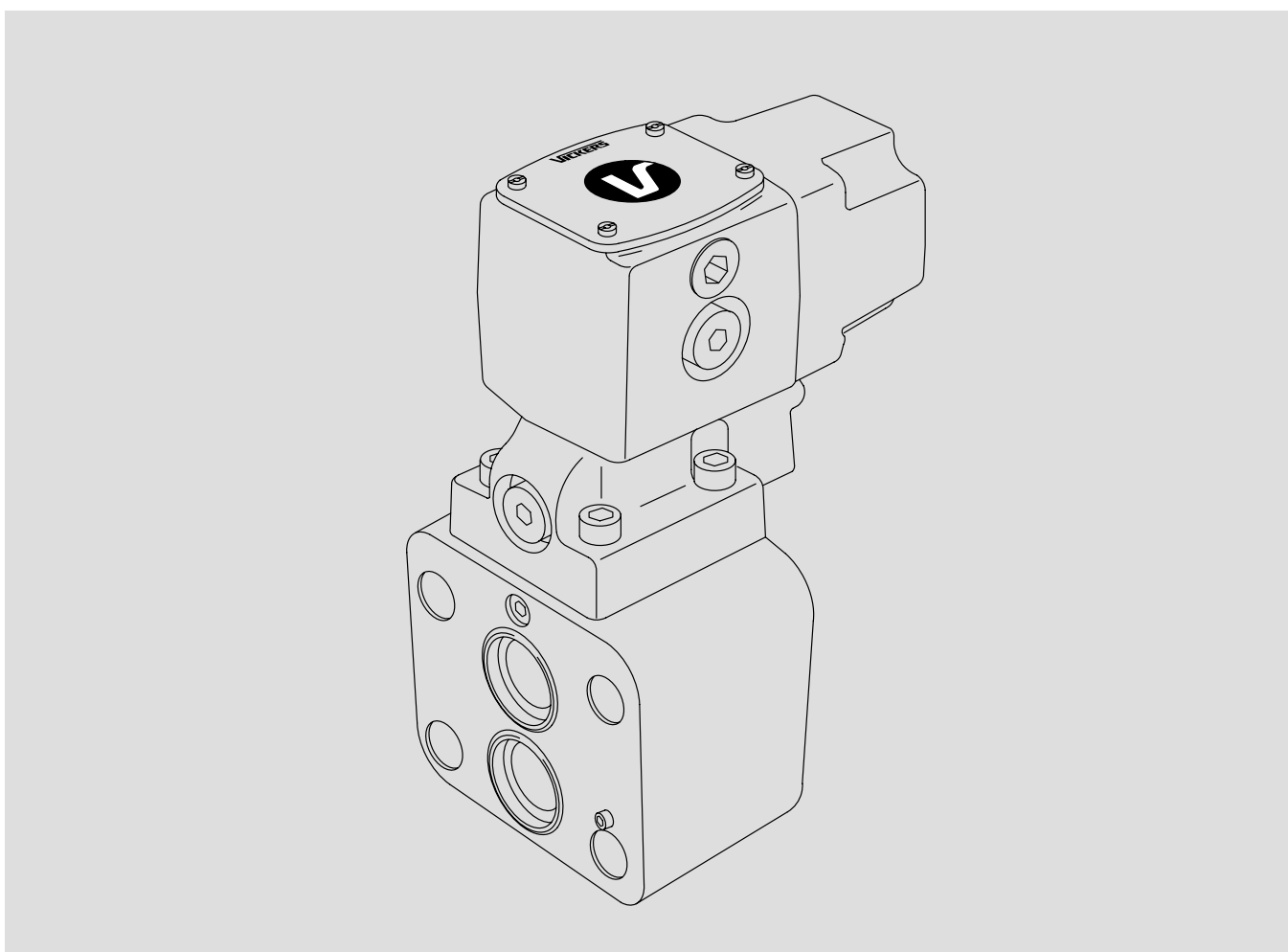


Table of Contents

Section	Page
Table 1. Model Code Breakdown	3
I. Introduction	3
A. Purpose of Manual	3
B. General Information	3
1. Related Publications	3
C. Model Code Breakdown	3
Table 2. Parts and Installation Drawings Chart	3
II. Description	4
A. General	4
B. Application	4
Figure 1. Remote Electrically Modulated Relief Valve Assembly	4
III. Principles of Operation	5
A. Electrically Modulated Pilot	5
Figure 2. Complete Electrically Modulated Relief Valve Functional Diagram	5
B. Intermediate Body	6
C. Main Stage	6
D. Theory of Operation	6
IV. Installation and Operating Instructions	7
A. Installation Drawings	7
B. Mounting	7
C. Piping and Tubing	7
D. Hydraulic Fluid Recommendations	7
E. Cleanliness	7
F. Sound Level	7
V. Inspection and Maintenance	8
A. Service Tools	8
B. Special Tools	8
C. Inspection	8
D. Adding Fluid to System	8
E. Adjustments	8
F. Lubrication	8
G. Replacement Parts	8
H. Trouble Shooting	8
Table 3. Trouble Shooting Chart	9
VI. Overhaul	10
A. General	10
B. Unit Removal	10
C. Disassembly	10
D. Cleaning	10
Figure 3. Exploded View	11
E. Inspection, Repair, and Replacement	14
F. Assembly	14
Figure 4. Check of main piston for bind	15
Figure 5. Setting magnetic gap on 1000 & 3000 PSI models	15
Figure 6. Setting hydraulic gap	16
Figure 7. CGE**-*-20 valve mounting data	16
VII. Test Procedure	17
A. Test Conditions	17
B. Electrical Specifications	17
C. Test (Preliminary Adjustments)	17
D. Manual Adjustment Test	17
E. Electrical Pilot Adjustment	18
Figure 9. Filter connection for S-6 models	19

Section I – Introduction

A. Purpose Of Manual

This manual describes the basic operational characteristics and provides service, overhaul and parts information for the Vickers CGE-06/10-*22-(S*) Remote Electrically Modulated Relief Valves.

The information contained herein pertains to the latest design series as listed in Table 1.

B. General Information

1. **Related Publications** – Service parts information and installation dimensions are not contained in this manual. The parts and installation drawings listed in Table 2 is available from any Vickers application engineering office.

Model Series	Parts Drawing	Installation Drawing
CGE-06-*22-(S*)	I-3695-S	511040
CGE-10-*22-(S*)	I-3696-S	511040

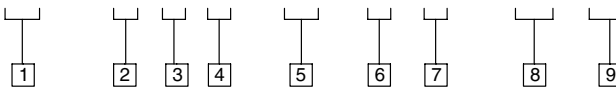
Table 1.

C. Model Code Breakdown

Variations within each basic model series are covered in the model code. Table 2 is a complete breakdown of the code covering these units. Service inquiries should always include the complete unit model code number as stamped on the nameplate.

Model Code

(F3) - C G E - ** - 3 (V) - 22 (S*)



<p>1 Seals for mineral oil and fire resistant fluids</p> <hr/> <p>2 Relief valve</p> <hr/> <p>3 Subplate mounted</p> <hr/> <p>4 Remote electrically modulated</p>	<p>5 Valve size 06 - 60 Series (3/4" nom.) 10 - 100 Series (1/14" nom.)</p> <hr/> <p>6 Pressure rating (PSI maximum) 1 - 1000 (70 bar) 3 - 3000 (210 bar)</p> <hr/> <p>7 "V" - Optional high venting feature. Omit if not required. (For 3000 PSI (210 bar) pressure models only)</p>	<p>8 Design</p> <hr/> <p>9 S6 - External 35 Micron pilot filter (furnished by customer) S7 - Viton seals with 35 Micron filter (early models) S8 - Viton seals only (early models)</p>
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Table 1. Model Code Breakdown

Section II – Description

A. General

Assembly of a typical remote electrically modulated relief valve is shown in Figure 1. In general, the valve consists of three basic parts, a main stage, an intermediate body and the electrically modulated pilot. The main stage is similar to the stand relief valve. The intermediate body contains standard relief valve pilot parts to provide manual adjustment and has a mounting pad which accepts CETOP 3 components. The electrically modulated pilot is machined to fit the CETOP 3 pad and contains a flapper valve assembly, a blocking valve, and a ball type check valve.

B. Application

The new valve series provides a self-contained unit that modulates system pressure electrically over a wide range without external feedback devices.

The valve has the ability to control system pressure from any distance or location. Modulating signals may be derived from potentiometers, analog computers, power supplies or any other source that will provide the necessary drive current for the pilot stage. A current of 0-500 milliamperes (mA) is required to modulate the valve.

Power supply EMCS-*-30 was specifically designed for control of this type valve. The EMCS is not limited to potentiometer command only but can easily be adapted to remote control devices. For information on EMCS, refer to installation drawing 521557, from Technical Publications, Troy, MI 48084.

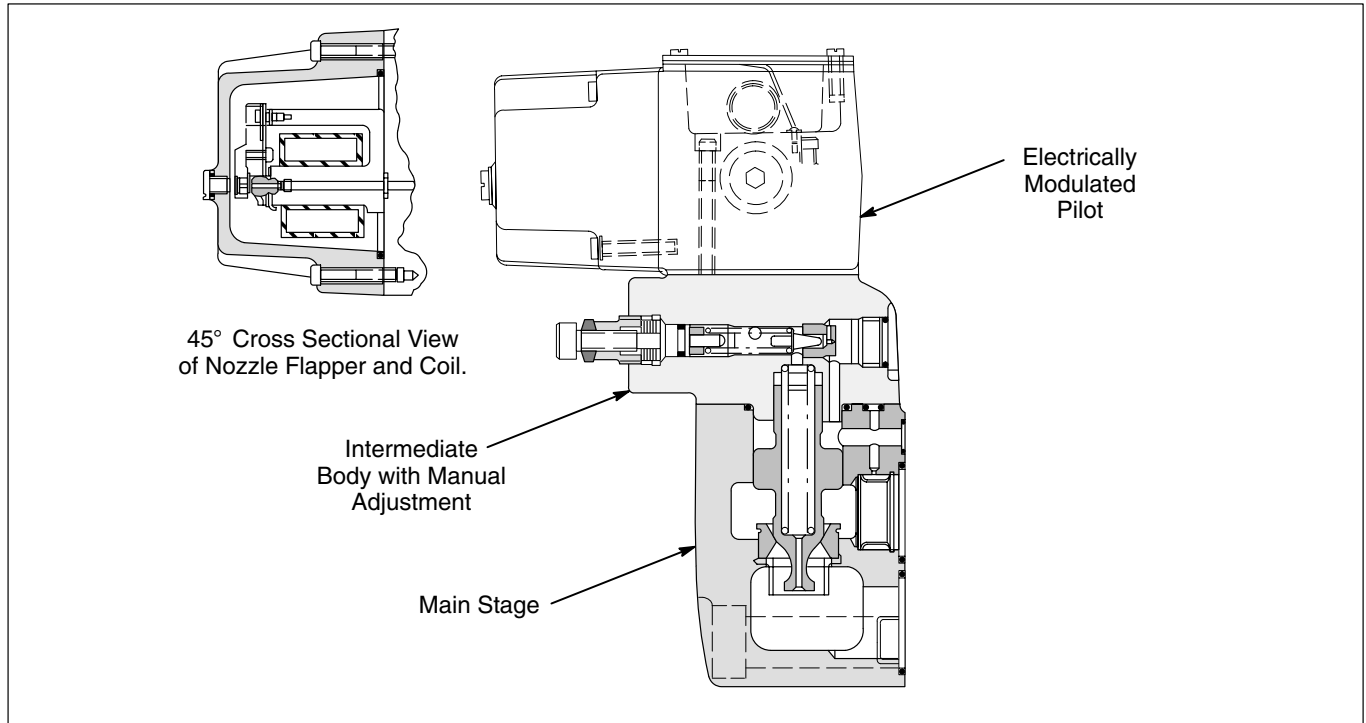


Figure 1. Remote Electrically Modulated Relief Valve Assembly.

Section III – Principles of Operation

A. Electrically Modulated Pilot

1. **Flapper, Nozzle and Coil:** The flapper nozzle is analogous to a poppet/seat with a spring type of control in that it is a force balance system. When current is applied to the coil, the resultant magnetic force pulls the flapper toward the pole piece. This results in a smaller hydraulic gap (orifice) and a build up of pressure at the upstream side of the valve. This increasing pressure produces a force which opposes the magnetic force and a balance is achieved with pressure being approximately proportional to current. Refer to Figure 2.

2. **Dual Gap Concept:** The hydraulic and magnetic gaps are both adjustable. This allows optimum trim of both gaps with a resulting improvement in stability and contamination tolerance.

3. **Dampening Shim:** The dampening shim prevents flapper oscillations. It is not used in 3000 PSI models.

4. **Blocking Valve:** The blocking valve is used to shut off flow to the flapper nozzle. This allows complete manual control during machine flushing and at start-up. To close the valve, shut down the machine and relieve all pressure. Remove the blocking valve access plug from the side of the

pilot valve body. Remove and reverse the button. When the access plug is reinstalled, the spool shifts and flow is blocked to the nozzle.

5. Drain Connection



CAUTION

The pilot valve drain connection must be piped directly to the reservoir and terminate below the oil surface. A 0.5625-18, UNF-2B straight thread port, (for 3/8" tubing), is provided on the side of the pilot valve for this purpose.

6. **Secondary Filter Screen:** A 100 micron screen located close to the nozzle helps prevent plugging of the flapper orifice. To change or clean this screen, remove the blocking valve spool. The screen is located in the end of the spool. See Figure 2.

7. **Ball Check Valve:** A ball check valve is used to keep the pilot valve cover full of oil during shut down. See Figure 2.

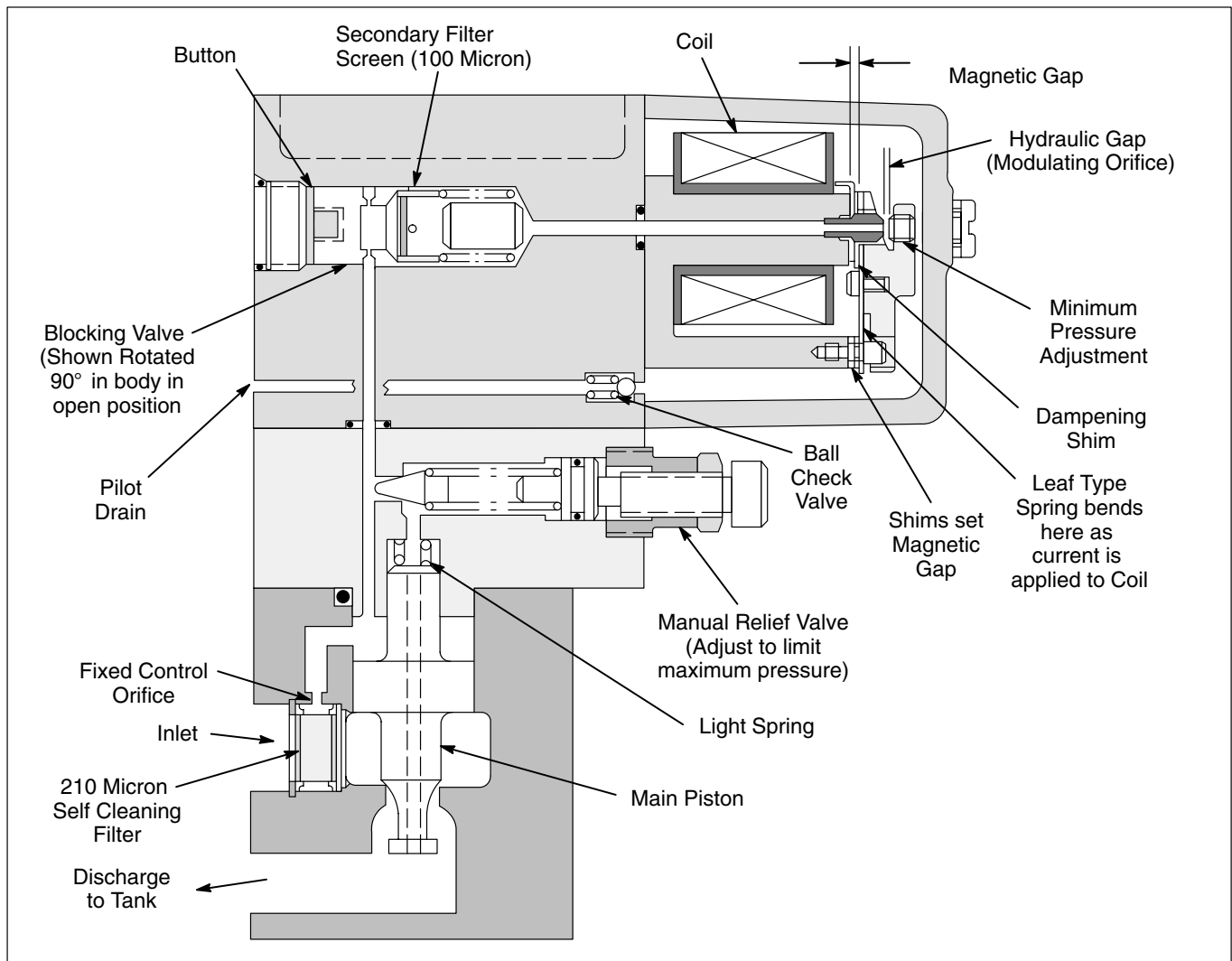


Figure 2. Complete Electrically Modulated Relief Valve Functional Diagram.

B. Intermediate Body

The intermediate body adapts the relief valve main stage to the electrically modulated pilot valve. A poppet and spring arrangement located in the intermediate body provides manual adjustment of relief pressure when the pilot valve is blocked. Normal operating procedure is to adjust the manual relief above the maximum pressure excursion of the electrically modulated pilot stage. This prevents interaction of the poppet and flapper and provides a manually adjusted upper limit for the valve.

C. Main Stage

The main stage consists of a body, piston, spring(s), primary filter screen, and seat. A control orifice is drilled in the body instead of the piston. The primary filter screen (210 micron self cleaning type) protects the drilled orifice and pilot stage from contaminants.

D. Theory of Operation

NOTE

Refer to Figure 2 during the following discussion.

When a new CGE valve is installed into a system and the system energized; oil will flow into the inlet of the CGE valve.

The light spring holds the main piston closed against the seat until pressure below the piston builds up to about 80 PSI. The 80 PSI pressure differential lifts the piston porting oil to the reservoir. Also, the 80 PSI will cause oil to flow through the self cleaning filter screen and the control orifice, filling the open area above the piston and the valve body passages. When the body passage to the flapper nozzle is filled, the orifice developed by the flapper nozzle develops a back pressure at the top of the piston and increases the original 80 PSI to approximately 150 PSI. The oil will continue to flow through the orifices filling the pilot cover. Pressure builds up within the cover, lifts the 5 PSI ball check from its seat and oil flows past the check into the pilot drain. The valve may be unstable until air is displaced within the pilot cover. With a new valve this displacement of air should be accomplished within one or two minutes.

The following action will take place when coil current is increased.

1. The increased current strengthens the magnetic field and attracts the flapper with a greater force toward the nozzle.

2. The modulating orifice decreases in size increasing the pressure at the upstream side of the orifice. This increase in pressure is reflected back to the top of the spool and adds to the light spring force. A higher pressure is then required at the inlet port to lift the spool.

NOTE

It can be seen from the preceding discussion that the greater the coil current the higher the pressure developed by the valve. This condition must not be allowed to exceed the ratings of the valve. As a safety precaution, the manual adjust section of the valve can be set to this limit. Also, the electrical circuitry should be trimmed to limit the maximum pressure, (usually 500 milliamperes or less.)

Section IV – Installation and Operating Instructions

A. Installation Drawings

Installation dimensions are not contained in this manual. Refer to installation drawing 511040 for that information.

B. Mounting

No mounting restrictions exist. The valve may be oriented in either a horizontal or vertical position.

C. Piping and Tubing

1. All pipes and tubing must be thoroughly cleaned before installation. Recommended methods of cleaning are sandblasting, wire brushing and pickling.

NOTE

For instructions on pickling, refer to instruction sheet 1221-S.

2. To minimize flow resistance and possibility of leakage, only as many fittings and connections as are necessary for proper installation should be used.

3. The number of bends in tubing should be kept to a minimum to prevent excessive turbulence and friction of oil flow. Tubing must not be bent too sharply. The recommended radius for bends is three times the inside diameter of the tube.

D. Hydraulic Fluid Recommendations

General Data

1. Oil in a hydraulic system performs the dual function of lubrication and transmission of power. It constitutes a vital factor in hydraulic system, and careful selection of it should be made with the assistance of a reputable supplier. Proper selection of oil assures satisfactory life and operation of system components.

2. Data sheet I-286-S for oil selection is available from Technical Publications, Troy, MI.

3. Oil recommendations noted in the data sheet is based on our experience in industry as a hydraulic component manufacturer.

4. Where special considerations indicated a need to depart from the recommended oils or operating conditions, see your Eaton representative.

E. Cleanliness

Thorough precautions should always be observed to insure the hydraulic system is clean:

1. Clean (flush) entire new system to remove paint, metal chips, welding shot, etc.

2. Filter each change of oil to prevent introduction of contaminants into the system.

3. Provide continuous oil filtration to remove sludge and products of wear and corrosion generated during the life of the system.

4. Provide continuous protection of system from entry of airborne contamination, by sealing the system and/or by proper filtration of the air.

5. During usage, proper oil filling and servicing of filters, breathers, reservoirs, etc., cannot be over emphasized.

6. Thorough precautions should be taken, by proper system and reservoir design, to insure that aeration of the oil will be kept to a minimum.

F. Sound Level

Noise is only indirectly affected by the fluid selection, but the condition of the fluid is of paramount importance in obtaining optimum reduction of system sound levels.

Some of the major factors affecting the fluid conditions that cause the loudest noises in a hydraulic system are:

1. Very high viscosities at start-up temperatures can cause pump noises due to cavitation.

2. Running with a moderately high viscosity fluid will impede the release of entrained air. The fluid will not be completely purged of such air in the time it remains in the reservoir before recycling through the system.

3. Aerated fluid can be caused by ingestion of air through the pipe joints of inlet lines, cylinder rod packings, or by fluid discharging above the fluid level in the reservoir. Air in the fluid causes a noise similar to cavitation.

Section V – Service, Inspection, and Maintenance

A. Service Tools

1. One each of the following hollow set screw hex keys: metric, 2.5mm, 3mm, and 4mm - inch, 3/16, 5/16, 1/4, 1/2, and 5/8.
2. Torque wrench with adapters for above straight hex keys.
3. Internal Truarc pliers (2300).
4. Small adjustable (6") wrench.
5. Feeler gage set (inch or metric).
6. Arbor press.

B. Special Tools

No special tools are required for the maintenance of the valve.

C. Inspection

Periodic inspection of the fluid conditions and the tube or piping connections can save time-consuming breakdowns and unnecessary parts replacement. The following should be checked regularly:

1. All hydraulic connections must be kept tight. A loose connection in a pressure line will permit the fluid to leak out. If the fluid level becomes so low as to uncover the inlet pipe opening in the reservoir, extensive damage to the pump can result. In suction or return lines, loose connections permit air to be drawn into the system resulting in noisy and/or erratic operation.
2. Clean fluid is the best insurance for long service life. Therefore, the reservoir should be checked periodically for dirt or other contaminants. If the fluid becomes contaminated, the system should be drained and the reservoir cleaned before new fluid is added.
3. Filter elements also should be checked and replaced periodically. A clogged filter element results in a higher pressure drop. This can force particles through the filter which would ordinarily be trapped, or can cause the by-pass to open, resulting in a partial or complete loss of filtration.
4. Air bubbles in the reservoir can ruin circuit components. If bubbles are seen, located the source of the air and seal the leak. (See table 3).

D. Adding Fluid to the System

When hydraulic fluid is added to replenish the system, it should always be poured through a fine wire screen (200 mesh or finer) or preferably pumped through a 10 micron (absolute) filter.

It is important that the fluid be clean and free of any substance which could cause improper operation. Therefore, the use of cloth to strain the fluid should be avoided to prevent lint getting into the system.

E. Adjustments

No periodic adjustments are required.

F. Lubrication

Internal lubrication is provided by the fluid in the system.

G. Replacement Parts

Reliable operation throughout the specified operating range is assured only if genuine Vickers parts are used. Sophisticated design processes and material are used in the manufacture of our parts. Substitutions may result in early failure. Part numbers are shown in the parts drawings listed in Table 2.

H. Troubleshooting

Table 3, lists the common difficulties experienced with relief valves. It also indicates probable causes and remedies for each of the troubles listed.

Troubleshooting Chart

	Probable Cause	Remedy
No load pressure or low pressure. Trouble	<ol style="list-style-type: none"> 1. Manual relief improperly adjusted. 2. Open vent connection. 3. Poppet not properly seated. 4. Self cleaning filter is plugged. (located in the pressure port). 5. Control orifice in body is plugged. 6. No current to coil. 7. Piston sticking in the open position. 	<p>Adjust manual relief valve to proper setting.</p> <p>Plug vent opening.</p> <p>Back off adjusting screw several turns while running pump to clear any contamination between poppet and seat. Check poppet and seat for wear. Check spring.</p> <p>Remove, clean and/or replace.</p> <p>Remove filter screen and open orifice with a small wire. (orifice size is 0.040)</p> <p>Check for loose electrical connection. Check output of power supply. Check resistance of coil. (resistance is 17 to 20 Ohms nominal).</p> <p>Remove piston. Check piston and bore for burrs. Use polishing paper or an Arkansas stone to remove burrs.</p>
Maximum pressure (valve will not modulate).	<ol style="list-style-type: none"> 1. Plugged flapper orifice. 2. Secondary filter plugged. 3. Button reversed causing blocking valve to prevent flow to nozzle. 4. Power supply current maximum. 	<p>Clean orifice and clean and/or replace internal filters.</p> <p>Clean filter.</p> <p>Remove and reverse button.</p> <p>Vary command control of power supply. If current does not change, repair or replace the power supply.</p>
Erratic pressure.	<ol style="list-style-type: none"> 1. Contamination. 2. Piston sticking in body bore. 3. Erratic input signal from power supply. 4. Misalignment of cover and body causing piston to stick. 	<p>Clean the system components, and flush the system.</p> <p>Remove piston. Check piston for burrs and freedom of movement in bore. Replace if necessary.</p> <p>Check for loose electrical connections, broken wires, etc.</p> <p>Loosen cover screws and check piston movement as described in reassembly section. Properly torque the cover screws.</p>
Excessive noise or chatter.	<ol style="list-style-type: none"> 1. High flow through valve. 2. Excessive tank line pressure. 3. Vent line too long. 4. Manual relief valve setting to close to system pressure. 5. Dampening shim left out of the valve. (1000 PSI models only.) 6. Dither control located on power supply set to high. 7. Power supply malfunction. 	<p>Check valve flow rating. Replace with larger size valve if necessary.</p> <p>Connect tank line directly to reservoir.</p> <p>Add a restriction (needle valve or orifice), in the vent line next to the valve.</p> <p>Set manual relief higher than the maximum pressure setting of the electrically modulated valve.</p> <p>Add shim to valve.</p> <p>Adjust dither control until a vibration is felt in the machine. Reduce the control setting until vibration just disappears.</p> <p>Check for loose connections, loose ground connection, broken wires, etc. Repair and/or replace.</p>

Section VI – Overhaul

A. General



WARNING

Turn off all electrical power and relieve hydraulic pressure. Before breaking a circuit connection, make certain that power is off and system pressure has been released. Lower all vertical cylinders, discharge accumulators, and block any load whose movement could generate pressure.

B. Unit Removal

1. Remove the unit from the system.
2. Cap all system openings to prevent contamination.



CAUTION

Absolute cleanliness is essential when working on a hydraulic system. Always work in a clean area. The presence of dirt and foreign materials in the system can result in serious damage or inadequate operation.

C. Disassembly

Periodic maintenance of the valve will generally not require disassembly to the extent described here. However, the sequence can also be used as a guide for partial disassembly. In general, disassembly is accomplished in the item number sequence shown in Figure 3. Special procedures are included in the following steps:

NOTE

Discard and replace all O-Rings and gaskets removed during disassembly.

1. Thoroughly clean the exterior of the valve.
2. The valve cover is full of fluid, so hold it over a container when cover (4), Figure 3 is removed.

NOTE

Refer to index numbers located on Figure 3 throughout the disassembly procedure.

3. Remove parts (1) through (11a) except do not remove adjustment screw (7) from flapper plate S/A (8) unless inspection of nozzle (12) mating surface shows erosion. See Figure 3.
4. Remove nozzle (12) with a 5 mm open end or a small adjustable wrench. Turn nozzle counter-clockwise to remove.

NOTE

Do not remove screw (18) or gasket S/A (17) in the following step unless gasket is damaged.

5. Remove parts (13) through (20). Pull coil (19) carefully from body (38), do not break wires. Part (13) does not exist on 3000 PSI models.

6. Remove parts (21) through (30). If spool (27) is tight, thread a 5/16-18, (M8-6H), screw into the spool end, work the spool in and out to loosen, then remove spool from body (38).



CAUTION

Do not clean filter screen (28) with a scribe or a pick.

7. Remove parts (31) through (36). If the check valve seat is tight within the body, a small hooked tool may be used to remove the check valve seat. Press the ball inward and hook the seat; work the seat out by pulling first one side then the other.

8. Remove parts (37) through (52). Do not remove seat (53) unless inspection of piston (50) reveals damage to the piston seating surface.

NOTE

Plunger (46) contains an 8-32 thread for disassembly purposes, (early designs use a 10-24 thread).

9. Remove parts (54) through (66). Use the internal Truarc pliers to remove retaining ring (62).

10. Remove parts (67) and (68). These parts exist on -S6 special models only.

NOTE

Do not remove rollpin (69) in the following step unless damaged. The mouting surface can be scored during removal. If removal is necessary, check surface for burrs and flatness before installation of a new rollpin.

11. Remove parts (69) through (71). Do not remove seat (70) unless piston (59) shows evidence of damage in the seat area.

NOTE

CGE-10-*-20 units use a sleeve (70a) located below seat (70). Refer to Figure 3. Replace the seat and sleeve if damaged.

D. Cleaning

All parts must be thoroughly cleaned and kept clean during inspection and assembly. The close tolerance of the valve makes this requirement more stringent than usual. Clean all removed parts, using commercial solvent that is compatible with the system fluid. Compressed air may be used in cleaning the valve, but it must be filtered to remove water and contamination. Clean compressed air is particularly useful in cleaning the spool orifices and body passages.



CAUTION

Do not stone edges of piston (59). See Figure 3.

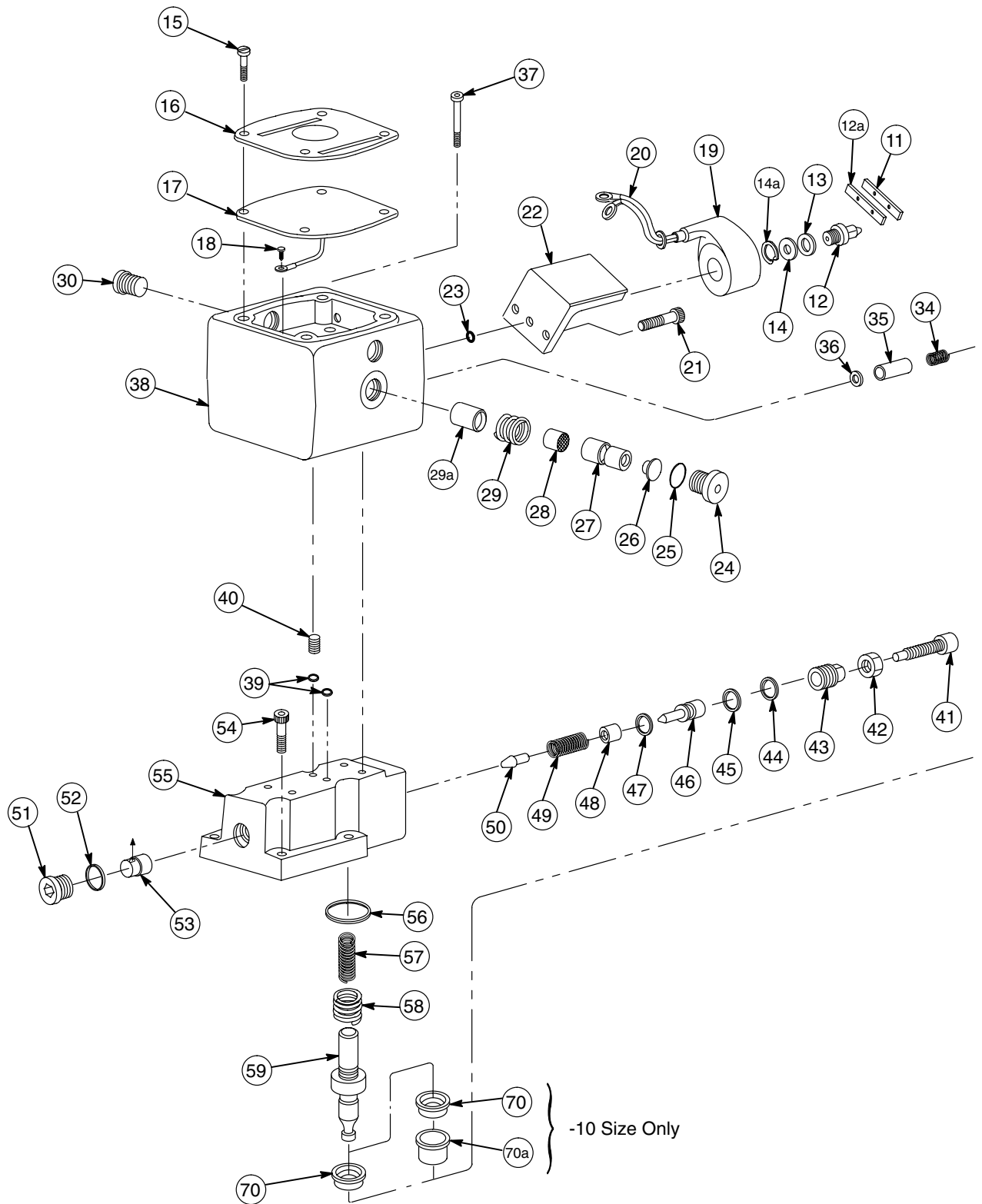


Figure 3.

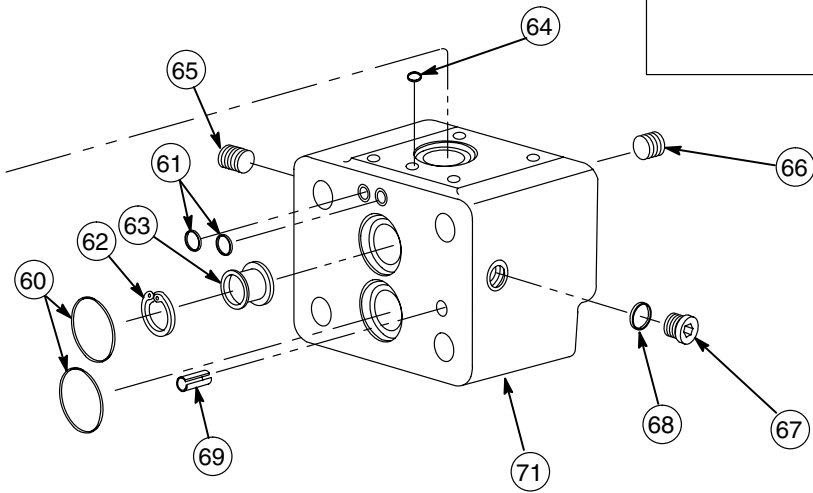
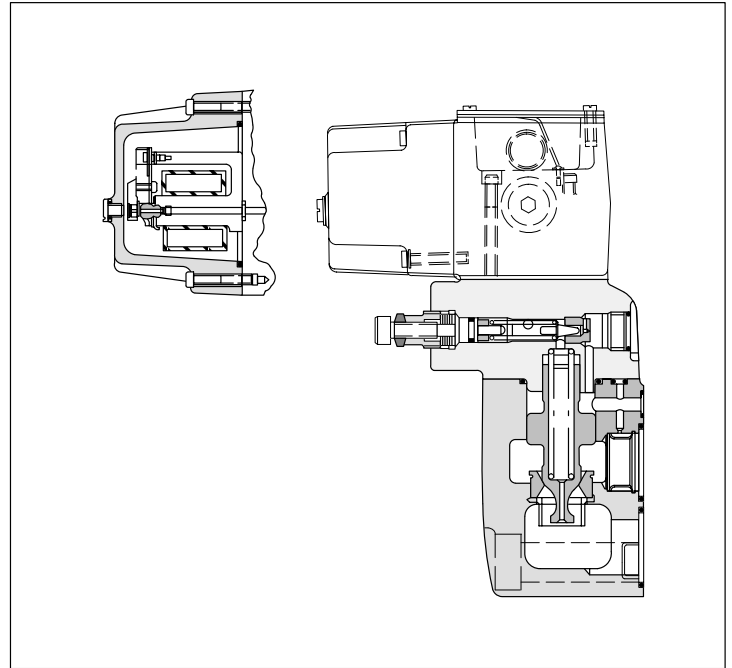
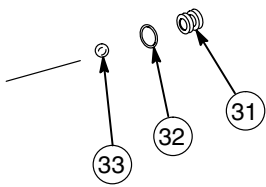
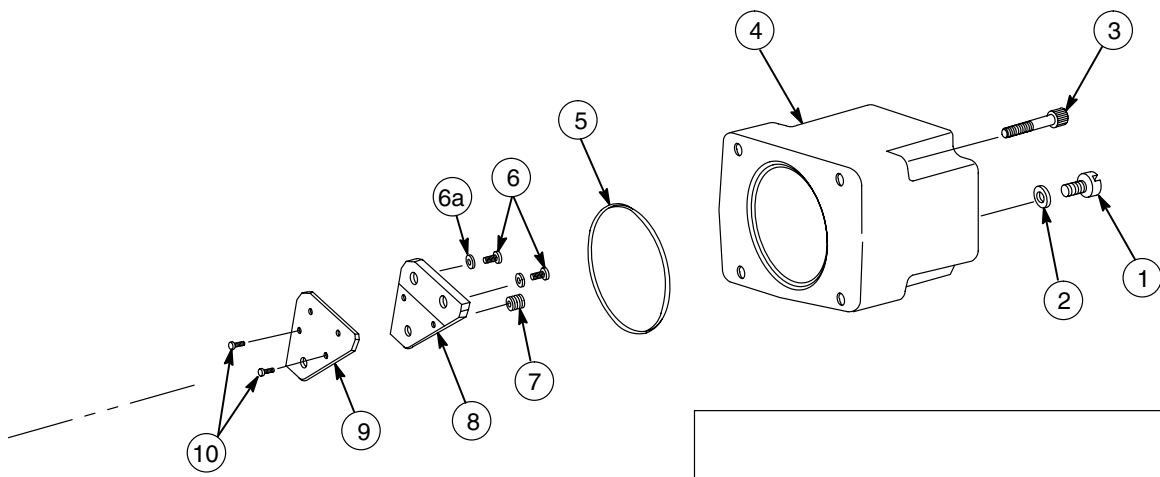


Fig. & Index No.	Description	Units Per Assy.
1	Screw	1
2	Washer (Dyna Seal)	1
3	Screw	4
4	Cover	1
5	O-Ring	1
6	Screw	2
6A	Washer	2
7	Adjustment Screw	1
8	Flapper Plate S/A	1
9	Leaf Spring	1
10	Screw	2
11	Shims	A/R
11a	Shim	1
12	Nozzle	1
13	Dampening Shim	1
14	Coil Retainer	1
14a	Retaining Ring	1
15	Screw	4
16	Nameplate	1
17	Wire & Gasket S/A	1
18	Screw	1
19	Encapsulated Coil	1
20	O-Ring	1
21	Screw	2
22	Frame	1
23	O-Ring	1
24	Plug	1
25	O-Ring	1
26	Button	1
27	Spool (Blocking Valve)	1
28	Filter Screen	1
29	Spring	1
29A	Rod	1
30	Plug	1
31	Seat	1
32	O-Ring	1
33	Ball	1
34	Spring	1

Fig. & Index No.	Description	Units Per Assy.
35	Retainer	1
36	Washer	1
37	Screw	4
38	Body	1
39	O-Ring	2
40	Plug	1
41	Adjusting Screw	1
42	Nut	1
43	Lock Screw	1
44	Shim	A/R
45	Washer	1
46	Plunger	1
47	O-Ring	1
48	Spacer	1
49	Spring	1
50	Piston	1
51	Plug	1
52	O-Ring	1
53	Seat	1
54	Screw	4
55	Intermediate Body	1
56	O-Ring	1
57	Spring	1
58	Spring	1
59	Piston	1
60	O-Ring	2
61	O-Ring	2
62	Retaining Ring	1
63	Filter Screen	1
64	O-Ring	1
65	Plug	1
66	Plug	1
67	Plug	1
68	O-Ring	1
69	Roll-pin	1
70	Seat	1
70a	Sleeve	1
71	Body	1

E. Inspection, Repair, and Replacement

Check that all internal passages are clean and unobstructed. Examine all mating surfaces for nicks and burrs. Minor nicks and burrs. Minor nicks and burrs can be removed with an India stone, or crocus cloth. If unit has operated in a contaminated system, all internal passages of pilot body (38), intermediate body (55) and main stage body (71) must be thoroughly flushed with clean solvent.

NOTE

Refer to index numbers located on Figure 3 throughout the inspection, repair and replacement procedure.

1. Inspect all screws for evidence of damaged threads. If threads are damaged, replace the screws.
2. Inspect springs (29, 34, 49, 57 and 58) for damaged coils. Replace springs if coils are damaged. Inspect springs for distortion. The ends of the springs shall be square and parallel to each other. Replace spring if distorted.
3. Perform a continuity test on coil (19). Resistance valves should range from 17 to 19 Ohms. This test is superficial, a more rigorous test requires special equipment. Replace the part if threads are damaged. Inspect the orifice face of nozzle for evidence of nicks or scratches. If the orifice size is distorted, or face is eroded, replace the part.
4. Inspect nozzle (12) for damaged threads. Replace the part if threads are damaged. Inspect the orifice face of nozzle for evidence of nicks or scratches. If the orifice size is distorted, or face is eroded. Replace the part.

NOTE

Two nozzle sizes are available:

1. 0.070 inch diameter hole for 1000 PSI models.
 2. 0.058 inch diameter hole for 3000 PSI models.
5. Inspect mating surfaces of cover (4), frame (22), body (38), intermediate body (55), and body (71) for nicks and scratches. Remove nicks and scratches using an India stone and/or polishing paper.

NOTE

Use polishing paper on a clean flat surface.

6. If a new piston (59) is required, use a three (3) or four (4) cornered India stone to break the feather edge of balancing grooves. Use 500 grit polishing paper lightly on the outside diameter of the piston. Wash the piston in clean solvent.
7. If seat (70) was removed, make sure hole in body is clear.
8. Inspect spool (27), button (26), and filter screen (28). If spool is scratched across the lands, body (38) may have scratches within the bore. Check to ascertain damage and replace parts if scratches are such that binding of the spool occurs or leakage through the blocking valve is excessive. Minor scratches can be removed with 500 grit paper. Make certain filter screen is not ruptured or bent.

NOTE

If spool (27) shows indications of large particle contamination, replace filter screen (63).

9. Inspect adjustment screw (7) for erosion. If adjustment screw (7) is loose within flapper plate, repalce screw. Inspect threads; screws (10) should thread easily into the flapper plate.

10. Inspect leaf spring (9) for burrs and possible fracture. Leaf spring should be flat. If a small bow exists, install the leaf spring against flapper plate (8) with bow outward. Screws (10) will pull the leaf spring flat against the flapper plate S/A. If bow is too great to be corrected, replace leaf spring (9).

11. Inspect the check valve assembly for burrs, and possible fracture.

12. Inspect piston (59) to body (71) clearance as follows: Clean and lubricate piston and body. Insert piston into body bore and turn 360° while moving the piston in and out of the bore. If binding occurs, remove piston, stone the balancing grooves and use 500 grit paper lightly on the surface of the piston. Clean and lubricate piston (59) and perform the clearance test again. Piston (59) should fit the bore with no noticeable side play. Check the piston's fit into intermediate body (55). Use the same procedure.

13. Make sure the 0.040 control orifice located in body (71) is open. The orifice is located below O-Ring (64) and is a straight through drilled hole.

F. Assembly

Replace the O-Rings removed from the unit with those supplied in the seal kit. Lubricated O-Rings and parts, using clean system fluid to facilitate assembly. Assembly of the parts will be in the reverse numerical sequence. Special procedures are included in the following steps:

NOTE

Refer to index numbers located on Figure 3 throughout the assembly procedure.

1. If seat (70), (70 and 70a on -10 size units), was removed from body (71), install a new seat by pressing fully into place against the shoulder. Use an arbor press for this operation.
2. If seat (53) was removed, install new seat (53) full in against the shoulder. Orient radial hole toward pilot stage see Figure 3. Use an arbor press to install seat (53).
3. If rollpin (69) was removed, make sure the mounting surface is flat before installation of a new rollpin.
4. Install plugs (67, 66, and 65) into body (71). Plug (67) exists on the -S6 models only. Use new O-Ring (68) on plug (67).
5. Install O-Ring (64), filter screen (63) and retaining ring (62) into body (71).
6. Install parts (59) through (54). Torque screws (54) hand tight, then use a hex key to move piston (59) within the valve (see Figure 4). Piston (59) should not stick or show evidence of bind. Cross torque screws (54) to 112 lbf. in., (12.6 N.m) maximum. Check the piston again to see if a bind occurs.

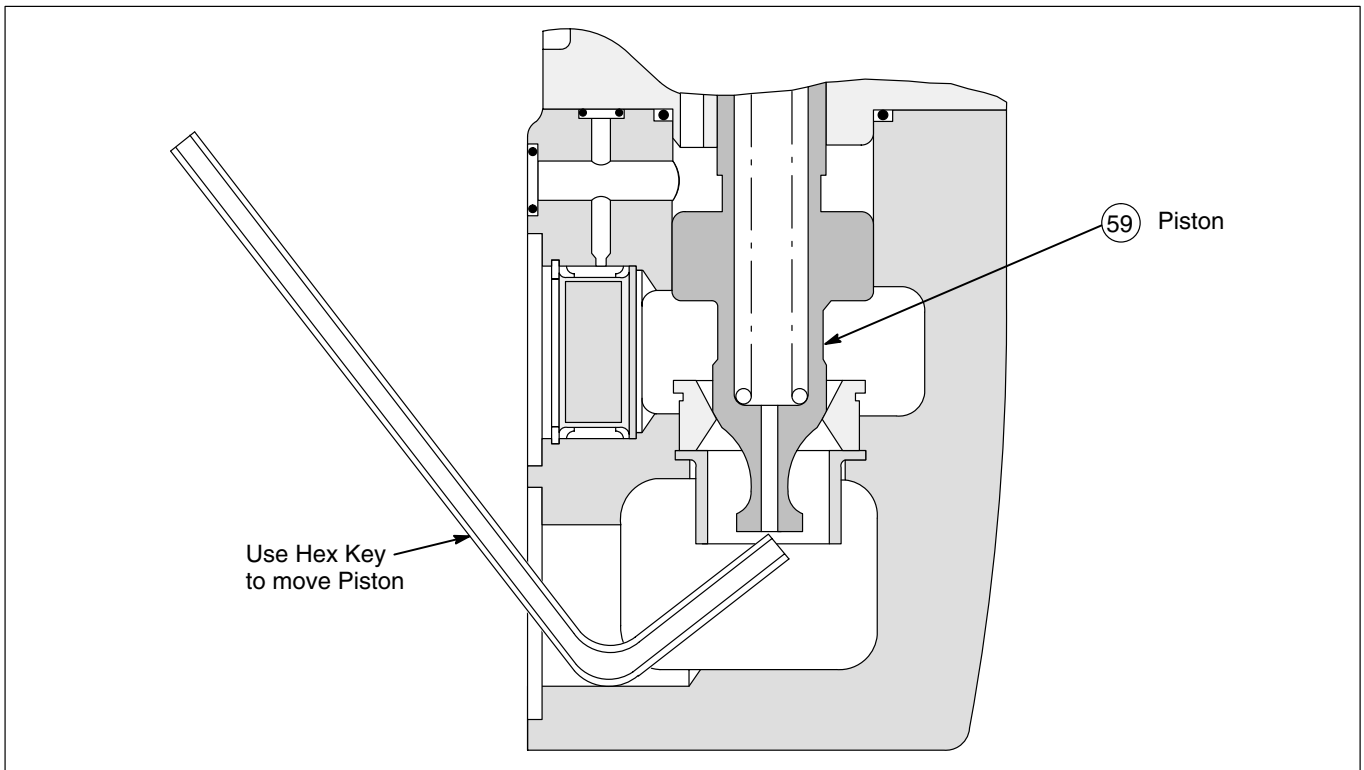


Figure 4. Check of main piston for bind.

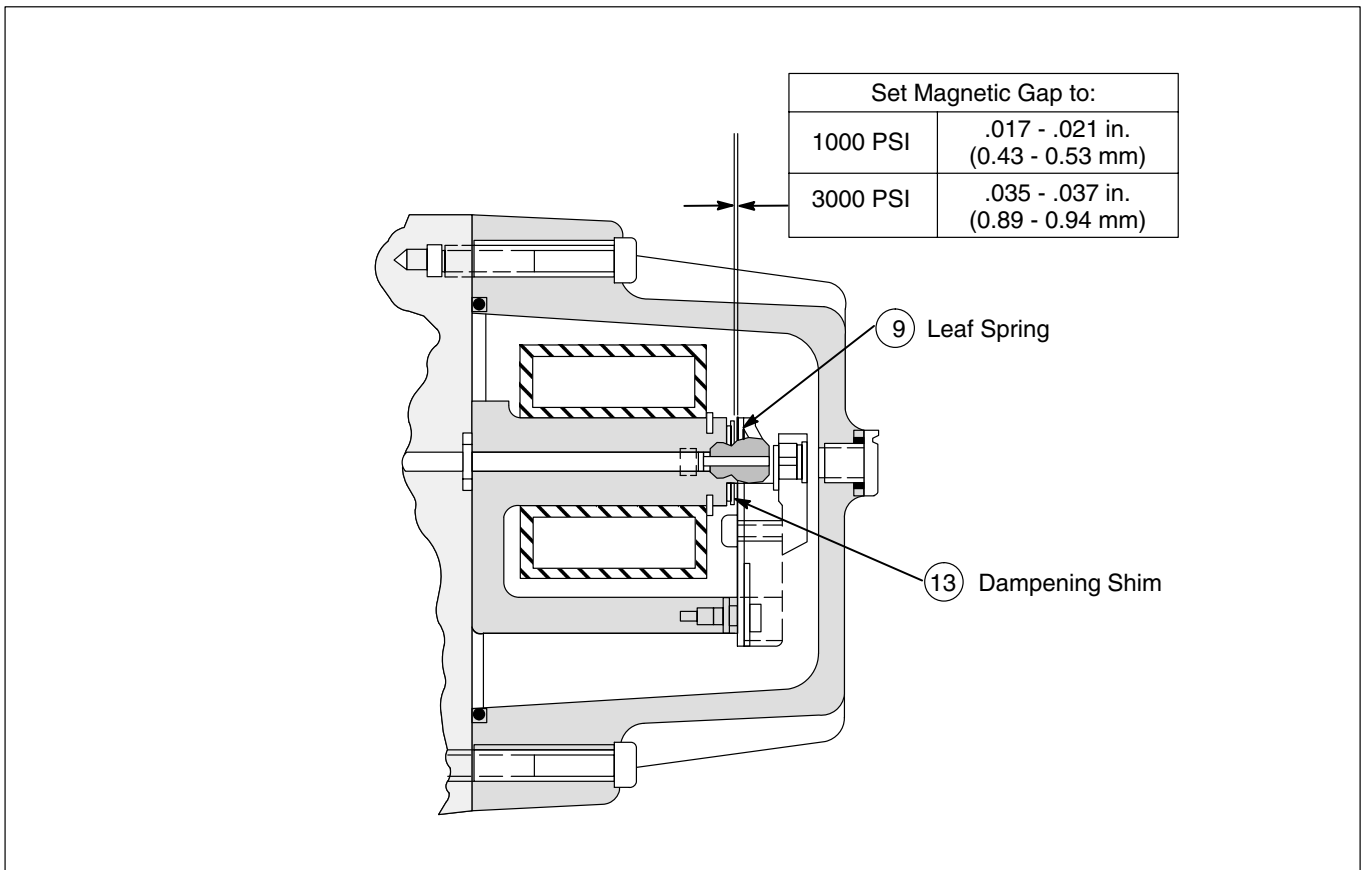


Figure 5. Setting magnetic gap on 1000 & 3000 PSI models.

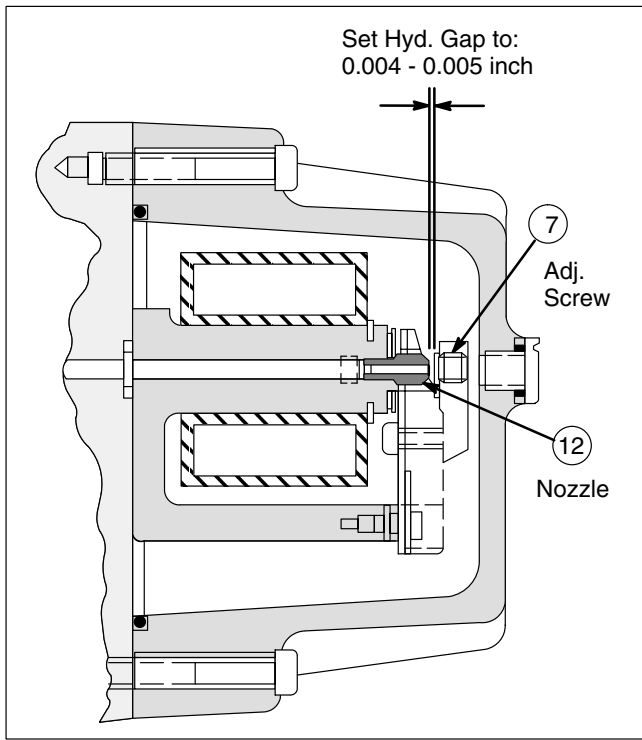


Figure 6. Setting hydraulic gap.

7. Install manual relief valve parts (52) through (41) into cover (55). If a new seat (53) was installed, coin piston (50) to seat (53). Use a six inch (6") piece of tubing to hold the piston. Insert piston and tubing into valve until piston rest against seat (53). Gently tap the tubing (while holding tubing centered in the bore); this mates the piston to the seat. Remove piston (50) and tubing, then remove piston from the tubing. Install parts associated with piston into valve, (49) through (41).

8. Install parts (40) through (37). Plug (40) must be below the mounting face of body (38) after installation. Cross torque screws (37) to 42 lb. in., (4.7 N.m), maximum.

9. Install check valve parts (36) through (31). If a new ball or seat is used, coin the ball and seat prior to installation.

10. Install plug (30) and blocking valve assembly parts (29a) through (24). Filter screen (28) fits into spool (27) with screen side inward. (Use petroleum jelly to retain filter screen within spool at assembly.) Important: Install button in manual position, (reversed from that shown in Figure 3). The blocking valve must prevent flow to the flapper orifice. (Initial test procedure set up).

11. Install parts (23) through (21). Torque screws (21) to 40 lb. in., (4 - 4.5 N.m).

12. Install O-Ring (20) in place over coil (19) wires. Slide coil (19) over frame (22) while inserting wires into body (38) wiring cavity. Gently press O-Ring (20) and wires through body opening until coil bottoms against the screw heads (21) that secure frame (22).

13. Install parts (18) through (12). Dampening shim (13) exists on 1000 PSI models only. Thread nozzle (12) through coil retainer (14) into frame (22) Use a 5 mm open end wrench or a small adjustable wrench to tighten the nozzle. Do not overtighten the nozzle (12) or accidentally strike the nozzle orifice face with the wrench. Damage to the orifice face could reduce the maximum pressure setting, (due to leakage past the orifice). See Figure 5 for location of dampening shim.

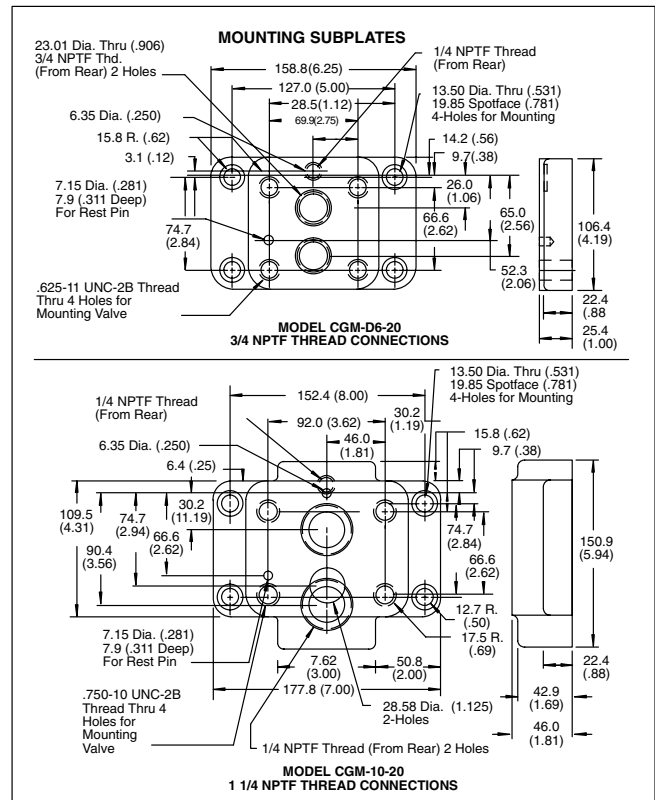


Figure 7. CGE** - * -20 valve mounting data.

14. Assemble leaf spring (9) and flapper plate (S/A) (8) with screws (10). Inspect the leaf spring; if the leaf spring is bowed, position the bow outward. Torque screws (10) to 12-14 lb. in., (1.4 - 1.6 N.m). Screws (10) should straighten the leaf spring against the flapper plate.

NOTE

In the following step, one master shim (11a) (thick) and four adjustment shims (11) (thin) are normally used. The shims set the magnetic gap of the valve.

15. Insert screws (6) and washers (6a) through flapper plate S/A (8) opening into leaf spring (9). Hold screws in place and locate shims over screws against leaf spring (9). Thread screws into frame (22) lightly. Position flapper plate S/A (8) to prevent mechanical contact with side of nozzle (12). Torque screws (6) to 12-14 lb. in., (1.4 - 1.6 N.m). Check the magnetic gap as follows:

a. 1000 PSI models: Refer to Figure 5 and carefully measure the distance between leaf spring (8) and dampening shim (13). Use a feeler gage. The distance should be 0.017 to 0.021 inches. (0.43 - 0.53 mm). Add or remove shims (11) to meet this dimension.

b. 3000 PSI models: Refer to Figure 5 and carefully measure the distance between leaf spring (9) and frame (22). Use a feeler gage. The distance should be 0.035 to 0.037 inches. (0.89 - 0.94 mm). Add or remove shims (11) to meet this dimension.

16. If adjustment screw (7) was removed from flapper plate (8), thread a new adjustment screw (7) into flapper plate (8).

Measure the hydraulic gap with a feeler gage to set the clearance between nozzle (12) and adjustment screw (7). The gap should be 0.004 - 0.005 inch, (0.10-0.13 mm). This applies to 1000 & 3000 PSI models. Refer to Figure 6.

17. Install parts (5) through (1). Cross torque screws (3) to 35-40 lbf. in., (4-4.5 N.m)

Section VII – Test Procedure

A. Test Conditions

Hydraulics:

Fluid medium SAW 10W oil or equivalent
 Fluid Temperature 100±5° F.
 Maximum Pressure 3500 PSI

Test Volume:

CGE-06 20 USGPM
 CG3-10 50 USGPM

B. Electrical Specifications

An adjustable current source from zero (0) to 500 milliamperes is required. Vickers EMCS-P-30 is recommended. Refer to installation drawing 521557.

C. Test. (Preliminary Adjustments)



CAUTION

The CGE pilot valve is externally drained through the cover. Connect drain line into the cover with a 0.5625-18 UNF-2B straight thread connection for 0.375 O.D. tubing. Drain line must be full size, unrestricted and connected directly to the reservoir so that it terminates below the fluid level. No other lines are to be connected to this line.

NOTE

System filtration should be 35 micron absolute full flow to prevent contamination of the pilot valve.

1. Before mounting the assembled valve for test, manually move piston (59, Figure 4) to full stroke with a hex wrench or similar tool. If piston (5) binds refer to paragraph VI, step E.12 and paragraph VI, step F.6.

NOTE

A suitable subplate is required to mount the valve. A CGE subplate properly piped is recommended. See Figure 7.

NOTE

A sample hydraulic and electrical circuit is shown in Figure 8. Modify an existing test stand or obtain necessary components to assemble the test circuit.

NOTE

If the valve is an -S6 model, connect a 3000 PSI, 35 micron filter to the main stage to the valve. Filter ports are located on the front side of the main stage. See Figure 9.

2. Connect valve to the test circuit and attach power supply (12, Figure 8). The connections can be made without regard to polarity.

3. Set dither adjustment on power supply to minimum.
4. Turn power supply current control knob to zero (0).



CAUTION

In the following step, if milliammeter (11, Figure 8) reads in reverse, reverse the meter connecting wires.

5. Crack the power supply control and observe milliammeter for polarity. Correct wiring if necessary. Return control to zero current.

6. Switch directional valve (8, Figure 8) to allow flow through flow meter and adjust flow rate for valve under test. (Flow rates tabulated in paragraph VII.A. Test Conditions).

7. Adjust relief valve (2, Figure 8) to minimum pressure and open globe valve (1)

8. Switch directional valve to center blocked condition. Gradually close globe valve (1, Figure 8) and adjust relief valve (2) until pressure reading on gage (7) is 3750 PSI. Globe valve must be completely closed at completion of this step.

NOTE

Needle valve (6, Figure 8) is used as a snubber for gage (7).

D. Manual Adjustment Test

1. Switch directional valve to divert flow through the valve under test (10, Figure 8). Turn relief valve adjustment screw (41, Figure 3) all the way in. Pressure should be within range "A", perform the following adjustment procedure.

Model	"A" PSI	"B" PSI	"C" PSI	"D" PSI	"E" PSI	"F" PSI
CG3-**-1	1200/ 1300	1000	700	15	125	1250
CG3-**-3	3450/ 3700	3000	2500	45	1500	3500

Table 4.



WARNING

To prevent personal injury, remove all power from the hydraulic system or divert all system flow to the reservoir through flow meter (9, Figure 8) when work is performed to the valve under test.

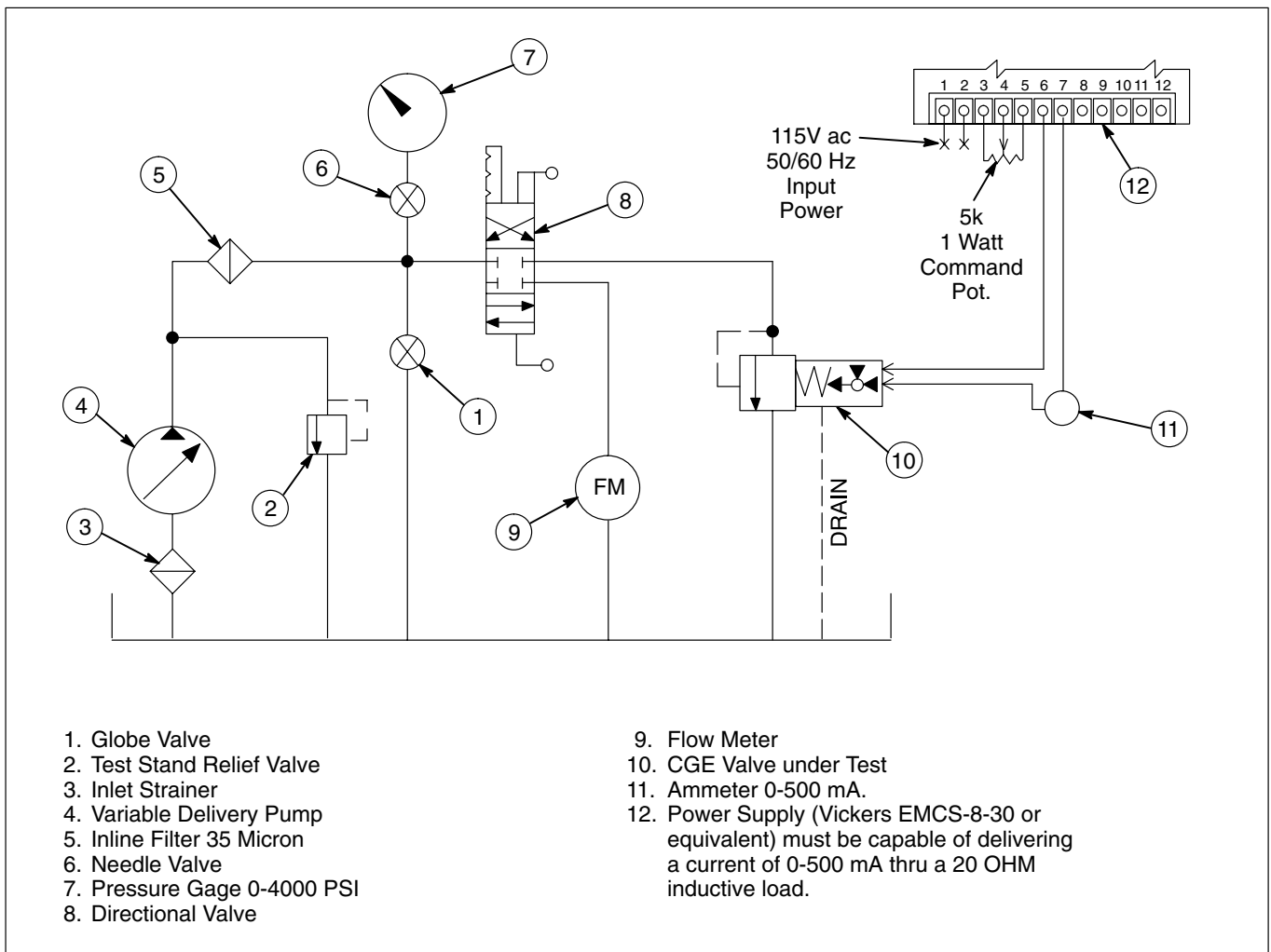


Figure 8. Hydraulic Test Circuit for CGE Valve.

NOTE

In the following step, adding shims increase pressure while removing shims decrease pressure.

2. CGE--1-2***

Add or remove shims to bring pressure shown on gage (7, Figure 8) within range "A" of table 4. Use the 0.025 inch thick shim, (44, Figure 3), for a 100 PSI change.

CGE--3-2***

Add or remove shims to bring pressure shown on gage (7, Figure 8) within range "A" of table 4. Use the 0.025 inch thick shim, (44, Figure 3), for a 230 PSI change and the 0.250 thick shim for a 700 PSI change.

3. Turn relief valve adjustment screw to pressure "B" shown in Table 4. Check for porosity and external leaks. Drop pressure to valve "C" with globe valve 1, (Figure 8), and check for leakage from discharge port, not to exceed "D".

4. Adjust relief valve pressure setting from "C" down to "E" then up to "F" for pressure range test. Tighten lock nut (42, Figure 3).

5. Switch directional valve (8, Figure 8) to divert flow through flow meter.

6. Remove plug (24, Figure 3) and reverse button (26, Figure 3) to the normal position. Reinstall plug (24) and secure.

E. Electrical Pilot Adjustment

1. Switch directional valve (8, Figure 8) to divert flow to the valve under test (10, Figure 8).

2. Make sure dither is off (dither control fully counter-clockwise). Increase current to the valve under test until rated pressure is obtained. The current at this time should be 475 to 400 milliamperes for the 3000 PSI models and between 465 and 500 for the 1000 PSI models. If the current is not within this range, remove current, shift directional valve (9, Figure 8) to direct oil to the flow meter and remove pilot valve cover (4, Figure 3). If the current reading is low, add shims (11, Figure 3) as required. If current reading is high, remove shims as needed. Each shim will change the pressure setting approximately 25 PSI on 1000 PSI models and 150 PSI on 300 PSI models.

3. Adjust the clearance between nozzle (12, Figure 3) and flapper adjustment screw (7, Figure 3) to be between 0.004 - 0.005 inch, (0.10 - 0.13 mm). Use a feeler gage for this adjustment.

4. Assemble cover (4, Figure 3) to the pilot valve with screws (3, Figure 3).

5. Repeat steps E.1. and E.2 to verify adjustment. Repeat the complete "Electrical Pilot Adjustment Procedure", until noted results are obtained.

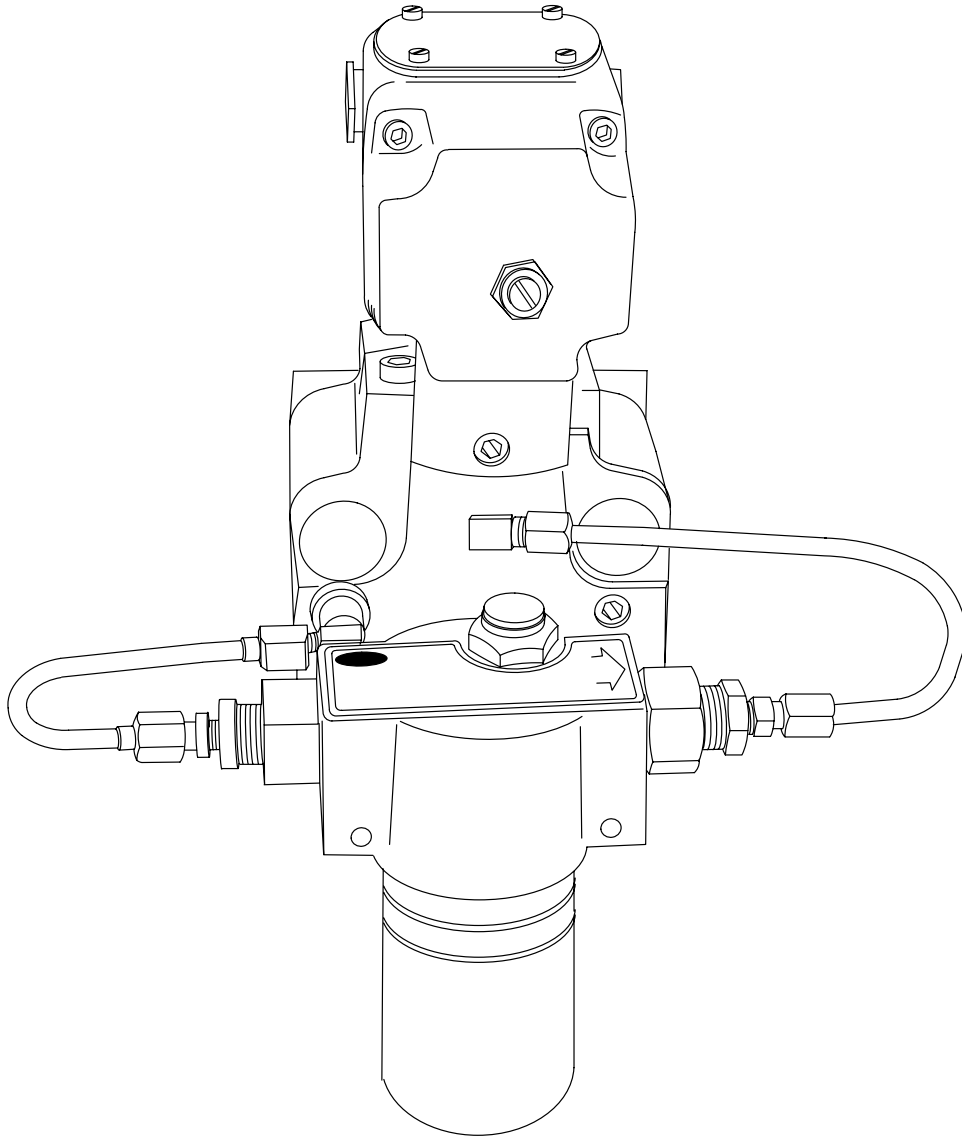


Figure 9. Filter connection for S-6 models.