Instruction Manual

CVS Type 667 Diaphragm Actuator
Sizes 30-70

All CVS Controls actuators are to be installed and maintained in accordance with instructions supplied by CVS Controls.

This manual includes information on installing, maintaining and adjusting the CVS Type 667 Actuator, sizes 30 to 70. Part numbers for the entire assembly is also included. For information on other equipment used with these actuators, consult the appropriate manuals.

Figure 1: CVS Type 667 Actuator

Introduction

The CVS 667 is a reverse-acting, spring-opposed diaphragm actuators providing 3-inches (76 mm) of maximum travel. Although typical pressure ranges are 3 to 15 psi or 6 to 30 psi, additional pressure ranges are available upon request. The CVS Type 667 Actuator is used for automatic operation of control valves, effective in applications where throttling or on/off service is required.

The actuator positions the valve plug in the valve in direct response to the varying loading pressure on the actuator diaphragm. When the signal pressure increases to the lower diaphragm casing, the actuator stem is forced upward, compressing the spring. When the signal pressure is reduced, the spring moves the actuator stem in the downward direction. If the signal pressure should fail, the spring will force the stem downward, providing "fail-closed action" for "push down to close" valves.

Specifications

Refer to Table 1 for specifications for the CVS Type 667 Actuator, and to the nameplate on your actuator for settings specific to your equipment.

It is important not to exceed the Maximum Diaphragm Pressure as listed in Table 1 when the actuator is set at less than full travel. If this pressure is exceeded before the travel stop comes in contact with the upper diaphragm plate, the maximum allowable valve stem load may be exceeded.

The Maximum Excess Diaphragm Pressure as listed in Table 1 is the pressure that can be added when the actuator is set at full travel. The sum of the pressure which is required to fully stroke the valve and the excess pressure added when the actuator is against the stop must not exceed the "Maximum Diaphragm Casing Pressure" as outlined in Table 1.

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Table 1: CVS Type 667 Diaphragm Actuator Specifications

Specification			Actuator Size							
			30	34	40	45	46	50	60	70
Nominal Effective Area		Sq. In.	46	69	69	105	156	105	156	220
		Sq. cm	297	445	445	677	1006	677	1006	1419
Yoke Boss Size Diameter		In.	2-1/8	2-1/8	2-13/16	2-13/16	2-13/16	3-9/16	3-9/16	3-9/16
		mm	54	54	71	71	71	90	90	90
Valve Stem Size		In.	3/8	3/8	1/2	1/2	1/2	3/4	3/4	3/4
		mm	9.5	9.5	12.7	12.7	12.7	19.1	19.1	19.1
Max. Allowable Output Thrust		Lbs	2300	2300	2700	5650	7550	5650	6800	8800
		N	10,230	10,230	12,010	25,131	33,582	25,131	30,246	39,142
Maximum Travel[2]	Standard	In.	3/4	3/4	1-1/2	2	2	2	2	3
		mm	19	19	38	51	51	51	51	76
	Top-Loaded	In.	---	3/4	---	3/4	---	---	1-1/8	---
		mm	---	19	---	19	---	---	29	---
Max. Diaphragm Pressure to Stroke Actuator		Psig	40	45	45	50	45	50	45	40
		Bar	2.8	3.1	3.1	3.4	3.1	3.4	3.1	2.8
Max. Excess Diaphragm Pressure		Psig	70	45	45	30	15	30	15	15
		Bar	4.8	3.1	3.1	2.1	1.0	2.1	1.0	1.0
Max. Diaphragm Case Pressure[1]		Psig	110	90	90	65	55	65	55	55
		Bar	7.6	6.2	6.2	4.5	3.8	4.5	3.8	3.8
Approximate Weight		Lb	40	60	56	95	125	97	125	254
		Kg	18	27	25	43	57	44	57	115

1. Maximum diaphragm casing pressure must not be exceeded, and must not produce a force on the actuator stem greater than the maximum allowable actuator output thrust or the maximum allowable valve stem load.
2. Actuator travel may be less than the value specified after being connected to the valve.

Installation

The CVS Type 667 Diaphragm Actuator is usually delivered mounted on a CVS Controls valve body. When installing the valve body into the pipeline, consult the instructions for that particular valve body.

Should you have any questions during the installation procedure, consult your CVS Controls representative.

Actuator Mounting

1. Install the stem locknuts onto the valve stem and place the travel indicator disc onto the locknuts.
2. If the valve is direct-acting, push the valve stem down to close the valve. If the valve is reverse-acting, push the valve stem down to open the valve.
3. Place the actuator onto the valve bonnet. If necessary, use a hoist or lift the actuator in order to slip the yoke locknut over the valve stem.
4. Screw the yoke locknut onto the bonnet securing the actuator to the bonnet.
5. Apply required supply pressure to actuator. If using a 6-30 signal, apply 35 psi. If using a 3-15 signal, apply 20 psi to move the actuator stem to the top of the travel.
6. Align the indicator disc with the travel side on the actuator by adjusting the locknuts.
7. Raise the valve plug until the travel disc aligns with the top of the scale (full travel).
8. Clamp the actuator and valve body stems between the two stem connector halves. Insert and tighten both stem connector cap screws.

Note: Avoid clamping the tip of either the valve stem or the actuator stem in the stem connector. Failure to completely clamp the stems may strip the threads and affect proper operation. The length of each stem clamped in the stem connector should be equal to or greater than the diameter of that stem.

9. Lift the travel indicator disc to the stem connector and thread the stem locknuts against the stem connector.
10. Realign the travel indicator scale to show the valve position.

Loading Connection

1. The loading pressure is connected to the 1/4-inch NPT connection in the side of the yoke.
2. For the CVS 667 Actuator Size 70, remove the 1/4-inch bushing in the 1/2-inch NPT female connection to increase the connection size if desired. Piping or tubing can be used, but should be kept as short as possible to avoid transmission lag in the control signal. If an accessory is attached to the actuator ensure that it has been properly secured.
3. If the valve positioner is provided as part of the original equipment, the loading pressure connection will be made at the CVS Controls manufacturing facility.
4. Check the valve stem travel by cycling the actuator several times. Ensure that the proper travel occurs when the correct pressure range is applied to the diaphragm.

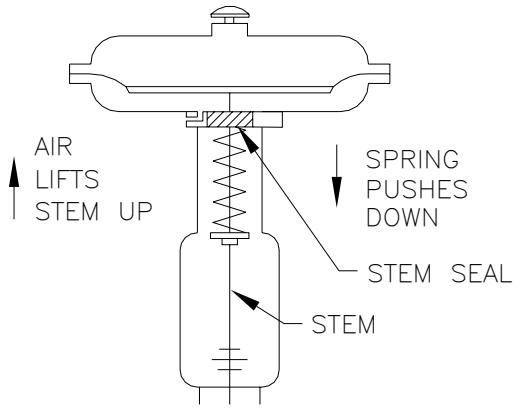

Figure 2: Schematic of CVS Type 667 Actuator

Loading Connection cont'd

5. If the valve stem travel or pressure range is incorrect, refer to the "Adjustments" section of this manual.

Do not place the valve in service if it is not responding properly to diaphragm loading pressure changes.

For ease of service, ensure that the control valve is located for easy access and serviceability with room above for accessibility. Ensure that sufficient room is provided below should removal of the actuator and valve plug be necessary.

Adjustments

Travel

Refer to the nameplate on the yoke of the actuator for details on the specific construction and operating range of the control valve assembly.

The requirements of your specific application will dictate the spring and diaphragm used in your CVS Type 667 Actuator, and when in service, the actuator should create full travel of the valve plug when diaphragm pressure is applied according to the range indicated on the name plate. Generally, the diaphragm pressure range is 3 to 15 PSI or 6 to 30 PSI, but other ranges may be used.

If the motion during the actuator travel differs from the travel stamped on the actuator nameplate, adjust according to the following directions. In order to adjust the travel of a direct-acting valve, slightly pressure the actuator to move the valve plug off of the seat. This reduces the chance of damaging the valve plug or seat during adjustments.

1. Loosen and back off the stem locknuts and indicator disc from the stem connector.
2. Loosen the stem connector cap screws.

   Note: Do not use wrenches or other tools directly on the valve stem as this could cause damage to the stem surface and valve packing.

3. Tighten the locknuts (Keys 14 and 20) and complete the adjustment by either screwing the valve stem into the stem connector to lengthen travel or out of the stem connector to shorten travel.
4. Cycle the actuator to ensure that the correct travel has been achieved and repeat the adjustment if necessary.
5. When the correct travel has been reached tighten the stem connector cap screws.
6. Raise the travel indicator disc by threading the stem locknuts against the stem connector.
7. Adjust the travel scale to match the disc.

Spring

If the loading pressure range applied to reach the desired travel differs from that specified on the nameplate, a spring adjustment is required.

Check the "Bench Set" pressure range on the nameplate when the valve contains no pressure and the packing is loosely inserted in the bonnet. Refer to the "Diaphragm Pressure" range on the nameplate when the valve is controlling the specified pressure drop and the packing is tightened to stop leaks around the stem.

1. Monitor the loading pressure while making adjustments. Be sure not to exceed the pressure specifications of either the loading regulator or the actuator casings.
2. Each actuator spring has a fixed pressure span. Changing the spring compression shifts the span up or down to make the valve travel coincide with the loading pressure range.

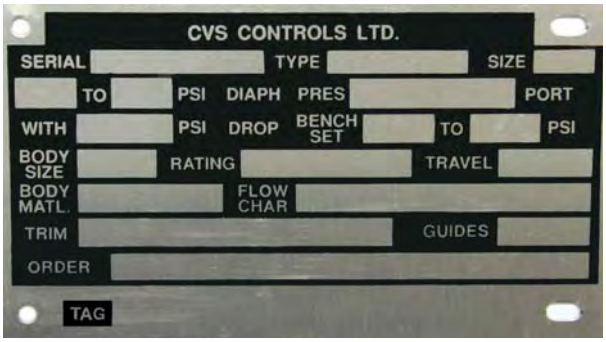

Figure 3: Nameplate on CVS Type 667 Actuator

Spring Adjustments cont'd

3. To shift the span up, turn the spring adjustor (Key 11) into the yoke. To shift the span down, turn the spring adjustor out of the yoke.

For operation of the CVS 667 Diaphragm Actuator the actuator stem and valve plug stem must move freely in response to the loading pressure change on the diaphragm.

Maintenance

Actuator parts are subject to normal wear and tear and should be inspected regularly. The frequency of inspection and replacement of parts is dependent on the severity of operating conditions.

WARNING

A sudden release of pressure or any uncontrolled process fluid can cause personal injury or damage to property. Prior to any disassembly, be sure to:

- **Isolate the valve from the process,**
- **Release all process pressure**
- **Vent the actuator loading pressure, and**
- **Relieve all spring compression.**

Disassembly

Although the following instructions describe how the CVS Type 667 Diaphragm Actuator can be completely disassembled, when inspection or repairs are required, only disassemble those parts required to accomplish the job. Key numbers refer to Figures 4 and 5.

1. Bypass the control valve and reduce the loading pressure to atmospheric.
2. Remove the tubing or piping from the connection in the top of the yoke (Key 9). For top-loaded construction also remove the piping or tubing from the connection in the upper diaphragm casing (Key 7).
3. Thread the spring adjustor (Key 2) off the stem (Key 3) to remove all spring compression.
4. If necessary remove the actuator from the valve body by separating the stem connector (Key 21) and removing the yoke locknut.
5. Remove the spring adjustor (Key 2) from the actuator stem (Key 3) and lift the spring seat and spring (Keys 4 and 1) out of the yoke.
6. Remove the diaphragm casing cap screws and nuts (Keys 10 and 14) and lift off the upper diaphragm casing (Key 7).
7. Remove the following parts: diaphragm (Key 6), diaphragm plate (Key 5), spacer (Key 32), cap screw (Key 11) and actuator stem (Key 3). Be careful not to damage the O-rings (Key 25) when pulling the threads of the actuator stem through the seal bushing (Key 24). Remove the stem through the housing of the yoke so as not to pull the threads through the seal bushing.
8. Separate the parts of this assembly by removing the cap screw (Key 11).
9. To remove the seal bushing, remove the snap ring (Key 30) and lift out the bushing.
10. Remove the cap screws (Key 19), the lower diaphragm casing (Key 8) and the gasket (sizes 30 through 60) or O-ring (size 70) (Key 28).
11. If necessary, the down travel stops can be removed (Key 33).

Assembly

1. Place a new gasket or O-ring (Key 28) on the yoke (Key 9) and apply lubricant to the O-ring.
2. Position the lower diaphragm casing (Key 8) on the yoke, align the holes and insert and tighten the cap screws (Key 19).
3. If the down travel stops (Key 33) were removed, insert and tighten them.
4. Coat the O-rings (Keys 28 and 29) with lubricant and place them in the seal bushing (24).
5. Fill the seal bushing with lubricant, slide the bushing into the yoke (Key 9) and install the snap ring (Key 30).
6. Insert the actuator stem (Key 3) through the spring housing of the yoke, then add the lower diaphragm plate (Key 29), diaphragm (Key 6), diaphragm plate (Key 5), and the travel stop cap screw and spacer (Keys 11 and 32).
7. Place this assembly in the actuator, being careful when pushing the actuator stem through the seal bushing that the threads do not damage the O-rings.

   Note: Over tightening the diaphragm cap screws and nuts can damage the diaphragm. Do not exceed 20 foot-pounds (27 Newton meters) torque.

8. Install the upper diaphragm casing (Key 7) and secure with cap screws and nuts (Keys 10 and 14). Tighten evenly using a crisscross pattern to ensure a proper seal.
9. Install the actuator spring (Key 1) and spring seat (Key 4). Apply lubricant to the threads of the actuator stem and to the surface of the spring adjustor (Key 2) that contacts the spring seat. Thread the spring adjustor onto the actuator stem.
10. Mount the actuator onto the valve, following procedures in the "Installation" section of this manual.

CVS Type 667 Actuator Parts List

The following parts list includes complete part numbers for components of the CVS Type 667 Actuator that are generally replaceable in the field, and are most commonly used. Key numbers correspond to those in Figures 4 and 5. Include the serial number of your actuator in all correspondence regarding replacement parts.

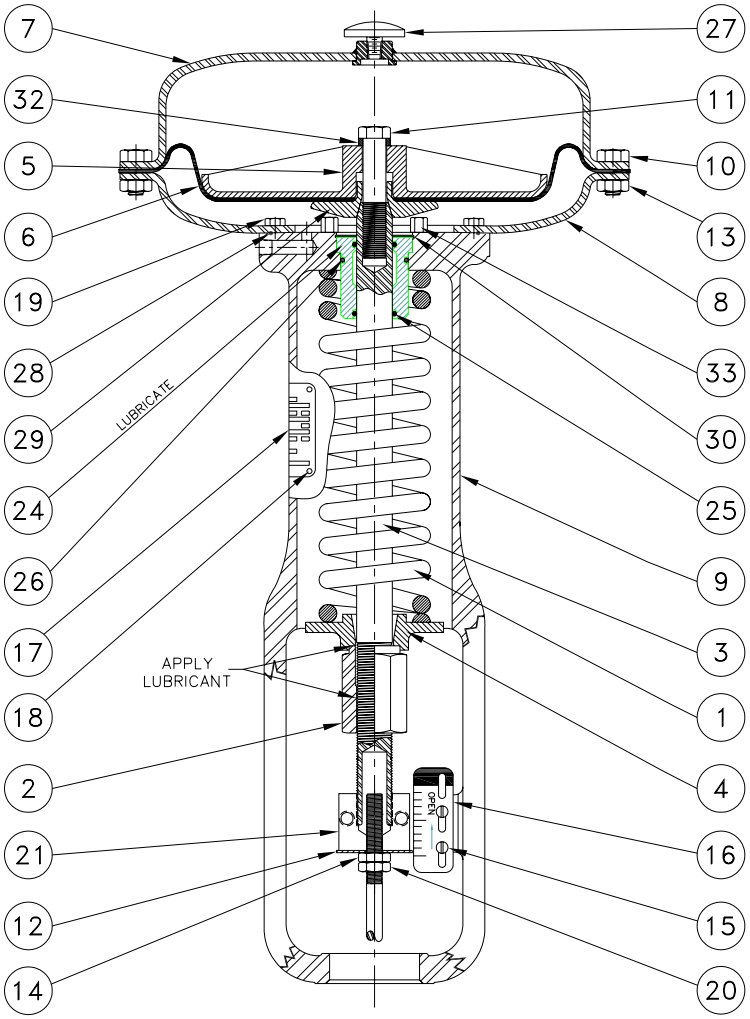

Figure 4: CVS Type 667 Actuator, Sizes 30 through 60

Table 2: Parts Reference

Key	Part Name
1	Actuator Spring
2	Spring Adjuster
3	Actuator Stem
4	Spring Seat
5	Diaphragm Plate
6*	Diaphragm
7	Upper Diaphragm Case
8	Lower Diaphragm Case
9	Yoke
10	Bolt
11	Cap Screw

Key	Part Name
12	Travel Indicator
13	Hex Nut
14	Hex Jam Nut
15	Self-Tapping Screw
16	Travel Indicator Scale
17	Nameplate
18	Drive Screw
19	Bolt
20	Hex Nut
21	Stem Connector
22	Twin Speed Nut (not shown)

Key	Part Name
23	Pipe Bushing (Size 70 only) (not shown)
24	Seal Bushing
25	O-Ring
26	O-Ring
27	Vent assembly
28	Gasket / O-Ring
29	Lower Diaphragm Plate
30	Snap Ring
31	Washer
32	Spacer
33	Down Stop

* Recommended spare part

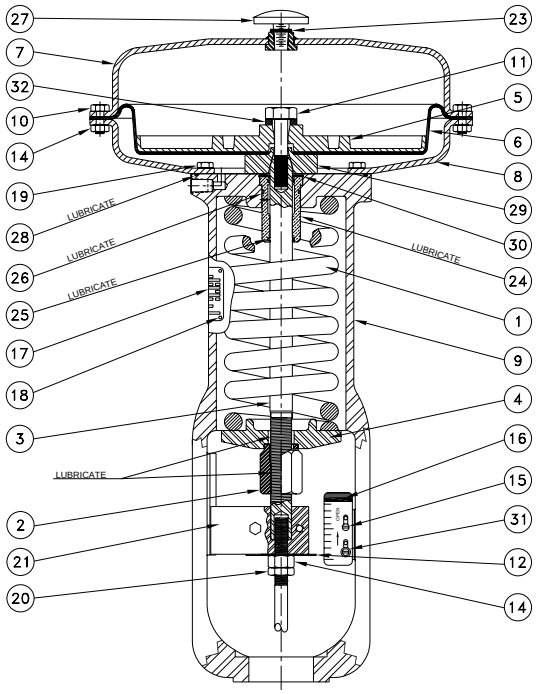

Figure 5: CVS Type 667 Actuator, Size 70

Table 3: Parts List

Key	Description			Part Number
1	Actuator Spring			Consult CVS Controls
2	Spring Adjustor	Size 30		CVS1E801724102
		Sizes 34, 40		CVS1E821024102
		Sizes 45, 46, 50, 60		CVS1E846224102
		Size 70		CVS1N131824102
3	Actuator Stem Steel, CD PL	Size 30		CVS1E801624222
		Size 34		CVS1E884724222
		Size 40		CVS1E820924222
		Sizes 45, 46		CVS1J332824222
		Sizes 50, 60		CVS1E846124222
		Size 70		CVS2N131724222
4	Spring Seat	Size 30, Steel		CVS1U425623122
		Sizes 34,40, Steel		CVS1R179923122
		Sizes 45, 46, 50, 60, Steel		CVS1R180023122
		Size 70	Cast Iron	CVS1N129619052
			Steel	CVS1N757722012
5	Diaphragm Plate	Size 30, Aluminum		CVS30A2880X012
		Sizes 34,40, Cast Iron		CVS3E880519042
		Sizes 45, 50, Aluminum		CVS30A2882X012
		Sizes 46, 60, Cast Iron		CVS2E847519042
		Size 70, Cast Iron		CVS2N127019042
6	Diaphragm Nitrile	Size 30		CVS2E800002202
		Sizes 34, 40		CVS2E669902202
		Sizes 45, 50		CVS2E859602202
		Sizes 46, 50		CVS2E859802202
		Size 70		CVS2N130902202
7	Upper Diaphragm Casing Steel	Size 30		CVS2E800728992
		Sizes 34, 40		CVS2E681428992
		Sizes 45, 50		CVS3E844628992
		Sizes 46, 60		CVS3E846728992
		Size 70		CVS2N127828992

Table 3: Parts List

Key	Description		Part Number
8	Lower Diaphragm Casing Steel	Size 30	CVS2E801125062
		Sizes 34, 40	CVS2E682625062
		Sizes 45, 50	CVS3E845325062
		Sizes 46, 60	CVS3E847725062
		Size 70	CVS2N131025062
9	Yoke Cast Iron	Size 30	CVS3E801419042
		Size 34	CVS2E884619042
		Size 40	CVS3E820819042
		Sizes 45, 46	CVS3E900819042
		Sizes 50, 60	CVS3E845919042
		Size 70	CVS3N130319042
10	Cap Screw Steel, CD PL	Size 30 (12 req'd)	CVS1E760324052
		Sizes 34, 40 (16 req'd)	CVS1E760324052
		Sizes 45, 50 (20 req'd)	CVS1A675124052
		Size 46, 60 (24 req'd)	CVS1A675124052
		Size 70 (28 req'd)	CVS1A582824052
11	Cap Screw		See Following Table
12	Travel Indicator, SST	Sizes 30, 34	CVS1E793138992
		Sizes 40, 45, 46	CVS1E807538992
		Sizes 50, 60	CVS1E832838992
		Size 70	CVS1B971838992
13	Hex Nut, SST (Refer to Key 10 for quantities)		CVS1A346524122
14	Hex Jam Nut, CD PL	Sizes 30, 34 (2 req'd)	CVS1P131224142
		Size 40 (1 req'd)	CVS1A413224122
		Size 45 (None req'd)	---
		Size 46 (1 req'd)	CVA1A413224122
		Sizes 50, 60, 70 (1 req'd)	CVS1A375424122
15	Self-tapping Screw, SST	Sizes 30, 34, 40, 45, 46 (2 req'd)	CVS1E793238992
		Sizes 50, 60, 70 (2 req'd)	CVS1E831338992
16	Travel Indicator Scale, SST		See Following Table
17	Nameplate, SST		CVS1K325738992
18	Drive Screw, SST (4 req'd)		CVS1A368228982
19	Cap Screw CD PL	Size 30 (6 req'd)	CVS1D529824052
		Sizes 34, 40 (6 req'd)	CVS1A368424052
		Sizes 45, 46, 50, 60 (8 req'd)	CVS1A368424052
		Size 70 (12 req'd)	CVS1N129328992
20	Hex Nut CD PL	Sizes 30, 34 (None req'd)	---
		Size 40 (1 req'd)	CVS1A353724122
		Size 45 (2 req'd)	CVS1A353724122
		Size 46 (1 req'd)	CVS1A353724122
		Sizes 50, 60, 70 (1 req'd)	CVS1A351124122
21	Stem Connector, SST	Sizes 30, 34	CVS1E7977000A2
		Size 40	CVS1E8033000A2
		Sizes 45, 46	CVS1J3330000A2
		Sizes 50, 60	CVS1E8337000A2
		Size 70	CVS1N1319000A2
22	Twin Speed Nut, SST	Sizes 30, 34	CVS1E793938992
		Sizes 40, 45, 46	CVS1E808438992
		Sizes 50, 60, 70	CVS1E833538992
23	Pipe Bushing, CD PL	Size 70	CVS1C379026232
24	Seal Bushing, Brass	Size 30	CVS1E791214012
		Sizes 34, 40	CVS1E682814012
		Sizes 45 to 60	CVS1E845714012
		Size 70	CVS1N131614012
25	O-Ring, Nitrile (2 req'd)	Size 30	CVS1E591406992
		Sizes 34, 40	CVS1D237506992
		Sizes 45 to 60	CVS1C562206992
		Size 70	CVS1E736906992
26	O-Ring, Nitrile	Sizes 30, 34, 40	CVS1C415706992
		Sizes 45, 46, 50, 60, 70	CVS1E845806992
27	Vent Assembly		CVSY602X1A11
28	Gasket, Garlock	Sizes 30, 34, 40	CVS1E801204022
		Sizes 45, 46, 50, 60	CVS1E845404022
	O-Ring, Nitrile	Size 70	CVS1D269106992

Table 3: Parts List

Key	Description		Part Number
29	Lower Diaphragm Plate	Size 30, Aluminum	CVS1E791344022
		Sizes 34, 40, Aluminum	CVS1E682744022
		Sizes 45, 46, 50, 60, Aluminum	CVS1E845544022
		Size 70, Steel	CVS1N131524092
30	Snap Ring, SST	Sizes 30, 34, 40	CVS1E801337022
		Sizes 45 to 70	CVS1E845638992
31	Washer (2 req'd)	Size 70, Steel	CVS1E873028992
32	Spacer, Steel		See Following Table
33	Down Stop, Steel	Sizes 30 to 40	CVS1H493524092
		Sizes 45 to 60	CVS1H494324092

Key 11 Cap Screw, Steel
Key 32 Spacer, Steel

Actuator Size	Key	Travel In (mm)			
		7/16 (11)	5/8 (16)	3/4 (19)	1-1/8 (29)
30	11	CVS1A685724052	CVS1A685724052	CVS1B227524052	---
	32	CVS1R408724092	CVS1R408624092	CVS1R408524092	---
34	11	CVS1R408828992	CVS1R408928992	CVS1R408928992	---
	32	CVS1R409324092	CVS1R409424092	CVS1R409524092	---
40	11	CVS1R408828992	CVS1R408828992	CVS1R408928992	CVS1R409128992
	32	CVS1R409324092	CVS1R409424092	CVS1R409524092	CVS1R409624092
45, 46, 50, 60	11	CVS1R409824052	CVS1R409824052	CVS1R409824052	CVS1R409924052
	32	CVS1R410324092	CVS1R410424092	CVS1R410524092	CVS1R410824092
70	11	---	---	CVS1R411024052	CVS1R411524092
	32	---	---	CVS1R411624092	CVS1R411124052

Actuator Size	Key	Travel In (mm)		
		1-1/2(38)	2 (51)	3 (76)
30	11	---	---	---
	32	---	---	---
34	11	---	---	---
	32	---	---	---
40	11	CVS1R409228992	---	---
	32	CVS1R409724092	---	---
45, 46, 50, 60	11	CVS1R410124052	CVS1R410224052	---
	32	CVS1R410624092	CVS1R410724092	---
70	11	CVS1R409824052	CVS1R409924092	CVS1R410224052
	32	CVS1R411424092	CVS1R411324052	CVS1R410724092

Key 16 Travel Indicator Scale

Actuator Size	Travel In (mm)			
	7/16 (11)	5/8 (16)	3/4 (19)	1-1/8 (29)
30	CVS1E793438992	CVS1E793538992	CVS1E793638992	---
34	CVS1E793438992	CVS1E793538992	CVS1E793638992	---
40, 45, 46	CVS1E807638992	CVS1E807738992	CVS1E808138992	CVS1E808238992
50	CVS1E833038982	CVS1E833038992	CVS1E833138992	CVS1E833238992
60	CVS1F535238982	CVS1E833038992	CVS1E833138992	CVS1E833238992
70	---	---	CVS1H745738992	CVS1H745838992

Actuator Size	Travel In (mm)		
	1-1/2(38)	2 (51)	3 (76)
30	---	---	---
34	---	---	---
40, 45, 46	CVS1E803838992	CVS1R444538982	---
50	CVS1E833338992	CVS1E833438992	---
60	CVS1E833338992	CVS1E833438992	---
70	CVS1H745938992	CVS1H746038992	CVS1H746138992

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Instruction Manual

CVS Type 657 Diaphragm Actuator

Sizes 30-70

All CVS Controls equipment, including actuators, are to be installed and maintained in accordance with instructions supplied by CVS Controls. Only qualified personnel may install and service the actuator, and, if necessary, contact a gas service person.

Introduction

The CVS Type 657 Actuator is used for the automatic operation of control valves, and is designed as a direct acting, spring-opposed diaphragm. By varying the pneumatic loading pressure on the actuator diaphragm, the valve plug within the body will open, close or throttle.

When the loading pressure is increased within a direct-acting diaphragm actuator the actuator stem moves downward, compressing the spring. A decrease in pressure will cause actuator stem to move upward with the decompression of the spring (Figure 2).

The valve plug action of the CVS Type 657 Actuator can be set to “push down to close” or “push down to open” and will then either open or close the control valve upon failure of the loading pressure. When the loading pressure fails, the diaphragm of the actuator moves to the extreme upward position and performs the selected action.

Refer to Table 1 for the specifications for various sizes of CVS Type 657 Actuators. All accessories used with the CVS 657 have individual manuals which should be consulted regarding installation, operation and maintenance.

Figure 1: CVS Type 657 Actuator

Installation

The CVS Type 657 Diaphragm Actuator is usually delivered furnished mounted on a CVS Controls valve body. When installing the valve body into the pipeline, consult the instructions for that particular valve body. Should you have any questions during the installation procedure, consult your CVS Controls representative.

The loading pressure is connected to the NPT connection in the top of the diaphragm case (1/4” for sizes 30 through 60, 1/2” size 70). With larger sizes, it may be beneficial to reduce the connection down

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Table 1: CVS Type 657 Diaphragm Actuator

Actuator Size		30	34	40	45	46	50	60	70
Nominal Effective Area (Sq.In.) (Diaphragm)		46	69	69	105	156	105	156	220
Yoke Boss Size Diameter (In.)		2-1/8	2-1/8	2-13/16	2-13/16	2-13/16	3-9/16	3-9/16	3-9/16
Valve Body Stem Size (In.)		3/8	3/8	1/2	1/2	1/2	3/4	3/4	3/4
Maximum Allowable Stem Force (Lbs)		2300	2300	2700	5650	7550	5650	6800	8800
Maximum Travel (In.)		3/4	1-1/8	1-1/2	2	2	2	2	3
Maximum Diaphragm Case Pressure (PSI)*		140	75	75	60	50	60	50	65
Approximate Weight	Kg	16	22	23	37	49	42	53	107
	Lb	36	48	51	82	107	92	116	235

*Maximum allowable diaphragm case pressure may be used only when maximum allowable stem forces are not exceeded.

Installation cont'd

to 1/4". Pipe or tubing may be used, and should be run to the output pressure connection on the automatic controller. Avoid transmission lag in the control signal by keeping the length of pipe or tubing as short as possible. When long distances are involved, install a valve positioner on the actuator. If the valve positioner is provided as part of the original equipment, the loading pressure connection will be made at the CVS Controls manufacturing facility.

If the CVS Type 657 Diaphragm Actuator is shipped alone for field mounting, it should be mounted onto the valve body and secured in place with the yoke locknut. Clamp the actuator stem and valve plug stem together using the stem connector to provide the proper valve travel. Refer to the "Assembly Instructions" section of this manual for complete instructions.

For ease of service, ensure that the control valve is located for easy access and serviceability with room above for accessibility. Ensure that sufficient room is provided below should removal of the actuator and valve plug be necessary.

Operation and Adjustment

Refer to the nameplate on the yoke of the actuator for details on the specific construction and operating range. The requirements of your specific application will dictate the spring and diaphragm used in your CVS Type 657 Actuator. When in service, the actuator will create full travel of the valve plug when diaphragm pressure is applied according to the range indicated on the name plate. Generally, the diaphragm pressure range is 3 to 15 PSI or 6 to 30 PSI, but other ranges may be used.

Pressure within the valve body creates forces on the valve plug which directly affect the actual operating diaphragm pressure range. When pressure conditions in the valve body are different from those indicated in the factory settings, the valve may not stroke completely over the indicated range. To achieve correct travel for the diaphragm pressure range utilized, a simple spring adjustment is necessary. Note, however, that the actuator spring has a fixed pressure span and that adjustment of the spring compression simply shifts this span up or down to make the travel of the valve correspond with the diaphragm pressure range.

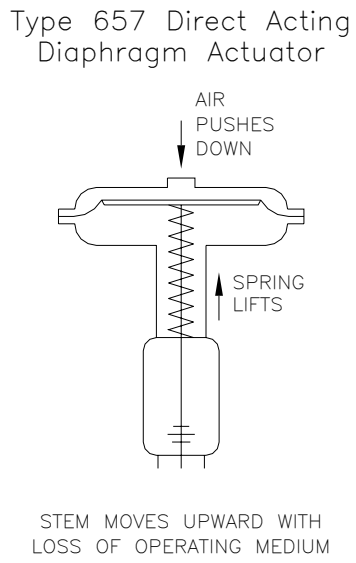

Figure 2: Schematic of CVS Type 667 Actuator

Operation and Adjustment cont'd

The CVS Controls nameplate indicates a "bench set" pressure range in addition to a standard diaphragm pressure range. The "bench set" pressure range indicates the range required to completely stroke the valve with out any pressure in the valve body, for example as if the valve were being tested on the work bench. While In service, however, with the specified pressure drop applied across the valve, it should stroke over the standard diaphragm pressure range as indicated on the nameplate.

Once the control valve has been installed and connected to the controller, it should be tested for correct travel, lack of friction and correct action (air-to-open or air-to-close) to match the controlling instrument. To ensure the most effective operation, the actuator stem and the valve plug stem must move freely when responding to the loading pressure change on the diaphragm.

Disassembly Instructions

Although the following instructions describe how the CVS Type 657 Diaphragm Actuator can be completely disassembled, when inspection or repairs are required, only disassemble those parts required to accomplish the job.

Consult Figure 4, and proceed as follows for disassembly:

1. Bypass the control valve and exhaust any actuator loading pressure to atmospheric. Disconnect the actuator supply line and any leakoff piping.
2. Relieve all pressure from the spring by threading the spring adjuster (key 2) out of the yoke.
3. To remove the valve body from the actuator, separate the stem connector (key 21) and remove the yoke locknut.
4. Loosen the stem locknuts (keys 13 and 14), remove the two cap screws and separate the stem connector.
5. Loosen the diaphragm case cap screws and nuts (keys 19 and 20) and remove the upper diaphragm case.
6. Remove the molded diaphragm (key 6).
7. Extract the diaphragm plate and actuator stem (keys 5 and 3) as an assembly. These parts can be further separated if required.
8. Remove the actuator spring (key 1) and spring seat (key 4).
9. If necessary, remove the lower half of the diaphragm case (key 8) by loosening the cap screws.
10. Removing the spring adjuster will complete the disassembly.

Assembly Instructions

1. The CVS Type 657 Actuator can be assembled in the reverse order of the disassembly instructions. These additional steps below will assist with proper assembly and continued operation.
2. Apply lubricant to the threads and spring seat bearing surface of the spring adjuster (See location marked "LP" on Figure 4).
3. Ensure that the spring seats and the lower seat align properly and rest against the diaphragm plate.
4. Use a criss-cross pattern to evenly tighten the nuts on the casing bolts.
5. If the stem locknuts were removed during disassembly, install them onto the valve plug stem and place the travel indicator (key 12) with the cupped side downward.
6. Secure the actuator onto the valve body using the yoke locknut.
7. Assemble the stem connection as follows according to the required action:

    a. <u>Mounted on Body with "Push Down to Close" Valve Plug</u>
        i. When the body is assembled and the actuator is mounted, ensure the valve plug is in the closed position.
        ii. Once the locknuts are secured onto the stem, set the travel indicator disc onto the locknuts with the cupped portion facing downward.
        iii. Raise the valve plug off of the seat, with the travel specified on the nameplate, or, pressure the actuator until the stem moves down the specified valve travel.
        iv. Install the stem connector by clamping the actuator stem to the valve stem.
        v. Raise the indicator disc to the stem connector, using the locknuts to tighten in position.
        vi. Ensure that the desired total travel is available by cycling the actuator. This will also demonstrate that the valve plug seats properly. If necessary, minor travel adjustments can be made by slightly loosening the stem connector, tightening the locknuts and screwing the stem either into or out of the stem connector using a wrench on the locknuts.

vii. Once the valve travel has been accomplished, secure the stem connector, lock the travel indicator disc against the connector using the locknuts, and adjust the travel indicator scale (key 16) to show valve plug position.

viii. Using a gauge, measure the pressure delivered to the actuator. Make any adjustments on the actuator, or the positioner, to set the starting point of valve travel and ensure full range of travel as desired.

b. <u>Mounted on Body with "Push Down to Open" Valve Plug</u>

i. Attach the locknuts to the stem and set the travel indicator disc into position.

ii. Raise the valve plug to the closed position. On larger body sizes, a pry bar may be inserted through the body line flange opening. If the valve is located in a pipeline application, you may remove the bottom flange and raise the valve plug from below.

iii. Install the stem connector and ensure that the actuator stem threads are fully engaged.

iv. Install the two cap screws in the stem connector to clamp the actuator stem to the valve stem.

v. If a pry bar has been used, remove it now. If the bottom flange has been removed, replace it now.

vi. Apply loading pressure to the diaphragm case and move the valve plug down off of its seat.

vii. Rotate the valve plug stem into the stem connector approximately 1/8". Slightly tighten the stem locknuts to move the travel indicator to the proper position.

viii. Check the availability of desired travel by fully cycling the actuator. The valve plug should seat before the upper travel stop. If required, minor adjustments to total travel can be made by slightly loosening the stem connector, tightening the locknuts and screwing the stem either into or out of the stem connector using a wrench on the locknuts.

Note: When making adjustments to the valve stem, do not rotate the valve stem more than the 1/8" that it was screwed into the actuator stem in step "vii". Over rotating the valve stem will prevent the valve from shutting off.

ix. Proceed with steps "vii" and "viii" as in section "A" above.

Serial Number

Each CVS Type 657 Actuator has a serial number, stamped on the nameplate. When corresponding with your CVS Controls representative, always refer to that serial number when requiring replacement parts or technical information.

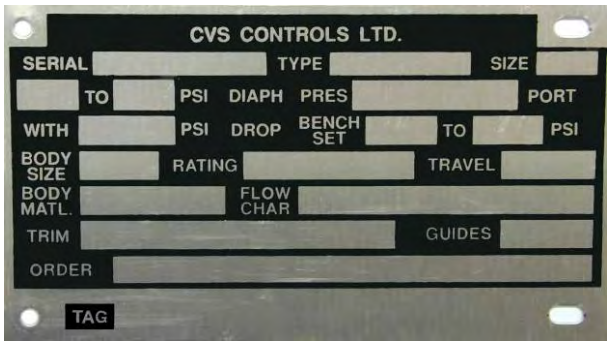

Figure 3: Nameplate on CVS Type 667 Actuator

CVS Type 657 Actuator Parts List

The following parts list includes complete part numbers for components of the CVS Type 657 Actuator that are generally replaceable in the field, and are most commonly used. Key numbers correspond to those in Figure 4. If materials and parts are required, but are not outlined in this literature, consult your CVS Controls representative. Include the serial number of your actuator in all correspondence regarding replacement parts.

CVS Type 657 Actuator

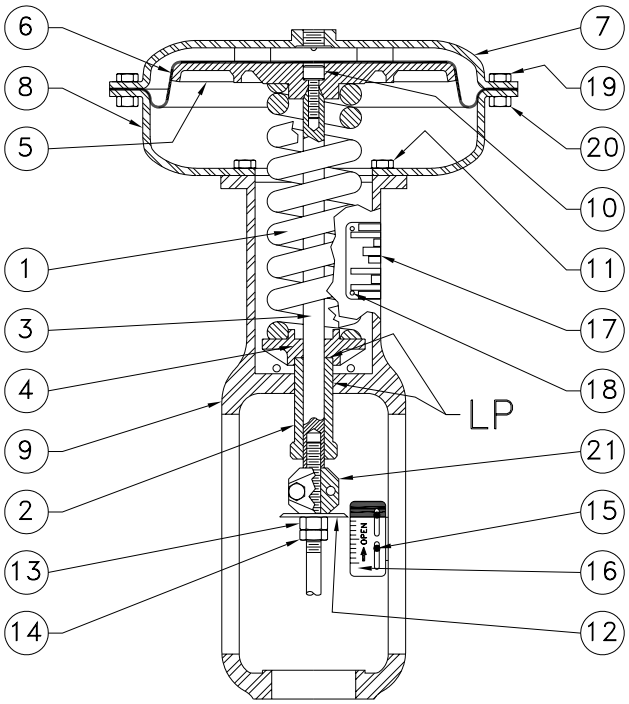

Table 2: Parts Reference

Key	Part Name
1	Actuator Spring
2	Spring Adjuster
3	Actuator Stem
4	Spring Seat
5	Diaphragm Plate
6*	Diaphragm
7	Upper Diaphragm Case
8	Lower Diaphragm Case
9	Yoke
10	Cap Screw
11	Cap Screw
12	Travel Indicator
13	Hex Nut
14	Hex Jam Nut
15	Self-Tapping Screw
16	Travel Indicator Scale
17	Nameplate
18	Drive Screw
19	Cap Screw
20	Hex Nut
21	Stem Connector
22	Twin Speed Nut (not shown)
23	Pipe Bushing (Size 70 only) (not shown)

* Recommended spare part

Figure 4: CVS Type 657 Actuator Assembly Drawing

Table 3: Parts List

Key	Description			Part Number
1	Actuator Spring			Consult CVS Controls
2	Spring Adjustor	Size 30		CVS1E792924102
		Sizes 34, 40		CVS1E807324102
		Sizes 45, 46, 50, 60		CVS1E832624102
		Size 70		CVS1N129724102
3	Actuator Stem Steel, CD PL	Size 30		CVS1E792824102
		Size 34		CVS1E872924102
		Size 40		CVS1E807124102
		Sizes 45, 46		CVS1J332924102
		Sizes 50, 60		CVS1E832424102
		Size 70	Up to 2" Travel	CVS1N129424102
			Over 2" Travel	CVS1N132524102
4	Lower Spring Seat	Size 30, Steel		CVS1U425623122
		Sizes 34,40, Steel		CVS1R179923122
		Sizes 45, 46, 50, 60, Steel		CVS1R180023122
		Size 70, Cast Iron		CVS1N129619052
5	Diaphragm Plate Cast Iron	Size 30		CVS2E880419042
		Sizes 34,40		CVS3E880519042
		Sizes 45, 50		CVS2E831519042
		Sizes 46, 60		CVS2E847519042
		Size 70		CVS2N127019042

CVS Type 657 Actuator

Parts List continued

Key	Description			Part Number
6	Diaphragm Nitrile	Size 30		CVS2E791902202
		Sizes 34, 40		CVS2E670002202
		Sizes 45, 50		CVS2E859502202
		Sizes 46, 50		CVS2E859702202
		Size 70		CVS2N126902202
7	Upper Diaphragm Casing Steel	Size 30		CVS2E791528992
		Sizes 34, 40		CVS2E806028992
		Sizes 45, 50		CVS3E830928992
		Sizes 46, 60		CVS2E847228992
		Size 70		CVS2N126628992
8	Lower Diaphragm Casing Steel	Size 30		CVS2E792225062
		Sizes 34, 40		CVS2E806325062
		Sizes 45, 50		CVS3E831625062
		Sizes 46, 60		CVS2E847425062
		Size 70		CVS2N127125062
9	Yoke Cast Iron	Size 30		CVS3E792619042
		Size 34		CVS2E869619042
		Size 40		CVS3E807019042
		Sizes 45, 46		CVS2E903719042
		Sizes 50, 60		CVS3E832319042
		Size 70		CVS3N127319042
10	Cap Screw Steel, CD PL	Size 30		CVS1E798032982
		Sizes 34, 40		CVS1E760432992
		Sizes 45, 46, 50, 60, 70		CVS1E775432982
11	Cap Screw	Push Down to Close Valve	Size 30 (6 req'd)	CVS1D529824052
			Sizes 34, 40 (6 req'd)	CVS1A368424052
			Sizes 45, 46, 50, 60 (8 req'd)	CVS1A368424052
			Size 70	CVS1N129328992
		Push Down to Open Valve	Size 30 (3 req'd)	CVS1D368424052
			Sizes 34, 40 (3 req'd)	CVS1A368424052
			Sizes 45, 46, 50, 70 (4 req'd)	CVS1A368424052
			Size 70 (9 req'd)	CVS1N129328992
12	Travel Indicator, SST	Sizes 30, 34		CVS1E793138992
		Sizes 40, 45, 46		CVS1E807238992
		Sizes 50, 60, 70		CVS1B832838992
13	Hex Nut, SST	Sizes 30, 34 (2 req'd)		CVS1P131224142
		Size 40, 46		CVS1A413224122
		Sizes 50, 60, 70		CVS1A375424122
14	Hex Jam Nut, SST	Size 40		CVS1A353724122
		Sizes 45, 46 (2 req'd)		CVS1A353724122
		Sizes 50, 60, 70		CVS1A351124122
15	Self-tapping Screw, SST	Sizes 30, 34, 45, 46 (2 req'd)		CVS11793238992
		Sizes 50, 60, 70 (2 req'd)		CVS1E831338992
16	Travel Indicator Scale, SST			See following Table 4
17	Nameplate, SST			CVS12B6508X0A2
18	Drive Screw, SST (4 req'd)			CVS1A368228982
19	Cap Screw, Standard 3/8" Bolt	Size 30, 34, 40, 45, 50, 60		1" bolt
		Size 70		1-1/4" bolt
20	Hex Nut, Standard 3/8" Nut			1" Nut
21	Stem Connector, STL	Sizes 30, 34		CVS1E7977000A2
		Size 40		CVS1F659225142
		Sizes 45, 46		CVS1J3330000A2
		Sizes 50, 60		CVS1E8337000A2
		Size 70		CVS1H8655000A2
22	Twin Speed Nut, SST	Sizes 30, 34		CVS1E793938992
		Sizes 40, 45, 46		CVS1E808438992
		Sizes 50, 60, 70		CVS1E833538992
23	Pipe Bushing, Steel, PL	Size 70		CVS1C379026232

Table 4: Travel Indicator Scale

Actuator Size	Part Numbers				
	3/4" Travel	1-1/8" Travel	1'1/2" Travel	2" Travel	3" Travel
30, 34	CVS1E793638992				
40, 45, 46	CVS1E808138992	CVS1E808228992	CVS1E808338992	CVS1R444538982	
50, 60	CVS1E833138992	CVS1E833128992	CVS1E833338992	CVS1E833428992	
70	CVS1E833138992	CVS1E833238992	CVS1E833338992	CVS1E833438992	1N129838992

Table 5: Thrust Capabilities by Input Signal Range

Travel	Actuator Size	Pressure Range to Actuator Diaphragm	Thrust Capabilities
mm		**Bar**	**N**
19	30	0.2-1	2250
		0.4-2	3890
	34	0.2-1	3380
		0.4-2	5830
29	40	0.2-1	3380
		0.4-2	5530
	45	0.2-1	4670
		0.4-2	8410
	46	0.2-1	6940
		0.4-2	13,190
38	50	0.2-1	5140
		0.4-2	8410
	60	0.2-1	6940
		0.4-2	13,190
51	70	0.2-1	7930
		0.4-2	18,590
Inch		**Psig**	**Lb**
3/4	30	3-15	506
		6-30	874
	34	3-15	759
		6-30	1311
1-1/8	40	3-15	759
		6-30	1242
	45	3-15	1050
		6-30	1890
	46	3-15	1560
		6-30	2964
1-1/2	50	3-15	1155
		6-30	1890
	60	3-15	1560
		6-30	2964
2	70	3-15	1760
		6-30	4180

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Instruction Manual

CVS Type 1051 Rotary Actuator
Sizes 30 - 60

All CVS Controls actuators are to be installed and maintained in accordance with instructions supplied by CVS Controls.

This manual includes information on installing, maintaining and adjusting the CVS Type 1051 Actuator, sizes 30 to 60. Part numbers for the entire assembly is also included. For information on other equipment used with these actuators, consult the appropriate manuals.

Introduction

The CVS Type 1051 Diaphragm Rotary Actuator is a pneumatic spring-return actuator designed for use with rotary-shaft control valves. This is a direct-acting actuator, and an increase in the loading pressure extends the diaphragm rod out of the spring barrel. The CVS Type 1051 Actuator is suitable for on-off service, or for throttling service when used with a valve positioner.

The stroking time is dependent on the actuator size, rotation, spring rate, initial spring compression and supply pressure. If the stroking time is critical for your application, consult CVS Controls Ltd. for proper settings.

The travel indicator is a combination graduated disk and pointer located on the actuator end of the valve shaft. Fixed travel stops are an available option.

Refer to Table 1 for additional specifications for the CVS Type 1051 Actuator. Additional information specific to the actuator as shipped from the factory are stamped on the nameplate (Figure 2) installed on the actuator.

Figure 1: CVS Type 1051 Actuator

Installation

When the actuator and the valve are shipped together from CVS Controls Ltd., the actuator is usually mounted onto the valve. Refer to the valve body instruction when installing the valve into the pipeline, and then follow the instructions in the Loading Connections portion of this manual.

If the actuator has been shipped separately, or if it is necessary to mount the actuator onto the valve, refer to procedures in the Actuator Mounting portion of this manual.

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Table 1: CVS Type 1051 Actuator Specifications

Operating Principle		Direct Acting
Actuator Sizes		30, 40, 60
Maximum Diaphragm Casing Pressure	**Size 30**	80 psig (5.5 bar)
	Size 40	65 psig (4.5 bar)
	Size 60	40 psig (2.8 bar)
Maximum Valve Shaft Rotation		90 degrees with optional fixed stops
Acceptable Valve Shaft Diameters In. (mm)	**Size 30**	1/2" (12.7 mm), 5/8" (15.9 mm), 3/4" (19.1 mm)
	Size 40	1/2" (12.7 mm), 5/8" (15.9 mm), 3/4" (19.1 mm), 7/8" (22.2 mm), 1" (25.4 mm), 1-1/4" (31.8 mm)
	Size 60	3/4" (19.1 mm), 7/8" (22.2 mm), 1" (25.4 mm), 1-1/4" (31.8 mm), 1-1/2" (38.1 mm) 1-3/4" (44.5 mm) or 2" (50.8 mm)
Material Temperature Capabilities	**Nitrile Diaphragm**	-40 to 180°F (-40 to 82°C)
Pressure Connections		1/4" NPT Female
Mounting Positions		See Figures 3 and 4
Approximate Weights		See Table 2
Additional Specifications		Refer to the Parts List for casing pressure ranges and material identification

Installation cont'd

Warning: Exceeding the diaphragm casing limits can cause pressure-retaining parts to burst and may cause personal injury or property damage. Do not exceed the limits outlined in Table 1. Use pressure-limiting or pressure-relieving devices to prevent the diaphragm casing pressure from exceeding these limits.

Actuator Mounting

Follow these instructions when connecting a valve body and an actuator that have been ordered separately. Refer to Figures 7 and 8 for Key Numbers.

1. Remove cap screws and washers (Keys 8 and 9), and then remove cover (Key 41).
2. Refer to Figures 3 and 4 for mounting styles and positions. Normally the actuator is positioned vertically with the valve in a horizontal pipeline.
3. Slide the mounting yoke (Figure 8, Key 35) over the valve shaft and use the valve mounting cap screws to secure it to the valve.
4. For other valve types refer to the instruction manual for that valve body and use bolting torques for these cap screws.

Caution: Refer to Table 3 for proper actuator bolt torque requirements. Exceeding the torque requirement may impair the safe operation of the actuator.

5. Screw the left-hand threaded locknut (Key 18) onto the diaphragm rod (Key 22) as far as possible.
6. Screw the turnbuckle (Key 16) as far as it will go onto the actuator rod.
7. Screw the locknut (Key 14) onto the rod end bearing (Key 13) and thread this assembly fully into the turnbuckle (Key 16).
8. If the lever is attached to the rod end bearing, remove the cap screw and hex nut (Keys 12 and 31)
9. Refer to the proper valve body instruction manual for lever/valve shaft orientation marks and slide the lever into place. (See Figure 5) Clamp with the cap screw (Key 10).
10. Turn the lever (Key 33) to align with the rod end bearing (Key 13). To facilitate this connection move the actuator off its up travel stop with a regulated air source and slightly adjust the turnbuckle (Key 16).

Table 2: Approximate Actuator Weights

Size	Cast Iron Construction[1]		Aluminum Construction[2]	
	Lb	Kg	Lb	Kg
30	65	29	55	25
40	94	43	86	39
60	197	89	175	79

1. Cast iron spring barrel and housing
2. Sizes 30, 40 and 60: aluminum spring barrel, housing and housing cover.

Installation cont'd

11. Apply thread locking compound to the threads of the cap screw (Key 12).
12. Connect the lever (Key 33), and rod end bearing (Key 13) with the cap screw and hex nut (Keys 12 and 31).

    Note: Refer to Table 3 for the recommended bolt torque and tighten the cap screw as indicated.

13. Note the valve position and direction of rotation and position the travel indicator (Key 38) accordingly.
14. Position the travel indicator (Key 38) according to the valve position noted in #13. Replace the cover (Key 41), securing with washers (Key 9) and cap screws (Key 8). If the holes in the cover and housing (Key 17) do not align properly, temporarily loosen the cap screws (Key 32) and shift the housing slightly. Do not stroke the actuator while the cover has been removed.
15. Refer to the instructions in the Adjustment section of this manual and properly adjust the actuator turnbuckle before proceeding to the Loading Connection portion of installation.

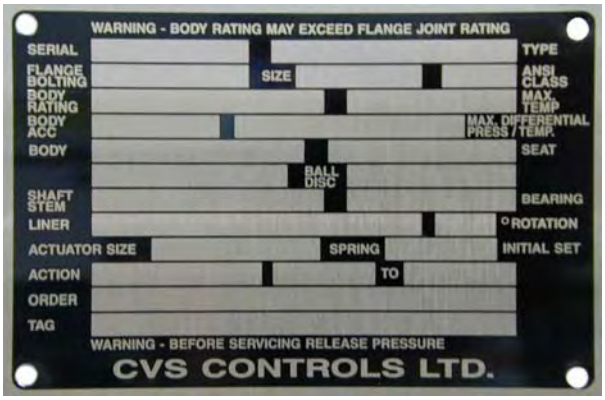
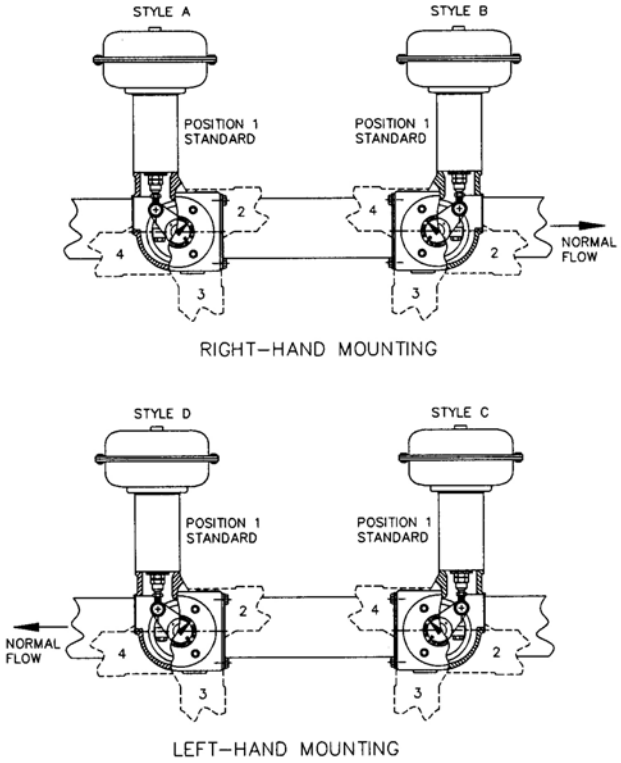


Figure 2: Nameplate on CVS 1051 Actuator

Table 3: Recommended Bolting Torques

Key #	Actuator Size					
	30		40		60	
	Ft-Lb	N•m	Ft-Lb	N•m	Ft-Lb	N•m
44	15	20	15	20	15	20
2 & 43	30	41	30	41	30	41
24	25	34	25	34	75	102
14	10	14	25	34	45	61
12	16	22	60	81	120	163
42	7	9	7	9	16	22
32	25	34	25	34	60	81
10	25	34	60	81	120	163
8	25	34	25	34	60	81
5	7	9	7	9	7	9
18	35	47	75	102	120	163



Mounting	Action[1]	CVS Design V100 Valve
Right-Hand	PDTC	A
	PDTO	B
Left-Hand	PDTC	C
	PDTO	D

1. PDTC: Push-Down-To-Close; PDTO: Push-Down-To-Open

Figure 3: Mounting Styles and Positions for CVS Type 1051 Actuator

Loading Connection

1. Connect the loading pressure piping to the pressure connection in the top of the diaphragm casing. Run either 1/4-inch pipe or 3/8-inch tubing between the 1/4-inch pressure connection and the instrument.
2. Keep the length of pipe or tubing as short as possible to avoid transmission lag in the control signal. Should a volume booster or valve positioner be used, ensure that it is properly connected to the factory. If a valve positioner is part of the assembly, the connection will likely be made at the CVS Controls factory.
3. When the control valve has been completely installed and connected, check for correct action (air-to-open or air-to-close) according to the controlling instrument. Ensure proper operation by checking that the actuator stem and valve shaft are moving freely in response to the loading pressure change on the diaphragm.

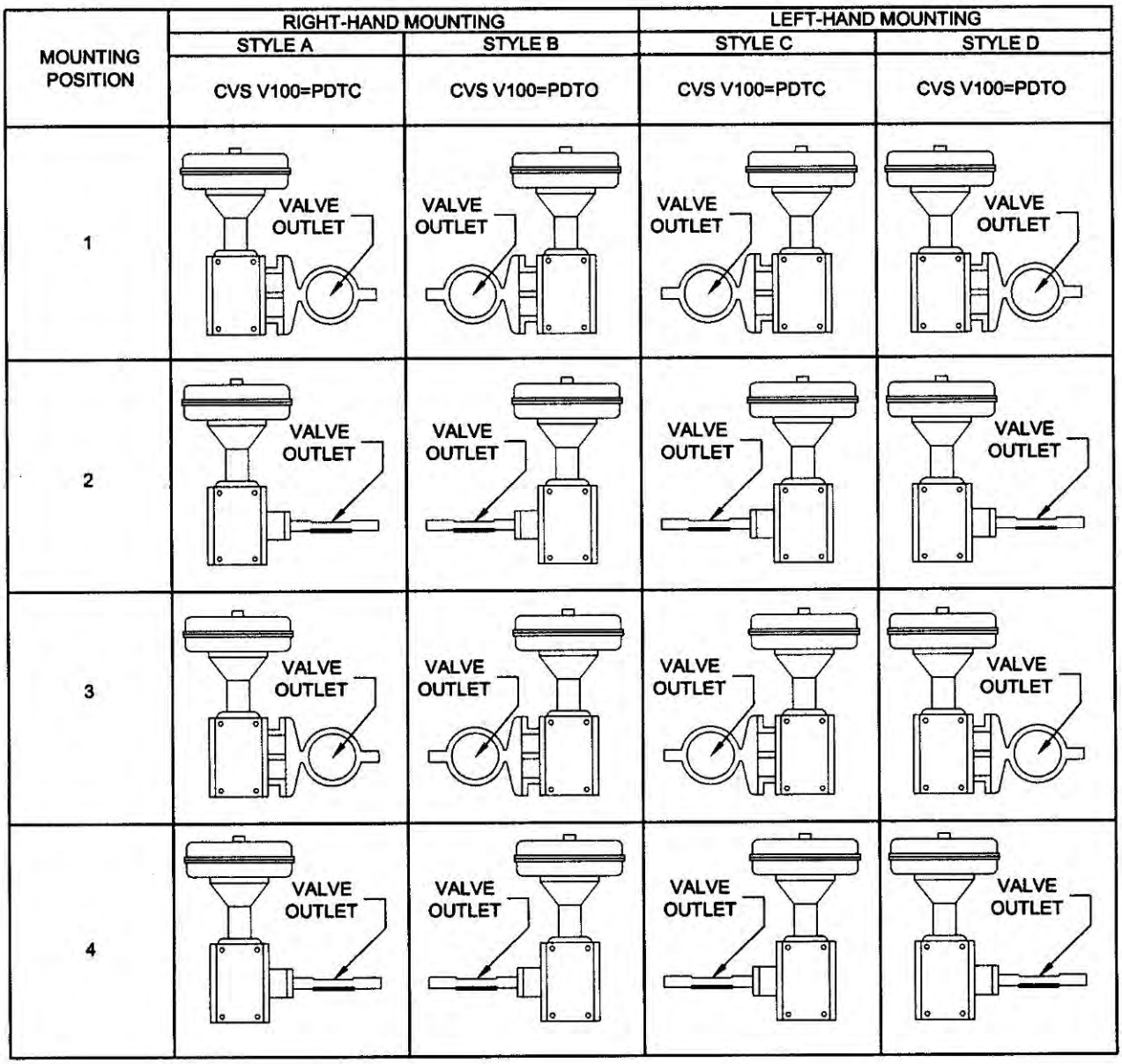


Figure 4: CVS Type 1051 Actuator-Valve Mounting

Turnbuckle Adjustment

Warning: The sudden release of process fluid can cause personal injury or property damage. Prior to starting adjustment procedures:

- **Isolate the valve from the process,**
- **Release the process pressure, and**
- **Vent the actuator loading pressure.**

Correct turnbuckle adjustment ensures the valve is correctly closed when the actuator is against its travel stops. Refer to Figure 7 for Key Numbers.

For accurate adjustment to the zero-degree valve ball position, remove the valve from the pipeline. Refer to instructions in the appropriate valve body instruction manual.

A regulated air supply will be required to stroke the actuator. Consult Table 4 for the sizes of the three open-end wrenches required for the procedure.

Note: To achieve the most accurate adjustment of the actuator, do not remove the cover during this procedure (Key 41).

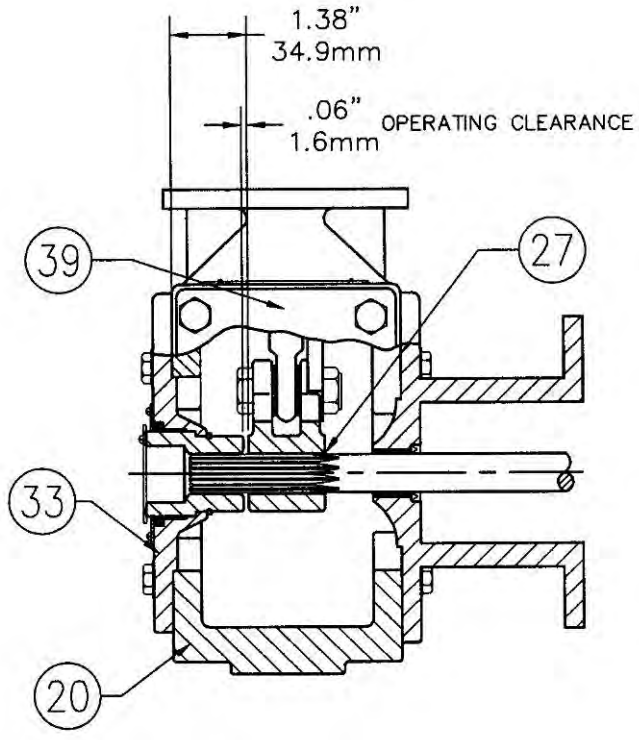


Figure 5: Lever Operating Clearance

1. Remove the access plate (Key 11) and machine screws (Key 29) if included.
2. Loosen the lower locknut (Key 14).
3. Ensure that there are no tools or instruments within the actuator housing and blocking the stroke path. Add pressure to the diaphragm casing to stroke the actuator down and provide access to the left-hand threaded upper locknut (Key 18). Loosen the locknut.
4. Use one of the following according to the service required by the actuator:

   a. **Push-Down-To-Close:** Slowly stroke the actuator to the down travel stop. Determine the closed position of the valve according to the appropriate valve body manual. Adjust the turnbuckle until the valve is in the closed position and lock this adjustment with the left-hand threaded locknut (Key 18). Stroke the actuator to the mid-travel position and tighten the locknut (Key 16).

   b. **Push-Down-To-Open:** Determine the closed position of the valve according to the appropriate valve body manual. Release all pressure from the diaphragm casing and ensure that the diaphragm is against its up travel stop. Check the valve position and stroke the actuator so the turnbuckle (Key 16) is accessible through the access opening. Adjust the linkage, release pressure to the actuator and check the new adjustment. Continue this procedure until the valve is in the closed position when the actuator is resting on its up travel stop. Tighten the locknut (Key 14), stroke the actuator and tighten the left-hand threaded locknut (Key 18).

5. Replace the access plate (Key 11).
6. Loosen the self-tapping screws (Key 7), adjust the travel indicator (Key 38) and retighten the self-tapping screws.

Table 4: Wrench Sizes Required for Turnbuckle Adjustment, In

Actuator Size	Turnbuckle (Key 16)	Lower Locknut (Key 14)	Upper Locknut (Key 18)
30	15/16	1/2	7/8
40	1-1/8	3/4	1-1/8
60	1-5/16	15/16	1-5/16

Principle of Operation

As the loading pressure is increased on top of the diaphragm the diaphragm rod moves down. As the loading pressure is decreased, the diaphragm rod is forced upward by the spring.

The spring and diaphragm have been selected to fulfill the requirements of the application. When in service the actuator should produce full travel of the valve with the diaphragm pressure as indicated on the nameplate (Figure 2)

For principle of operation of the actuator with a valve positioner, refer to the separate positioner manual.

Maintenance

Actuator parts are subject to wear and tear which requires inspection and replacement as necessary according to the severity of service conditions. The following instructions outline adjustment, disassembly and reassembly of parts. Refer to Figures 7 & 8 for Key Numbers.

Warning: The sudden release of process fluid can cause personal injury or property damage. Prior to starting adjustment procedures:

- **Isolate the valve from the process,**
- **Release the process pressure, and**
- **Vent the actuator loading pressure.**

Disassembly

The CVS Type 1051 Actuator can be completely disassembled by following these procedures. When inspecting or repairing the actuator, perform only those steps necessary. Under normal conditions, the cap screws (Keys 2, 42 and 43) should not be removed.

Note: Cap screw (Key 12) must be disengaged from the lever (Key 33) prior to removing the diaphragm casing (Key 26). Failure to do so will allow the spring compression to rotate the valve beyond its fully open or closed position. This could cause damage to the valve seal.

1. Bypass the control valve, relieve all loading pressure and remove the tubing or piping from the top of the actuator.
2. If the control valve assembly includes a valve positioner, remove it from the assembly.
3. Remove the cap screws and washers (Keys 8 and 9) as well as the cover (Key 41).
4. Remove the retaining ring and then the hub (Keys 36 and 30) from the cover.
5. Inspect the bushing (Key 40). If replacement is necessary, remove the travel indicator scale (Key 39) by first unscrewing the self-tapping screws (Key 37).
6. Remove the cap screw and hex nut (Keys 12 and 31).
7. Note the orientation of the lever/valve shaft, and then loosen the cap screw (Key 10).

   Note: Avoid using a hammer to drive the lever (Key 33) off of the valve shaft. On some valve types this could cause the valve ball and bearings to move from their centered position, causing damage to valve parts during operation.

   If using a tool is necessary, use a wheel puller to remove the lever. Tapping the wheel puller screw lightly to loosen the lever is permissible, but hitting the screw with excessive force could also cause damage to valve parts or disrupt the positioning of the valve ball and bearings.

   Warning: Before proceeding further, remove the cap screws and relieve the spring compression. Failure to do so may cause personal injury if the compressed spring force suddenly thrusts the upper diaphragm casing away from the actuator.

8. Loosen but do not remove the casing cap screws (Key 45). Ensure that all spring force in the upper diaphragm casing has been relieved. Unscrew and remove the cap screws and hex nuts (Keys 45 and 44) then remove the upper diaphragm casing and the diaphragm (Key 25).
9. Refer to the warning on the CVS Controls nameplate (Key 27) located on the diaphragm plate (Key 1).
10. Remove the diaphragm plate (Key 1) and the attached parts from the actuator. The following parts will be attached to the diaphragm head: spring (Key 21), diaphragm rod (Key 22), cap screw (Key 24), spring seat (Key 19), hex nut (Key18), turnbuckle (Key 16), hex nut (Key 14) and rod end bearing (Key 13).

Disassembly, cont'd

Warning: The diaphragm plate (Key 1) may be lodged against the diaphragm rod (Key 22), preventing the spring compression from being relieved as the cap screw (Key 24) is being loosened. If this is the case, loosen the cap screw (Key 24) one full turn, and then tap the underside of the diaphragm head until it follows the cap screw disassembly. Failure to check for and rectify this situation prior to removing the cap screw (Key 24) could cause a sudden release of spring compression as the cap screw is disengaged. This sudden release could result in personal injury or property damage.

11. Slowly remove the cap screw (Key 24) while ensuring that the diaphragm head is following the cap screw disassembly. The spring load will be zero before the cap screw is completely removed. The remaining parts of the assembly can then be separated.
12. Unscrew the cap screws (Key 32) and remove the actuator housing assembly (Key 17).
13. Unbolt the mounting yoke (Key 35) from the valve body.
14. Push out the bushing (Key 34) from the mounting yoke and examine for wear. Replace if necessary.

Assembly

These instructions assume that the actuator was completely disassembled. If the actuator was only partially assembled, start the instructions at the appropriate step. Refer to Figures 7 & 8 for Key Numbers.

1. If the bushing (Key 34) was replaced, press in the new bushing and ensure the end of the bushing is flush with the bottom of the recess in the mounting yoke (Key 35).
2. Slide the mounting yoke (Key 35) over the valve shaft and secure it to the valve using the valve mounting cap screws. Refer to Table 3 and to the appropriate valve manual for bolting torques on these cap screws.

   Note: Exceeding the torque requirement may result in unsafe operation of the actuator. Refer to Table 3 for recommended bolting torques.

3. Consult Figures 3 and 4 for the desired housing orientation. Secure the housing to the yoke using cap screws (Key 32).
4. Coat the thread of the cap screw (Key 24) as well as the tapered end of the diaphragm rod (Key 22) with an appropriate lubricant.
5. Assemble the following parts: diaphragm rod (Key 22), spring seat (Key 19), spring (Key 21) and diaphragm plate (Key 1), then secure with the cap screw (Key 24). Tightening the cap screw will compress the spring. Ensure that the tapered end of the diaphragm rod is seated in the corresponding hole in the diaphragm plate, that the spring is seated in the spring seat, and that the cap screw is tightened to the torque specified in Table 3.
6. Install the hex nut (Key 18), turnbuckle (Key 16), hex nut (Key 14) and rod end bearing (Key 13) onto the diaphragm rod.
7. Ensure the travel stops (Key 43) are located as shown in Figure 6.
8. Install the diaphragm plate and attached parts into the actuator.

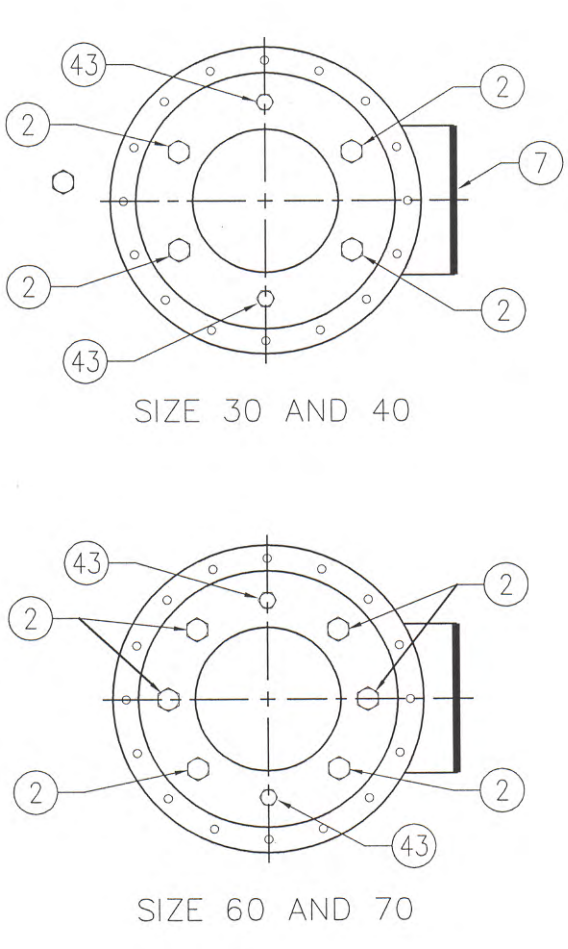


Figure 6: Travel Stop Orientation

Disassembly, cont'd

9. Ensure that the warning nameplate (Key 27) is in place and install the diaphragm (Key 25) and the upper diaphragm casing (Key 26).
10. Install the cap screws and hex nuts (Keys 45 and 44). Tighten cap screws evenly using a crisscross pattern to compress the spring, and then secure the upper diaphragm casing.
11. Refer to the appropriate valve body instruction manual for lever/valve shaft orientation marks, and slide the lever (Key 33) into place. See Figure 5 for correct lever operating clearance. Clamp with the cap screw (Key 10).
12. Rotate the lever (Key 33) until it aligns with the rod end bearing (Key 13). This connection can be assisted by stroking the actuator off its up travel stop using a regulated air source.
13. Apply a thread-locking compound to the threads of the cap screw (Key 12).
14. Connect the lever (Key 33) and the rod end bearing (Key 13) with the cap screw and hex nuts (Keys 12 and 31). Tighten the cap screw to the torque as recommended in Table 3).
15. If a valve positioner is being used with the assembly, consult the appropriate manual for positioner installation.
16. Coat the bearing surfaces of the hub (Key 30) and the cover (Key 41) with a suitable lubricant. Install the bushing (Key 40) and hub into the cover and secure with the retaining ring (Key 36).
17. Install the travel indicator scale (Key 39) and secure with self-tapping screws (Key 37).
18. Make note of the valve position and direction of rotation and position the travel indicator (Key 38) accordingly.
19. Replace the cover (Key 41) and secure with cap screws and washers (Keys 8 and 9). If the holes in the cover and housing (Key 17) do not align, use a regulated air source to move the actuator slightly off its up travel stop. If this does not result in proper alignment, temporarily loosen the cap screws (Key 32) and shift the housing slightly. Do not stroke the actuator while the cover is off.
20. Refer to the Adjustment section of this manual for correct actuator turnbuckle adjustment.

Changing Actuator Mounting

Generally the actuator is positioned vertically in a horizontal pipeline, however there are four possible mounting styles and for possible positions for each style. Refer to Figures 3 and 4.

Correct lever/valve shaft positioning is important in ensuring proper valve action. Refer to the appropriate valve body instruction manual.

Warning: The sudden release of process fluid can cause personal injury or property damage. Prior to starting adjustment procedures:

- **Isolate the valve from the process,**
- **Release the process pressure, and**
- **Vent the actuator loading pressure.**

Style A is right-hand mounted and Style D is left-hand mounted. In all other ways Styles A and D are identical.

Style B is right-hand mounted, while Style C is left-hand mounted. In all other ways Styles B and C are identical.

Refer to the following procedure to convert from Styles A and D to Styles B and C or vice versa, or to change the mounting position. Key numbers refer to Figures 7 & 8.

1. Remove the cover (Key 41) by unscrewing and removing the cap screws and washers (Keys 8 and 9).
2. Unscrew cap screw (Key 12) and loosen cap screw (Key 10).

   Warning: Do not use a hammer to drive the lever off the drive shaft. This could cause damage to internal valve parts. On some valves, driving the lever could move the valve ball and bearings away from the centered position, resulting in damage to valve parts as the valve is operated.

   If using a tool to remove the lever is necessary, use a wheel puller. Tapping the wheel puller screw lightly to loosen the lever is permissible, but excessive force could also result in damage to valve parts and disruption of the centered position of the valve disk and bearings.

3. If changing styles,
   a. Remove the cap screws (Key 32) and the actuator housing (Key 17) from the mounting yoke (Key 35).
   b. Rotate the housing 180 degrees while maintaining the appropriate position (1, 2, 3 or 4) and place the actuator onto the mounting yoke (Key 35).
4. If changing positions, remove cap screws (Key 32) and rotate the actuator housing to the desired position.

Changing Actuator Mounting cont'd.

Note: Consult Table 3 for appropriate bolt torques.

5. Secure the actuator housing (Key 17) to the mounting yoke (Key 35) with cap screws (Key 32).
6. Refer to the appropriate valve body instruction manual for lever/valve shaft orientation marks and slide the lever into place. Consult Figure 5 for lever operating clearance. Clamp with the cap screw (Key 10).
7. Rotate the lever (Key 33) to align with the rod end bearing (Key 13). This connection can be aided by stroking the actuator slightly off its up travel stop with a regulated air source.
8. Apply thread locking compound to the threads of the cap screw (Key 12).
9. Connect the lever (Key 33) and the rod end bearing (Key 13) using the cap screw and hex nuts (Keys 12 and 31). This connection can be aided by stroking the actuator slightly off its up travel stop with a regulated air source.

Note: Tighten cap screw (Key 12) to the recommended bolt torque shown in Table 3.

10. Position the travel indicator (Key 38) according to the valve position and direction of rotation.
11. Replace the cover (Key 41) and secure it with cap screws and washers (Keys 8 and 9).). If the holes in the cover and housing (Key 17) do not align, use a regulated air source to move the actuator slightly off its up travel stop. If this does not result in proper alignment, temporarily loosen the cap screws (Key 32) and shift the housing slightly. Do not stroke the actuator while the cover is off.
12. Refer to the Adjustment section of this manual for correct actuator turnbuckle adjustment.

Parts Ordering

The serial number for your CVS Type 1051 Rotary Actuator is located on the nameplate (Figure 2 and Key 3, Figure 7). Please refer to your serial number when corresponding with your CVS Controls representative. When ordering replacement parts, please refer to the following parts list.

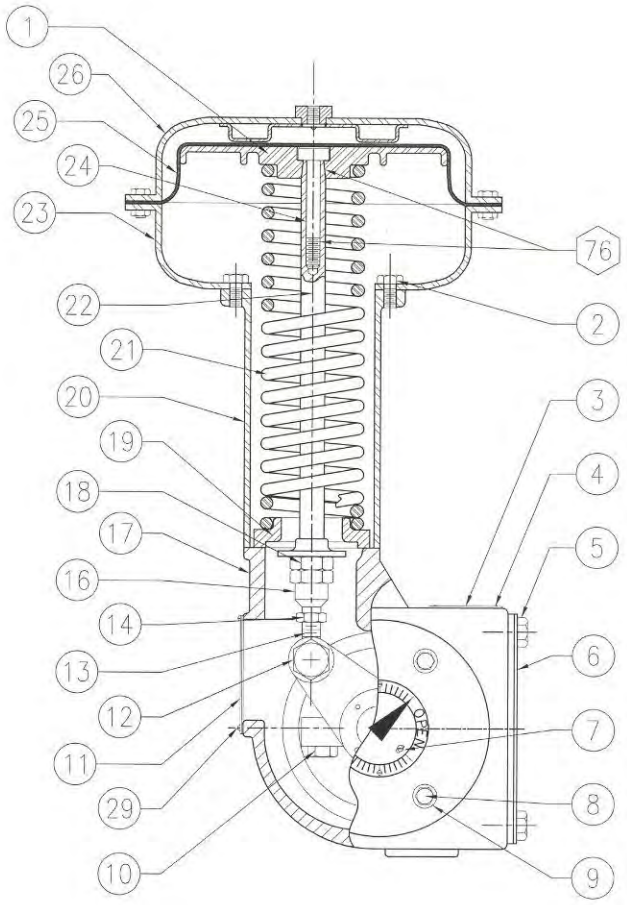


Figure 7: Typical CVS Type 1051 Actuator Assembly

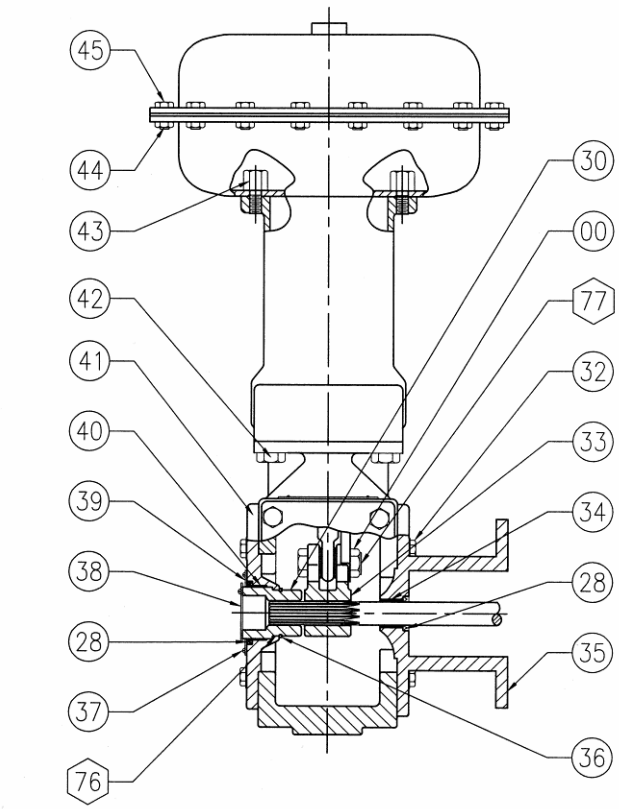


Figure 8: Typical CVS Type 1051 Actuator Assembly cont'd

CVS Type 1051 Rotary Actuator

Parts List

Key No.	Description		Part Number
1	Diaphragm Plate, cast iron	Size 30	CVS2F649319042
		Size 40	CVS2V939919042
		Size 60	CVS20A1336X012
2	Cap Screw, pl steel	Size 30 & 40 (4 req'd)	CVS1A368424052
		Size 60 (6 req'd)	
3	Nameplate, stainless steel		CVS16A3188X012
4	Drive Screw, stainless steel (4 req'd)		CVS1A368228982
5	Cap Screw, pl steel (4 req'd) (Not required with positioner)		CVS1C275224052
6	Cover Plate, steel (Not required with positioner)		CVS22A9359X012
7	Cap Screw, pl steel (2 req'd)		CVS1B561528982
8	Cap Screw, zn pl steel	Size 30 & 40	CVS1A336924052
		Size 60	CVS1A340924052
9	Washer, zn pl steel	Size 30 & 40	CVS1H723125072
		Size 60	CVS1A518925072
10	Cap Screw, pl steel	Size 30	CVS1A353124052
		Size 40	CVS1A340924052
		Size 60	CVS12A9405X012
11	Access Plate, steel (For aluminum constructions only)		CVS12A9638X012
	Access Plate, polyester (For aluminum constructions only)		CVS38A4712X012

Key No.	Description		Part Number
12	Cap Screw, pl steel	Size 30	CVS1A553424052
		Size 40	CVS1A361524052
		Size 60	CVS12A9519X012
13	Rod End Bearing, steel/TFE	Size 30	CVS1R580299012
		Size 40	CVS1E561699012
		Size 60	CVS1R440899012
14	Hex Nut, zn pl steel	Size 30	CVS1A946324122
		Size 40	CVS1E353724122
		Size 60	CVS1A354024122
16	Turnbuckle, zn pl steel	Size 30	CVS12A9623X012
		Size 40	CVS22A9625X012
		Size 60	CVS22A9624X012
17	Housing, aluminum	Size 30	CVS46A0463X022
		Size 40	CVS42A9306X062
		Size 60	CVS42A9309X062
	Housing, cast iron	Size 30	CVS48A5247X012
		Size 40	CVS48A5245X012
		Size 60	CVS48A5246X012
18	Hex Nut, zn pl steel	Size 30	CVS12A9666X012
		Size 40	CVS12A9629X012
		Size 60	CVS1R438924122
19	Spring Seat, steel		See Following Table

CVS Type 1051 Rotary Actuator
Parts List

Key No.	Description		Part Number
20	Spring Barrel, aluminum	Size 40	CVS32A9325X012
		Size 60	CVS42A9327X012
	Spring Barrel, cast iron	Size 40	CVS32A9325X022
		Size 60	CVS42A9327X022
21	Spring		See Following Table
22	Diaphragm Rod, pl steel	Size 30	CVS12A9652X042
		Size 40	CVS12A9652X022
		Size 60	CVS12A9462X032
23	Lower Diaphragm Casing, zn pl steel	Size 30	CVS2E792225062
		Size 40	CVS2E806325062
		Size 60	CVS2E847425062
24	Cap Screw, steel	Size 30	CVS12A9459X012
		Size 40	CVS12A9460X012
		Size 60	CVS12A9461X012
25	Diaphragm, Nitrile	Size 30	CVS2E791902202
		Size 40	CVS2E670002202
		Size 60	CVS2E859702202
26	Upper Diaphragm Casing, zn pl steel	Size 30	CVS2J713828992
		Size 40	CVS2L441828992
		Size 60	CVS30A0055X012
27	Warning Nameplate (not shown)		CVS12A9530X012
29	Machine Screw, pl steel, 4 req'd (Aluminum constructions only, not shown)		CVS1A340828992
28	Seal, steel & synthetic rubber	Size 30 & 40	CVS12A9451X012
		Size 60	CVS12A9452X012
30	Hub		See Following Table
31	Hex Nut, pl steel	Size 30	CVS1A352724122
		Size 40	CVS1A341224122
		Size 60	CVS1A343324122
32	Cap Screw, pl steel (4 req'd)	Size 30 & 40	CVS1A336924052
		Size 60	CVS1A340924052
33	Lever, ductile iron		See Following Table
34	Bushing		See Following Table

Key No.	Description		Part Number
35	Mounting Yoke		See Following Table
36	Retaining Ring, zn pl steel	Size 30 & 40	CVS12A9409X012
		Size 60	CVS12A9455X012
37	Self Tapping Screw, steel (2 req'd)		CVS1B561528982
38	Travel Indicator, SST	Size 30 & 40	CVS28A8534X012
		Size 60	CVS28A8495X012
39	Travel Indicator Scale, SST	Size 30 & 40	CVS28A8533X012
		Size 60	CVS28A8492X012
40	Bushing, fiberglass	Size 30 & 40	CVS12A9373X012
		Size 60	CVS12A9374X012
41	Cover, aluminum	Size 30 & 40	CVS32A9533X012
		Size 60	CVS32A9532X012
	Cover, cast iron	Size 30 & 40	CVS32A9311X012
		Size 60	CVS32A9313X012
42	Cap Screw, pl steel (4 req'd)	Size 40	CVS1A352624052
		Size 60	CVS1A418624052
43	Travel Stop, steel, Size 30		CVS15A8382X012
	Travel Stop, steel, Size 40		CVS1H591724092
	Travel Stop, steel, Size 60		CVS16A4120X012
44	Hex Nut, zn pl steel	Size 30 (12 req'd)	CVS1A346524122
		Size 40 (16 req'd)	
		Size 60 (24 req'd)	
45	Cap Screw, pl steel	Size 30 (12 req'd)	CSV1A675124052
		Size 40 (16 req'd)	
		Size 60 (24 req'd)	
46	Travel Indicator, SST (not shown)		CVS12A9693X012
47	Machine Screw, pl steel (not shown)		CVS1C899028982
48	Travel Indicator Disc, steel (not shown)		CVS22A9699X012
76	Lubricant		(Not Supplied)
77	Sealant		(Not Supplied)

Key 19 Spring Seat
Key 21 Spring

Casing Pressure[1] (PSIG)	Torque Output (In.-Lb)				Casing Pressure[1] (BAR)	Torque Output (N•m)				Key 19 Spring Seat (steel)	Key 21 Spring (steel)
	90° Rotation		60° Rotation			90° Rotation		60° Rotation			
	Up[2]	Down[2]	Up[2]	Down[2]		Up[2]	Down[2]	Up[2]	Down[2]		
Actuator Size 30											
0-18	180	210	180	480	0-1.2	20	24	20	54	CVS12A9445X012	CVS1K509827032
	---	---	250	180		---	---	28	20	CVS12A9445X012	CVS1N751527032
0-33	180	560	180	1530	0-2.3	20	63	20	173	CVS12A9445X012	CVS1K509827032
	250	700	250	1220		28	79	28	138	CVS12A9445X012	CVS1N751527032
Actuator Size 40											
0-18	---	---	650	570	0-1.2	---	---	73	64	CVS12A9447X012	CVS1P637127082
	440	600	440	1320		50	68	50	149	CVS12A9447X012	CVS1L217427042
0-33	630	1800	630	3180	0-2.3	71	203	71	359	CVS12A9447X012	CVS1P637127082
	830	560	830	1880		94	63	94	212	CVS12A9446X012	CVS1L217327042
Actuator Size 60											
0-18	1580	1330	1580	3220	0-1.2	179	150	179	364	CVS12A9450X012	CVS1K162727082
0-33	1310	2830	1310	6810	0-2.3	148	320	148	769	CVS12A9448X012	CVS1K162827082
	1580	3960	1580	4320		179	447	179	488	CVS12A9450X012	CVS1K162727082
	2330	2030	2330	5490		263	229	263	620	CVS12A9449X012	CVS1K162827082
0-40	2330	4380	2330	8780	0-2.8	263	495	263	992	CVS12A9449X012	CVS1K162827082

1. Positioner supply pressure should be 10 percent higher than actuator casing pressure
2. Up: diaphragm rod fully retracted; Down: diaphragm rod fully extended

Key 34 Bushing, TFE
Key 35 Yoke-Bushing Assembly[1]

Actuator Size	Valve Shaft Diameter		Key 34 Bushing, TFE	Key 35 Yoke-Bushing Assembly Cast Iron & TFE
	In	mm		
30	1/2	12.7	CVS1U902599402	CVS12A9779X0A2
40	3/4	19.1	CVS12A9556X012	CVS12A9799X0C2
	7/8	22.2	CVS12A9557X012	CVS12A9799X0E2
60	1	25.4	CVS12A9775X012	CVS12A9799X0H2
	1-1/4	31.8	CVS12A9558X012	CVS12A9799X0J2
	1-1/2	38.1	CVS12A9559X012	CVS12A9799X0K2

1. Yokes are available only as yoke-bushing assemblies. Bushing is available separately as a replacement part.

Key 30 Hub, Aluminum or 416 sst

Actuator Size	Valve Shaft Diameter		Key 30 Hub
	In	mm	
30	1/2	12.7	CVS22A9496X012
40	3/4	19.1	CVS22A9497X012
	7/8	22.2	CVS22A9486X012
60	1	25.4	CVS22A9420X012
	1-1/4	31.8	CVS22A9500X012
	1-1/2	38.1	CVS22A9501X012

Key 33 Lever, Ductile Iron

Actuator Size	Valve Shaft Diameter		Key 33 Lever
	In	mm	
30	1/2	12.7	CVS32A9579X012
40	3/4	19.1	CVS32A9569X012
	7/8	22.2	CVS32A9570X012
60	1	25.4	CVS32A9590X012
	1-1/4	31.8	CVS32A9591X012
	1-1/2	38.1	CVS32A9592X012

CVS Type 1051 Actuator Sizes

V100 Valve Body Size	Valve Stem Connection		CVS Type 1051 Actuator Size
	In	mm	
2”	1/2	12.7	30
3”	3/4	19.1	40
4”	7/8	22.2	
6”	1	25.4	60
8”	1-1/4	31.8	
10”	1-1/4	31.8	
12”	1-1/2	38.1	

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Instruction Manual

CVS 7970 High-Low Pressure Pilot

Figure 1: CVS 7970 High-Low Pressure Pilot

Introduction

This instruction manual includes the following information for CVS 7970 High-Low Pressure Pilot:

1. Description
2. Piston Arrangement Changeover Instructions
3. Parts Information

Only persons qualified through training or experience should install, operate and service this equipment. If you have any questions regarding this product or this manual, please contact your CVS Controls Sales Representative before proceeding.

Description

The CVS 7970 is a versatile sensor that can be programmed to detect and react to either increasing pressure or decreasing pressure with an adjustable range of 2 to 10,000 PSI (.138 to 689.5 bar).

When used within standard safety systems, a pressure sensor monitors a specific media or process pressure source for changes to the normal operating range. Loss of pressure within the control circuit will begin a shutdown sequence or trigger an alarm, and pressure sensors can also indirectly operate on/off flow control valves or pneumatic driven pumps.

The CVS 7970 is a two position, three-way pilot with universal ports (H, O, L), automatic reset (spring return) and pressure balance spool.

Each CVS 7970 is a self-contained unit containing necessary components for four different piston arrangements. Changeover instructions and drawings are included in this manual. Parts which are not installed in your current piston arrangement are kept in an enclosed storage tube. Machined within the piston housing of the CVS 7970 is a convenient 1/8"–27 NPT Female process connection and 1/2" NPT Male process connection.

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Table 1: CVS 7970 Specifications

Characteristic		Dimensions
Dimensions		1.750” diameter x 8.0” length
Working Pressure	Process Pressure Inlet	10,000 PSI Maximum (689.5 bar)
	Control Ports	125 PSI Maximum (8.62 bar)
Connections	Process Pressure Inlet	1/2”-14 NPT M and 1/8”-27 NPT F
	Control Ports	1/4”-18 NPT F
Weight		3.5 lbs / 1.6 kg
Panel Hole Cutout Size		1 5/8” (39.81 mm)
M=Male, F=Female		

Introduction continued

One particular advantage of the CVS 7970 is its adjustment range capability. Because of the complete supplied components, there is no need to purchase and store additional sets of matching piston and spring components. The installation or reorientation of the existing piston components allows for an adjustment range capability of 2 to 10,000 PSI. This is especially convenient for remote facilities which require changes to pressure settings to match changes in process conditions.

The CVS 7970 is available in a High-Low configuration using two pilots mounted and tubed to a carbon steel or stainless steel manifold (Figure 8). Your choice of 2-1/2” NPT process or gauge connections are available. This design allows for completely independent setting of the high and low pilots spanning the range of 2 psi to 10,000 psi. This configuration is available in Auto Reset (not shown) or Manual Reset (shown, pg 8).

Piston Arrangement Changeover Instructions

The information in this manual, including the parts listings and piston detail drawings, will assist you in completing the Piston Arrangement Changeover.

Caution: Consult and follow the established safety procedures of your facility prior to beginning disassembly of any CVS Controls product. Ensure that all pressure is exhausted from the system prior to performing any service work. Failure to remove the pressure from the system can result in serious personal injury.

1. Isolate and depressurize the control system.
2. Disconnect the control circuit instrumentation tubing from control valve, as well as the monitored process connection from the piston housing.
3. Where possible, remove the CVS 7970 from the service location to perform the changeover in a clean work environment.
4. Loosen the lock nut and remove from the adjusting cap. (See figure 2)
5. Gently relieve all spring tension by fully unscrewing the adjusting cap. This allows access to the storage tube.
6. Unscrew the piston housing from the valve body.
7. Turn the piston housing upside down and tap it gently on a flat, clean surface to remove the piston arrangement. The pistons should slide out easily.
8. Thoroughly clean the piston components, including the piston housing and internal bores, using warm water and a liquid detergent. Do not use abrasive tools or acidic cleansers. Dry all components with a cloth or paper towel.
9. Lightly lubricate all components and seals, and assemble the piston arrangement as desired according to the enclosed detail drawing.
10. When inserting the new piston arrangement into the piston housing, apply even pressure. Press evenly using both thumbs on the piston’s outer edges for the insertion of the 1-1/8”, 1/2” and 3/16” piston arrangements.
11. For the 1/4” piston insertion, install the 1/4” piston first, using a needle-nosed pliers. Then press the other piston components into place.
12. Lightly lubricate the threads of the piston housing, body and spring housing. Be sure to use a grease or medium appropriate for stainless steel.
13. Reassemble the pressure pilot.
14. Adjust the pressure setting to the required amount, and function test the pressure pilot. When the desired setting is achieved, tighten the lock nut securely against the adjusting cap.
15. Connect the instrumentation tubing and the pressure connection to the monitored process.
16. Introduce pressure to the pressure pilot’s control circuit and monitored process inlet. Resume normal operation.

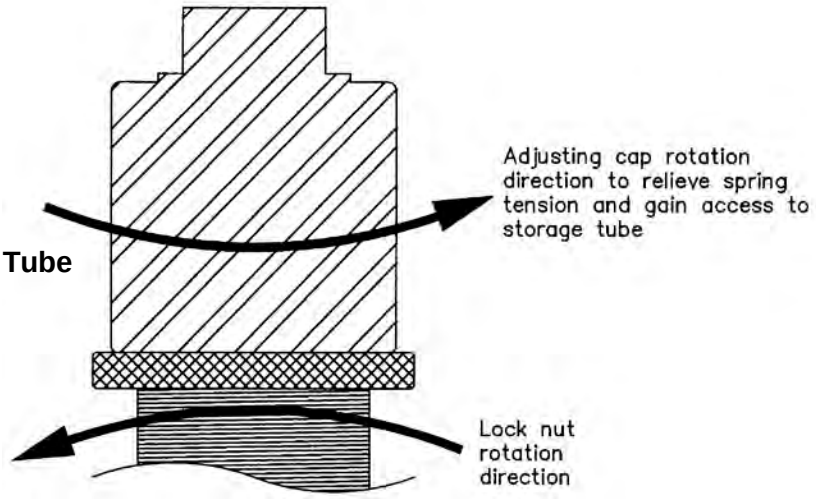


Figure 2: Adjusting Cap / Storage Tube Access

CVS 7970 High-Low Pressure Pilot

Table 2: Parts List

Key	Part Number	Qty.	Description	Material
1	CVS79710A	1	Adjusting Cap	Black Delrin
2	CVS79702A	1	5/16" Ball Bearing	Stainless Steel
3	CVS7911A	1	Spring Guide	Black Delrin
4	CVS7970A	1	Spring	302 Stainless Steel
5	CVS79712A	2	Lock Nut	Black Delrin
6	CVS79709A	1	Spring Housing	316 Stainless Steel
7	CVS79708	1	Stop Plate	316 Stainless Steel
8	CVS79704A	1	Body Housing	316 Stainless Steel
9	CVS79707A	1	Upper Stem	316 Stainless Steel
10	CVS79706A	1	Lower Stem	316 Stainless Steel
11	CVS79703A	1	Small Piston	316 Stainless Steel
12	CVS79705	1	Stop Washer	316 Stainless Steel
13	CS79702	1	Large Piston	316 Stainless Steel
14	CVS797014	1	Snap Ring	304 Stainless Steel
15	CVS79701A	1	Piston Housing	316 Stainless Steel
16	V-75-010	2	Seal	Viton Coated TFE
17	V-75-008	2	Seal	Viton Coated TFE
18	V-75-119	1	Seal	Viton Coated TFE
19	TFE-008	1	Back-Up Ring	Teflon
20	V-75-008	1	Seal	Viton Coated TFE
21	CVS79713A	1	1/4" Piston	316 Stainless Steel
22	V-75-006	1	Seal	Viton Coated TFE
23	TFE-006	1	Back-Up Ring	Teflon
24	TFE-012	1	Back-Up Ring	Teflon
25	V-75-012	1	Seal	Viton Coated TFE

Seal Kits

CS7970-BKK	1	Piston O-Ring Kit (Body Housing)	
V-75-008	1	Seal	Viton Coated TFE
V-75-010	1	Seal	Viton Coated TFE
CVS7970-Pkk	1	Piston O-Ring Kit (Body Housing)	
V-75-006	1	Seal	Viton Coated TFE
V-75-008	1	Seal	Viton Coated TFE
V-75-012	1	Seal	Viton Coated TFE
V-75-119	1	Seal	Viton Coated TFE
TFE-006	1	Back-Up-Ring	Teflon
TFE-008	1	Back-Up Ring	Teflon
TFE-012	1	Back-Up Ring	Teflon

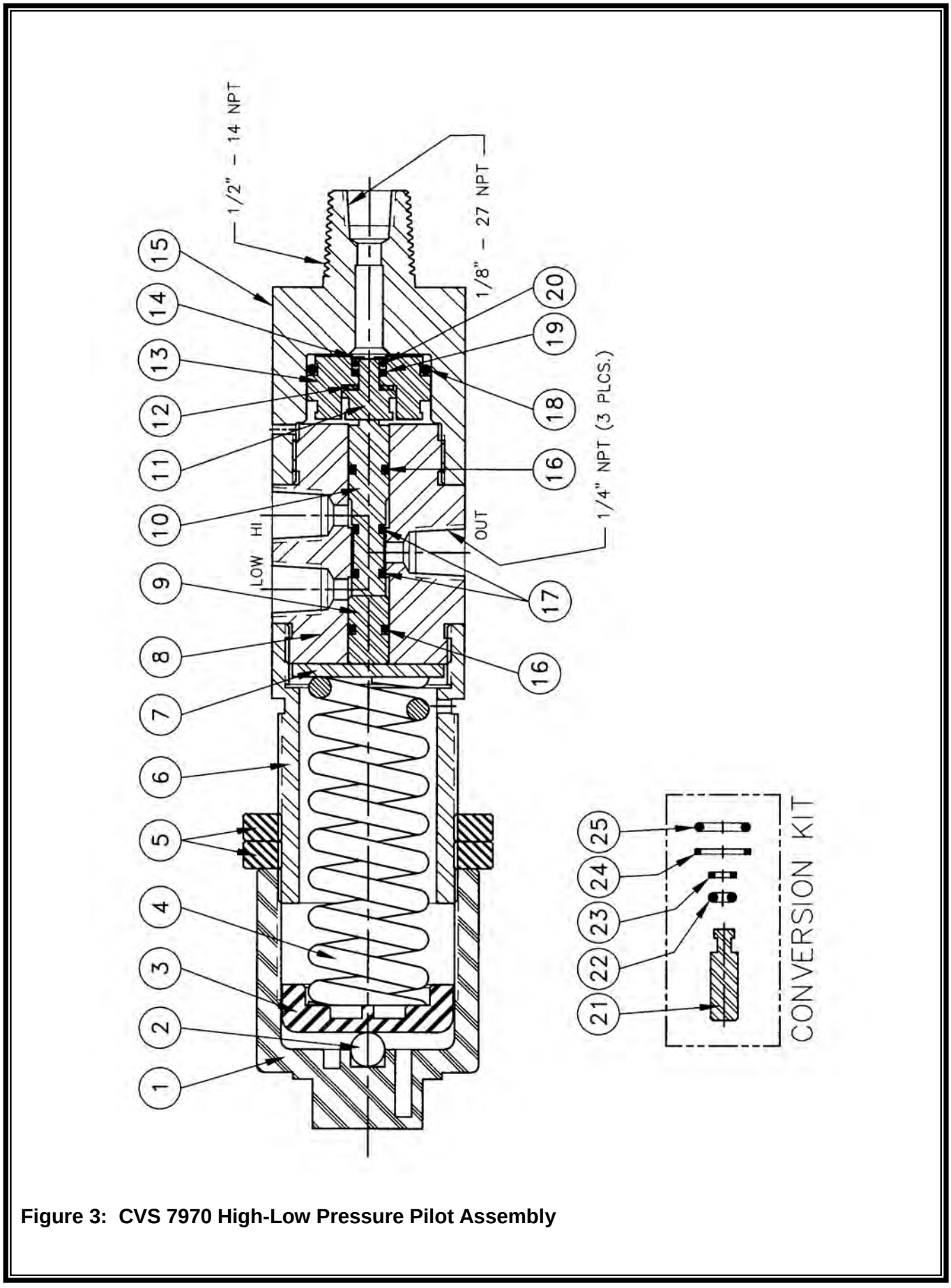


Figure 3: CVS 7970 High-Low Pressure Pilot Assembly

Key	Part Number	Qty.	Description	Material
11	CVS79703A	1	Small Piston	316 Stainless Steel
13	CS79702	1	Large Piston	316 Stainless Steel
14	CVS797014	1	Snap Ring	304 Stainless Steel
18	V-75-119	1	Seal	Viton Coated TFE
19	TFE-008	1	Back-Up Ring	Teflon
20	V-75-008	1	Seal	Viton Coated TFE

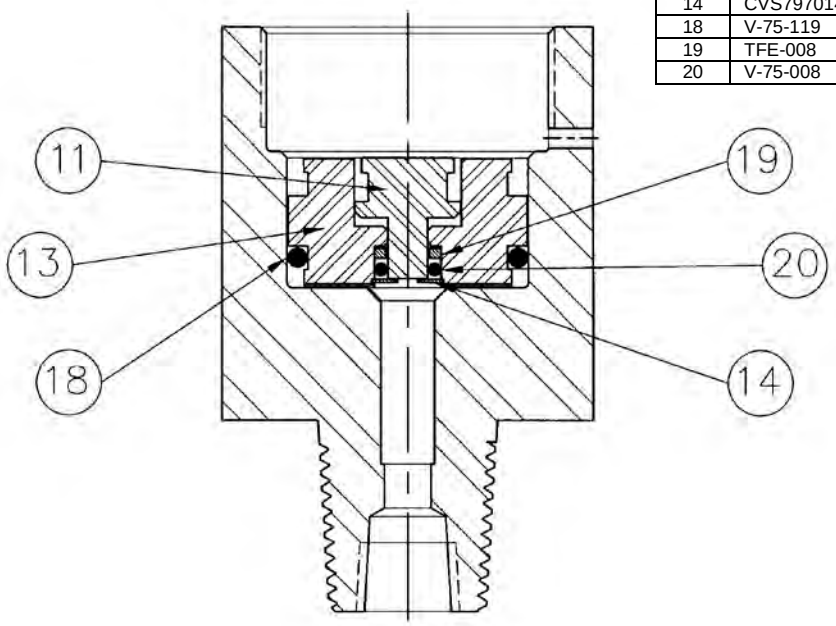


Figure 4: 3/16 Piston Arrangement Enlarged Detail Drawing
For pressures from 5900 to 10,000 PSI (407 to 690 bar)

Key	Part Number	Qty.	Description	Material
11	CVS79703A	1	Small Piston	316 Stainless Steel
13	CS79702	1	Large Piston	316 Stainless Steel
14	CVS797014	1	Snap Ring	304 Stainless Steel
19	TFE-008	1	Back-Up Ring	Teflon
20	V-75-008	1	Seal	Viton Coated TFE
21	CVS79713A	1	1/4" Piston	316 Stainless Steel
22	V-75-006	1	Seal	Viton Coated TFE
23	TFE-006	1	Back-Up Ring	Teflon

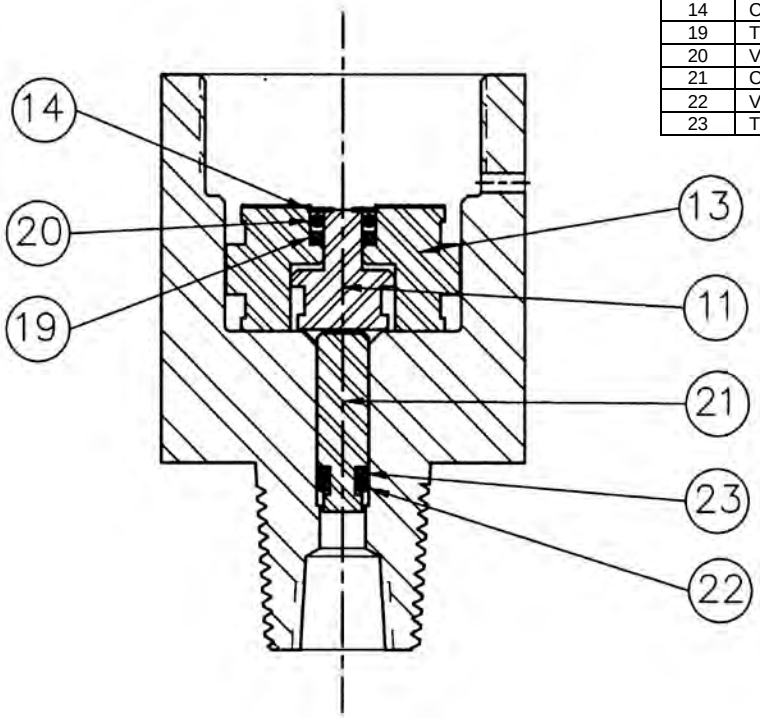


Figure 5: 1/4" Piston Arrangement Enlarged Detail Drawing
For pressures from 1440 to 5900 PSI (99 to 407 bar)

Key	Part Number	Qty.	Description	Material
11	CVS79703A	1	Small Piston	316 Stainless Steel
13	CS79702	1	Large Piston	316 Stainless Steel
18	V-75-119	1	Seal	Viton Coated TFE
24	TFE-012	1	Back-Up Ring	Teflon
25	V-75-012	1	Seal	Viton Coated TFE

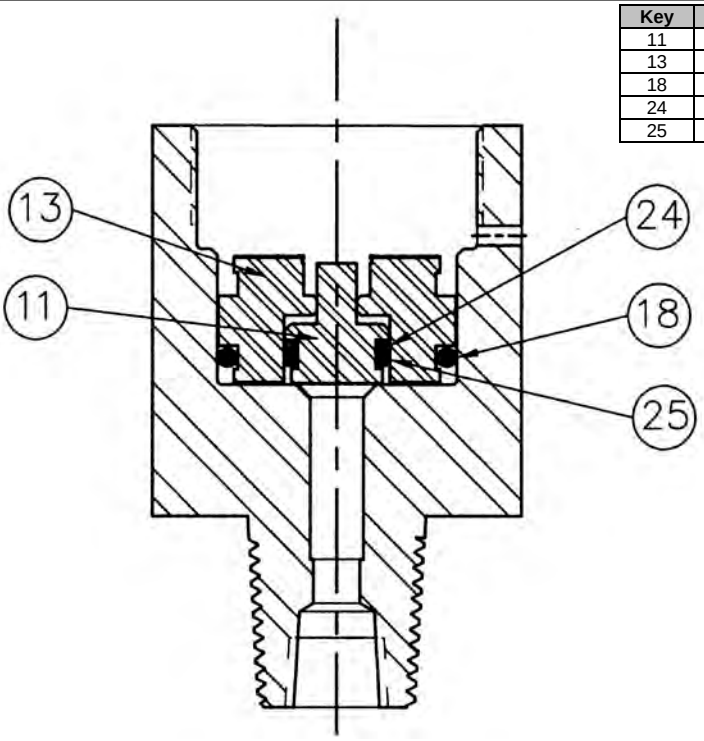


Figure 6: 1/2" Piston Arrangement Enlarged Detail Drawing
For pressures from 290 to 1440 PSI (20 to 99 bar)

Key	Part Number	Qty.	Description	Material
11	CVS79703A	1	Small Piston	316 Stainless Steel
12	CVS79705	1	Stop Washer	316 Stainless Steel
13	CS79702	1	Large Piston	316 Stainless Steel
14	CVS797014	1	Snap Ring	304 Stainless Steel
18	V-75-119	1	Seal	Viton Coated TFE
19	TFE-008	1	Back-Up Ring	Teflon
20	V-75-008	1	Seal	Viton Coated TFE

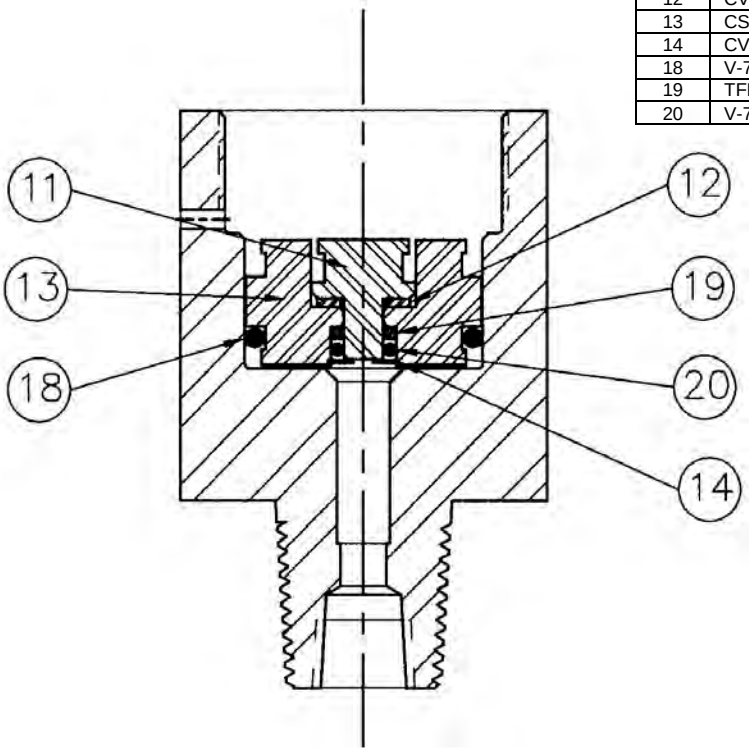
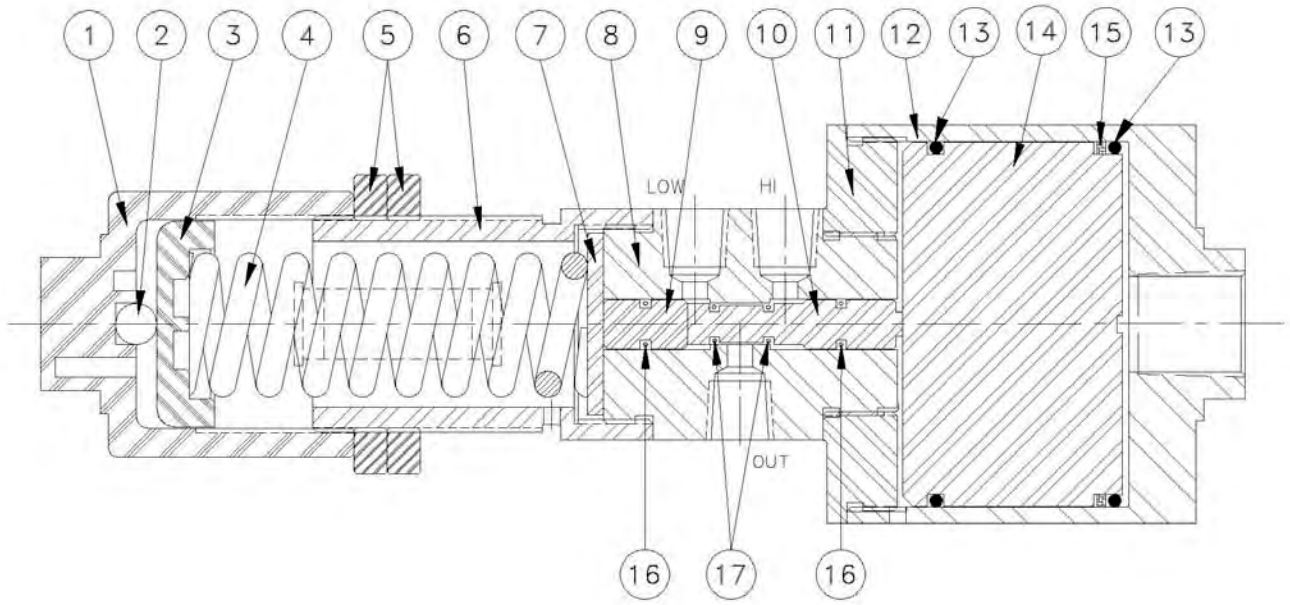


Figure 7: 1-1/8" Piston Arrangement Enlarged Detail Drawing
For pressures from 10 to 290 PSI (.689 to 20 bar)

Figure 8 – CVS Series 7970 Low Pressure Pilot – Adjustment 2 to 15 PSI, Assembly



CVS Series 7970 Low Pressure Pilot – Adjustment 2 to 15 PSI, Parts List

Item Number	Part Number	Description	Qty.
1	CVS 7910A	Adjusting Cap, Black Delrin	1
2	CVS 7920A	6/16" Ball Bearing, SST	1
3	CVS 7911A	Spring Guide, Black Delrin	1
4	CVS 7970A	Spring, 302 Stainless Steel	1
5	CVS 79712A	Lock Nut, Black Delrin	2
6	CVS 79709A	Spring Housing, 316 SST	1
7	CVS 79708A	Stop Plate, 316 SST	1
8	CVS 79704A	Body Housing, 316 SST	1
9	CVS 79707A	Upper Stem, 316 SST	1
10	CVS 79706A	Lower Stem, 316 SST	1
11	CVS 79730	Adapter, Low Pressure, 316 SST	1
12	CVS 79701LP	Piston Housing, 316 SST	1
13	V-75-145	o-ring, Viton Coated TFE	2
14	CVS 79702LP	Piston, LP, 316 SST	1
15	CVS 79731	Wiper Ring, Viton	1
16	V-75-010	Seal, Viton Coated TFE	2
17	V-75-008	Seal, Viton Coated TFE	2

Figure 9: CVS Series 7970 High-Low Pressure Pilot Switch

Hi-Low Pressure Pilot - Manual Reset

Low Pressure Valve:

*Out Port ⟶ To Valve
*Hi Port ⟶ To Vent

High Pressure Valve:

*High Port ⟶ To (air/gas) Supply (Max Supply Pressure 125 psi)
*Low Port ⟶ To vent

Manifold:

*Either port for process

Notes:

Notes:

Notes:

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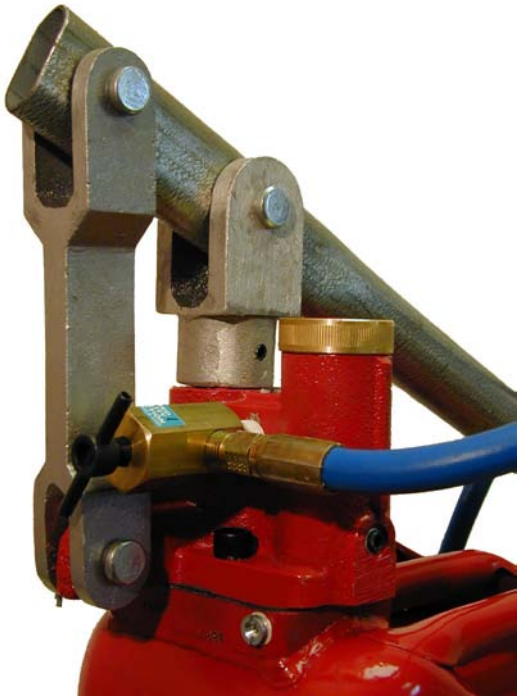
CVS Controls High Pressure Portable Injection Hand Pump

This is a High Pressure Alcohol Injector Pump of rugged design that will quickly and effectively de-ice valves and lines with just a few strokes.



The hand pump is mounted on a 20-litre (5 gallon) metal container. Other features include adjustable pressure settings (1000, 2000 and 3000 psi), rubber core steel braided discharge hose for easy connections, convenient pressure relief valve and a discharge stroke volume of .730 cu. in or 11.96 ml.

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CVS Controls – High Pressure Portable Injection Hand Pump – Operation and Maintenance

The following components are shipped loose and must be installed prior to operation of hand pump.

1. "Link Kit", consists of 2 Clevis Pins (4), 1 Clevis Pin (33), 3 Flat Washers (3), 1 Handle Link (30), 2 Cotter Pin (5), 1 R-Clip (41)
2. Handle (1)
3. Discharge Hose Assembly (40)

Link Kit and Handle Assembly Installation

1. Install Handle Link (1) by inserting Clevis Pin (33) through Handle Link and Pump Body (28). Install 1 Flat Washer (3) and 1 Cotter Pin (5). Bend back tabs of cotter pin to secure.
2. Install Handle (1), by inserting 2 Clevis Pin (4) through upper Handle Link (30), and Plunger (14). Install 1 Flat Washer (3) on each Clevis Pin and secure upper handle link with Cotter Pin (5) by bending back tabs of cotter pin. Install R Clip (41) on clevis pin securing handle to the plunger to allow for easy removal for priming.
3. Apply thread tape or equivalent to fixed end of Discharge Hose Assembly (40). Thread into Bleed Valve Body (31), and secure.

Operation

1. Remove Tank Cap (37), and fill Tank assembly with alcohol or desired liquid best suited for your application. Replace Tank Cap. Cycle pump two to three full strokes with bleed valve open to Prime. Close bleed valve for normal operation. Should pump not be primed for regular use follow instructions below.

   To Prime Pump

   A. Remove Plunger (14), by first removing 1 Clevis Pins (4) which attaches Handle to Plunger.
   B. Fill with alcohol or equivalent
   C. Replace Plunger
   D. Release excess pressure using the Bleed Valve Screw (32)
   E. Re-attach handle to plunger.

Unit is now primed and ready for use.
***Note**: **The CVS Controls High Pressure Hand Pump has a working pressure up to a maximum of 3000 psi. Prior to connecting Discharge Hose Assembly ensure working line pressure has been relieved**. CVS Controls has available the CVS-A-0675 Inline Check Valve for installation on the discharge hose assembly to prevent potential back pressure to the tank assembly.

2. Connect discharge line.

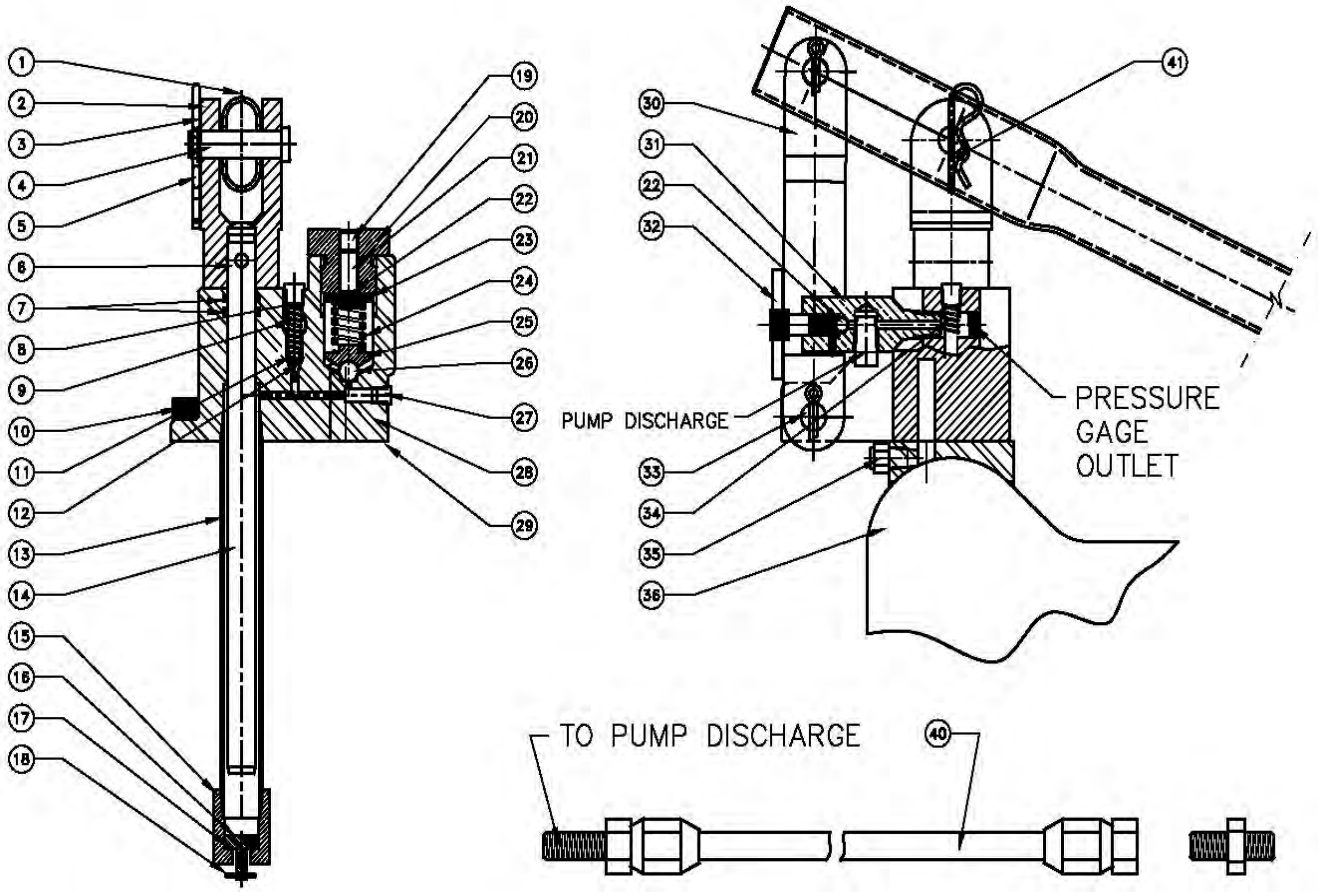
3. Pump handle to inject alcohol.

Maintenance and Trouble Shooting

- If unit is not pumping, remove plunger and check Foot Valve o-ring (17), replace as necessary
- Unit does not hold pressure, Discharge Poppet (11) and Discharge Poppet o-ring (12) may be damaged or need replacing.

CVS Controls Ltd. has available a maintenance kit for the High Pressure Hand Pump (CVS-HP-1038). Should maintenance be required, it should only be performed by competent personnel, or a Qualified CVS Controls Technician. Contact a CVS Controls representative for more information.

CVS Controls High Pressure Portable Injection Hand Pump



Parts List

Item	Part No.	Description
	CVS-HP-1000	Complete Unit
1	CVS-HP-1001	Handle
2	CVS-HP-1002	Plunger Clevis
3	CVS-HP-1003	Washer
4	CVS-HP-1004	Clevis Pin
5	CVS-HP-1005	Cotter Pin
6	CVS-HP-1006	Roll Pin
7	CVS-HP-1007	O-Ring Plunger
8	CVS-HP-1008	Pipe Plug
9	CVS-HP-1009	Spring
10	CVS-HP-1010	Cap Screw
11	CVS-HP-1011	Discharger Poppet
12	CVS-HP-1012	O-Ring Poppet
13	CVS-HP-1013	Pump Barrel
14	CVS-HP-1014	Plunger
15	CVS-HP-1015	Foot Valve Cage
16	CVS-HP-1016	Foot Valve Poppet
17	CVS-HP-1017	O-Ring Foot Valve
18	CVS-HP-1018	Cotter Pin
19	CVS-HP-1019	Set Screw
20	CVS-HP-1020	Pressure Setting Screw

Item	Part No.	Description
21	CVS-HP-1021	Set Screw
22	CVS-HP-1022	Stainless Steel Ball
23	CVS-HP-1023	Spring Set Plate
24	CVS-HP-1024	Spring
25	CVS-HP-1025	Spring Base Plate
26	CVS-HP-1026	Stainless Steel Ball
27	CVS-HP-1027	Pipe Plug
28	CVS-HP-1028	Body
29	CVS-HP-1029	Gasket
30	CVS-HP-1030	Handle Link
31	CVS-HP-1031	Bleed Valve Body
32	CVS-HP-1032	Bleed Valve Screw
33	CVS-HP-1033	Clevis Pin
34	CVS-HP-1034	Pipe Plug
35	CVS-HP-1035	Vent Check Valve
36	CVS-HP-1036	Tank assembly
37	CVS-HP-1037	Tank Cap
38	CVS-HP-1038	Repair Kit
39	CVS-HP-1039	Cap Gasket
40	CVS-HP-1040	Hose Assembly
41	CVS-HP-1041	R-Clip

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CVS Controls Ltd.

Product Manual

CVS Self Contained Hydraulic Pump

Figure 1: CVS Self Contained Hydraulic Pump

Introduction

This CVS Controls product manual includes instructions for the installation, adjustment, maintenance and parts ordering of the CVS Self Contained Pump.

All CVS Controls equipment should be installed, operated and maintained by qualified personnel. If you have any questions regarding this equipment, contact your CVS Controls representative.

Description

The CVS Self Contained Pump provides reliable emergency shutdown when an external power source or fuel gas is not available or not reliable. The unit uses clean hydraulic fluid.

Used in conjunction with a linear or rotary spring return hydraulic operator, the CVS Self Contained Pump is a fail-safe system which is suitable for ball, plug or other quarter-turn valves as well as reverse-acting gate valves or other linear operated valves.

This pump has been proven reliable under the most demanding operating and environmental conditions. It is designed to be the foundation for a flexible sensing and control system, and has built-in temperature compensation and pressure relief.

Installation

Generally the module is installed on the operator by CVS Controls at the manufacturing facility, but can also be field installed by the user.

The module can be ordered in pressure configurations from 100 psi to 1500 psi.

The following connections are marked on the manifold assembly:

- H: High pressure hydraulic supply to operator
- L: Low pressure hydraulic supply for monitoring devices
- S: Low pressure hydraulic signal for RESET VALVE from monitoring or ESD devices
- V: Vent or return line to allow off-panel devices to return oil to the reservoir

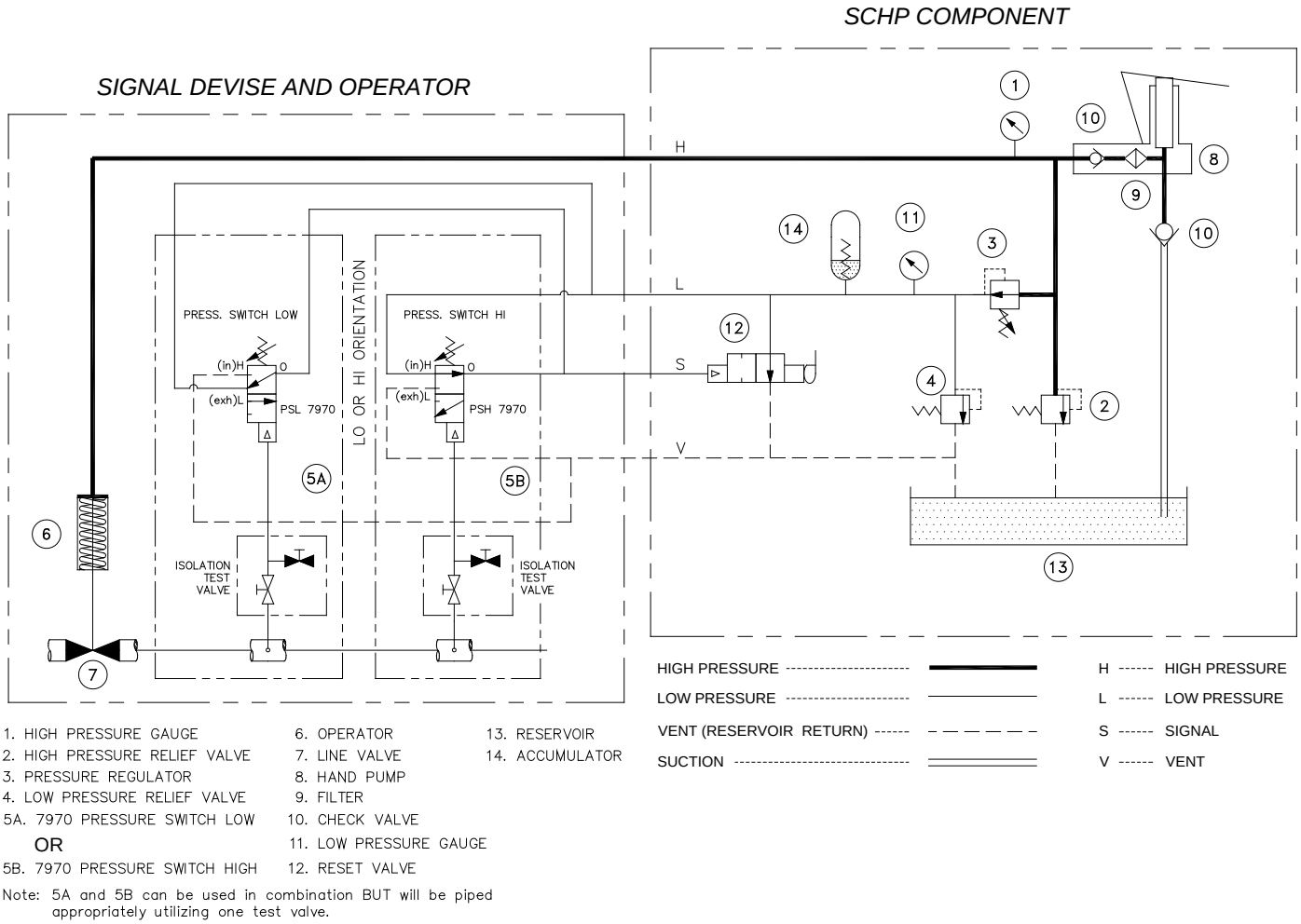


Figure 2: Module Schematic

This example illustrates the operating method and options for sensing and control.

The module is shown with the line valve closed and reset valve unlatched.

To operate in this configuration:

1. Latch the reset valve (Key 12), then open the line valve (Key 7) by operating the hand pump (Key 8)
1. When the pilot (Key 5a or 5b) senses that pressure is within the set points the system enters automatic mode
1. The line valve (Key 7) will close if:
    1. the reset valve (Key 12) is switched manually, or
    2. the pilot (Key 5a or 5b) senses that the pressure is out of range

Specifications

Components	High-pressure SCH Module	▪ HP-2-SC or BHP 3 Handpump ▪ 0-3000 PSI HP Gauge ▪ 0-200 PSI LP Gauge
	Low-pressure SCH Module	▪ HP-2-SC Handpump ▪ 0-200 PSI LP Gauge
Pressure Settings	High-pressure SCH Module	▪ HP Relief set at 2250 psi ▪ LP Relief set at 135 psi ▪ CVS SCR Regulator set at 80-100 psi[1]
	Low-pressure SCH Module	LP Relief set at 135 psi
Valves	▪ Pilot to close valve ▪ Reset valve ▪ Toggle valve ▪ Manual pilot valve (requires 40-60 psi on signal port to sustain auto mode)	
Optional Solenoid Valve	Voltage as specified by user ▪ 24 VDC ▪ 125 VDC ▪ 120VAC with MAWP 150 psi	
Valve Operator	Refer to appropriate manual for specifications	
Reservoir	Low temperature, high impact resin standard (Lexan) Cast aluminum optional.	
Other Components	High/low pressure pilot upper block is connected to the self contained hydraulic module with an operating pressure of 60 to 130 psi. Process sensing pressure MAWP depends on the manufacturer.	

1. Set to 90 psi at point of manufacturing

Installation continued

Refer to Figure 2 for connections, which are also tagged at the factory. If requested, an optional Solenoid valve may have been installed and tubed at the factory and is ready for electrical connection. A metal or plastic plug may have been installed in the breather/fill port of the reservoir. If that is the case, remove the plug and replace with the breather provided in the bag attached to the unit.

Hydraulic fluid used is Esso Univis J13 unless an alternate is specifically requested.

Operation

Manual Mode (Start Up or Reset)

1. Lift the toggle on the manual pilot valve and latch in the "Up" position. See Figure 3 for "Manual Reset" position.
2. Operate hand pump to open/close line until system is pressurized.
3. Stop pumping when high pressure gauge reading is 10% above the minimum value required to hold the valve in position.

Note

System will automatically reset at set pressure.

Note

To start up when the system is not completely connected, plug "L" Low Pressure to prevent fluid flow off the panel. Refer to operation instructions above.

Automatic Mode (To Run)

4. Lower the toggle on the manual pilot valve. See Figure 3 for "Auto/Run" position. The toggle should automatically go to "Run".
5. When the signal device(s) is satisfied, the unit will be in automatic mode. The optional Solenoid valve is returned to normal operating condition (either energized or de-energized).

Shutdown

If the pilot detects pressures outside of the set points, (or if there is an applied or removed electrical signal to the optional Solenoid valve), the pilot removes the signal to the manual pilot valve. The manual pilot valve then switches which allows the spring in the operator to stroke the line valve to the failsafe position.

The pilot can also be shutdown manually by pushing the toggle.

Maintenance

Note:

Regular maintenance should be performed each fall, or as required. CVS Controls recommends the use of protective clothing, gloves and eyewear when performing any installation or maintenance.

1. Empty fluid reservoir of any accumulated moisture.
2. Check filter element(s) and clean and/or replace as necessary.
3. Check set points on pressure relief valve(s) and reset values if required.
4. If possible, check operation and calibration of pressure pilot or optional Solenoid.
5. Top up hydraulic fluid. Be sure to use compatible fluid.

Troubleshooting

Note

As shown in Figure 2, the high-pressure side of the system supplies the low-pressure regulated side, therefore any leakage on the low side will cause significant changes in high-pressure gauge values.

Without cycling the actuator, but with the pressurized removal of the reservoir and off panel device, vent/return lines will assist in tracing leakage. To trace leakage:

1. Disconnect the vent line from the pilot/solenoid vent port. This isolates it from the SCH module and allows for checking oil leakage throughout the device.

Note

This procedure also checks o-ring seals of poppet/spool and spool/sleeve in operating positions.

2. Remove reservoir from the module and check for oil leakage of reliefs and reset valve under operating conditions.
3. Remove the filter plug, spring and filter in hand pump sub-plate to observe backside of HP discharge. Check for leakage across and around it while applying high pressure.
4. Remove fitting and tubing or plug from the second vent port of the module. Check for oil leakage that may be caused by manifold porosity between low-pressure (LP) channel and vent (V) channel.
5. Remove operator inspection cover or plate, and/or tubing from the cylinder plate to check for oil leakage across the piston seal and the piston centre o-ring.

In the case of pumping problems, access the pump suction valve by removing the pump assembly from the sub-plate. Pumping difficulties are usually caused by a dirty filter element, contaminated oil (with water or methanol), or using incorrect fluid in the unit.

When the unit fails to regulate it is noticeable by a low pressure gauge reading of 130 psi after two strokes. Service the regulator according to the appropriate maintenance manual.

Note

Before removing or disassembling any components on the manifold, depressurize the system.

Parts Ordering

All pertinent information regarding the CVS Self Contained Pump is stamped on the manifold assembly. Please refer to this information when corresponding with CVS Controls regarding parts or service.

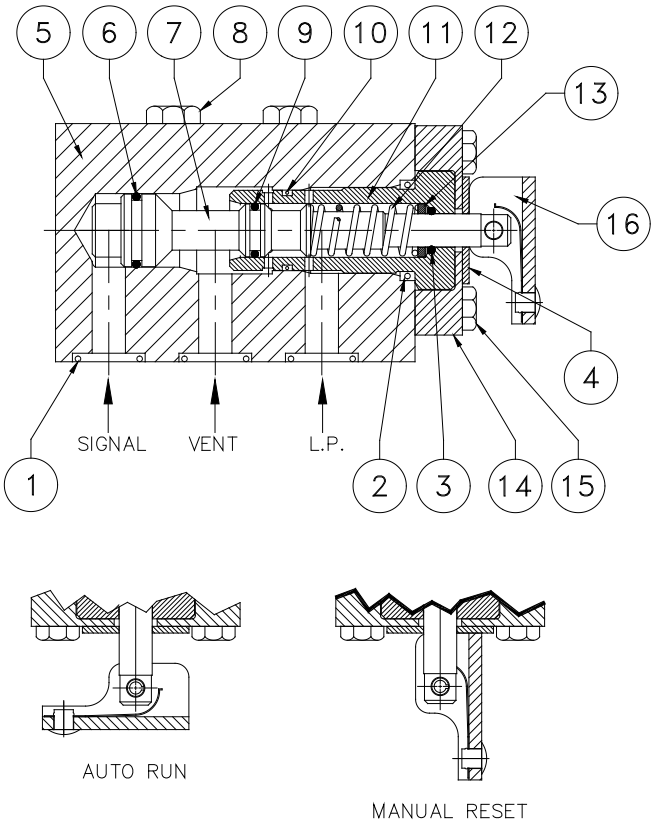


Figure 3: Reset Valve

Parts List

Key No.	Description	Material	Part Number	Qty
1	O-Ring, Reset Valve	Nitrile	Seal Kit	3*
2	O-Ring, Sleeve Head	Nitrile	Seal Kit	1*
3	O-Ring, Sleeve Stem	Nitrile	Seal Kit	1*
4	Washer Toggle	Nylon	Seal Kit	1*
5	Body, Reset Valve	AL 6061-T6	CVSSCHARV001	1
6	O-Ring, Spool Piston	Nitrile	Seal Kit	1*
7	Spool, Reset Valve	AL 6061-T6	CVSSCHARV003	1
8	Capscrew, Reset Valve	SS 304	Bolt Kit	3
9	O-Ring, Spool	Nitrile	Seal Kit	1*
10	O-Ring, Sleeve	Nitrile	Seal Kit	1*
11	Sleeve, Reset Valve	Teflon	CVSSCHARV007	1
12	Spring, Reset Valve	SS 302	CVSSCHARV005	1
13	Washer, Spring	AL 6061-T6	CVSSCHARV006	1
14	Sleeve Retainer	AL 6061-T6	CVSSCHARV002	1
15	Capscrew, Sleeve Retainer	SS	Bolt Kit	2
16	Toggle Assembly	AL 6061-T6 / SS 3001	CVSSCHARV008	1

1. * Recommended Spare Part. Included in Seal Kit (CVS SCHA Seal Kit)

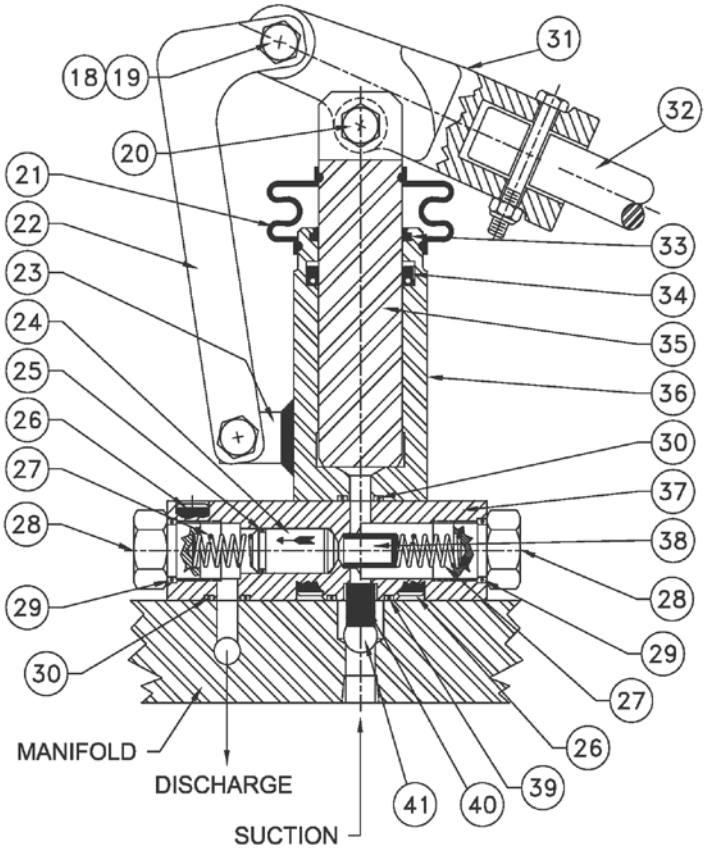


Figure 4. Hand Pump

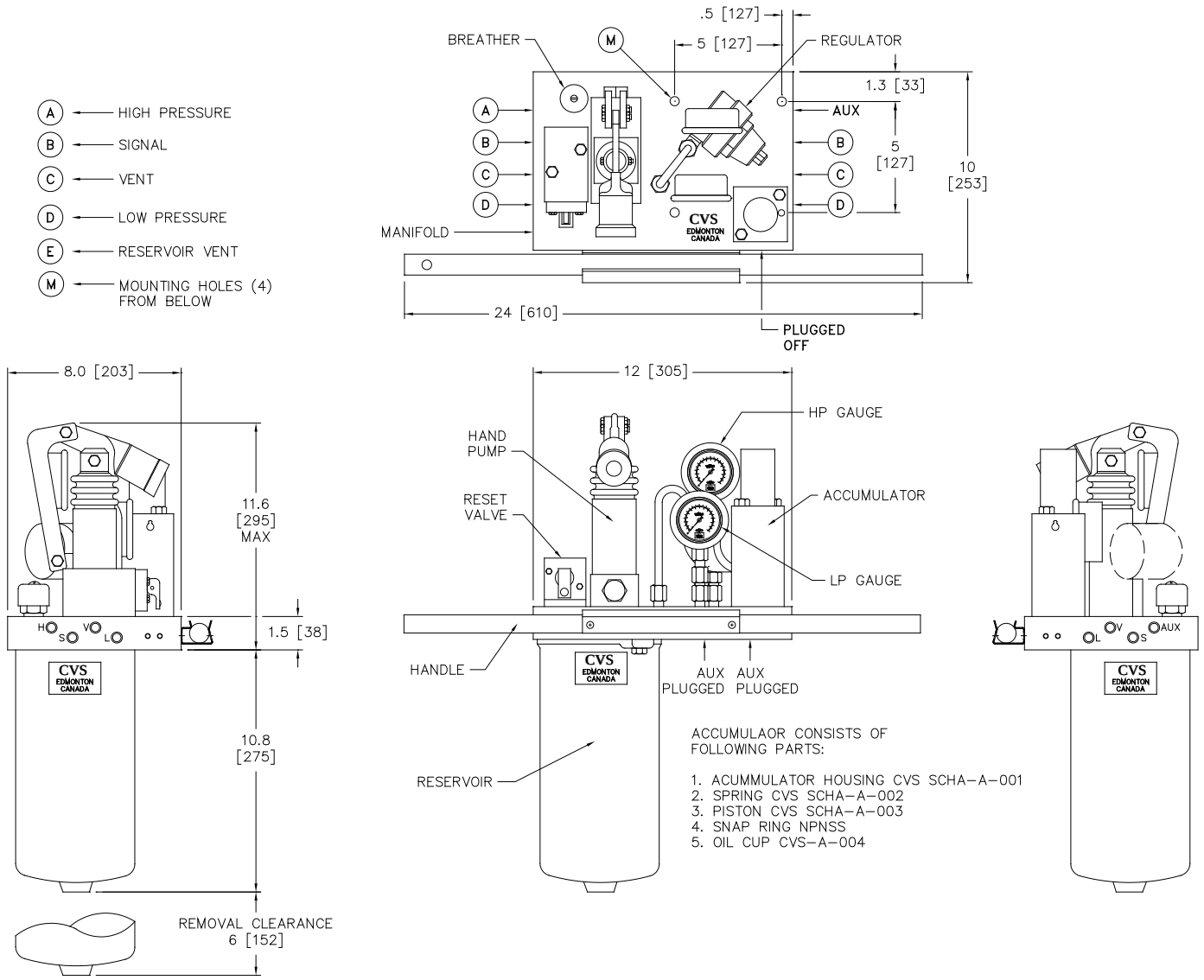
Parts List

Key No.	Description	Material	Part Number	Qty
18	Locknut	HEXN ZN PL	Bolt Kit	3
19	Pin, Connecting Link	HXHC GR 5 ZN PL	Bolt Kit	2
20	Pin, Ram	HXHC GR 5 ZN PL	Bolt Kit	1
21	Boot		CVS SCHA-PA-007	1
22	Connecting Link – SCHA	AISI C1020 ZN PL	CVSSCHAPA003	2
23	Pivot – Series SCHA	AISI C1020 ZN PL	CVSSCHAPA001A	1
24	Cartridge Insert Check Valve	CS/Nitrile	CVSSCHA908029	1
25	O-Ring, Check Valve	Nitrile	Seal Kit	1*
26	Socket Head Screw	HXSC GR 8 ZN PL	Bolt Kit	4
27	SCHA Spring	SS 302	CVSSCHA908026	2
28	Plug – Series SCHA	AL 7075-T651	CVSSCHAPA004	2
29	O-Ring, End Plug	Nitrile	Seal Kit	2*
30	O-Ring, Body	Nitrile	Seal Kit	2*
31	Lever – CVS SCHA	D.I. 65-45-12 PL	CVSSCHAPA005	1
32	Lever Handle	ASTM A53-B ZN PL	CVSSCHA003	1
33	Wiper	Urethane	Seal Kit	1*
34	Rod Polypak	Urethane/Nitrile	Seal Kit	1*
35	Ram – Series SCHA	AISI C1045 CH PL	CVSSCHAPA002	1
36	Body – Series SCHA	AISI C1020 ZN PL	CVSSCHAPA001	1
37	Base – Series SCHA	AL 6061-T6	CVSSCHAPA006	1
38	90 Micron Sintered Filter Element	SS 316	CVS908025	1
39	O-Ring, Suction Port	Nitrile	Seal Kit	1*
40	SCHA Suction Port Spring	AL 7075-T651	CVSSCHA908023	1
41	½" SST Ball, Suction Port	SS 302	CVSA0053	1
	Seal Kit (O-Ring Kit) (Includes Keys 1,2,3,4,6,9,10.24, 27, 29, 32, 33, 38)		CVSSCHA Seal Kit	
	Bolt Kit (Includes Keys 8.15,18, 19, 20, 26)		CVSSCHA-B/N	

* Recommended Spare Part, Included in Seal Kit (CVS SCHA Seal Kit)

Figure 5: Self Contained Hydraulic Pump Assembly

CVS-BF68.5



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Instruction Manual

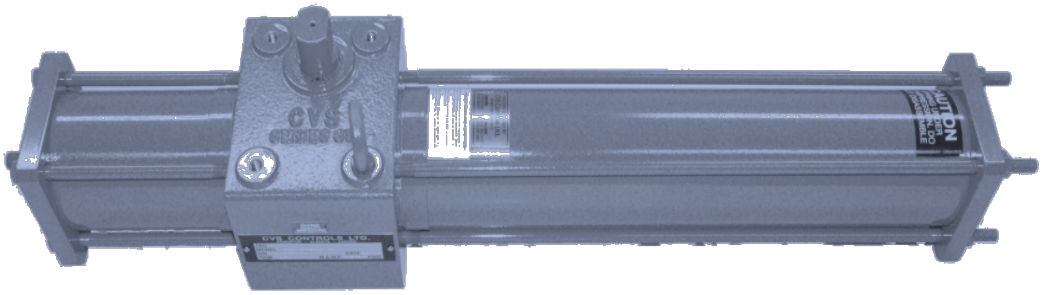

Figure 1: CVS Series 35D SRM100 Actuator

CVS Series 35D SRM100 Scotch Yoke Hydraulic Actuator

Introduction

The CVS Series 35D SRM 100 Hydraulic Actuator uses a scotch yoke mechanism to convert linear piston motion to a 90 degree rotation. The CVS 35D Series actuator incorporates key materials for construction, such as aluminum drive case, fiber wound cylinders, and do not use brass or bronze components to allow for use in sour gas applications.

The CVS 35D Series actuator is well suited for operating plug, ball, butterfly, dampers and other devices requiring 90^{o} turn rotation.
($\pm 4^{0}$ of additional angle adjustment)

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Features

- Scotch Yoke Mechanism, high breakaway and reseat torque
- $\pm 4^0$ of additional angle adjustment
- Can be used for fail open, or closed
- Light weight Aluminum Drive Case
- Light weight and durable Fiber Wound Cylinders
- Standard operating temperature range: -50^{oC} to $+80^{oC}$ (-58^0 F to +176 F)
- Safe reliable spring cartridges to allow removal for field service
- Stainless Steel Stem and Drive Rod components
- Fully Serviceable

Installation

Align actuator and valve in the same position, open or closed. Check mounting surfaces and orientation of the actuator to the valve for any misalignment. Set actuator into position on valve, and install all bolts and nuts. Align actuator and valve stem; tighten mounting bolts evenly to torque specifications (20-30 ft-lb). The CVS 35D series actuator is tested and set to fully open or fully closed positions at point of manufacturing. Refer to the **Adjustments** portion of this manual should there be further adjustments required.

Determine Fail Safe Action

With the actuator horizontal, cylinders extended to the sides, and the stem closest to you (vertical), a spring side housing (long cylinder) to the right will indicate a “fail open”, while a spring side housing to the left will indicate a “fail closed”

Maintenance

O-ring, gasket, and bushing replacement are the only expected servicing that may be required under normal operating conditions. Contact your CVS Controls representative for service and repair kits. Specify model and serial number when ordering.

Disassembly

- Ensure no hydraulic pressure is being applied to the actuator. Disconnect all piping and remove the actuator from the valve.
- Remove jam nut (28), flat washer (27), and o-ring (26) from both end caps (22), remove end stop (25)
- Place actuator with cylinders extended to the side

Spring Side Disassembly

- Carefully release preload of spring side cylinder (20b) by evenly loosening stay rod nuts (24)

Disassembly Continued,

- Completely remove stay rod nuts(24) and lock washers (23)
- Remove end cap (22), which allows for removal of spring cartridge

***Note: Do not disassemble spring cartridge (29 thru 34). This is a self contained unit under compression, and may cause injury if disassembled incorrectly.**

- Remove spring side cylinder (20B)
- Remove stay rods (21)

Piston Side Disassembly

- Remove cylinder bolts (37), and lock washers (23) from piston side
- Take end cap (22) off of piston cylinder
- Carefully slide piston cylinder (20) off of piston
- Remove lock nut (18) to allow for removal of piston (15), piston seal (17), and o-ring (16)
- Remove cylinder plate (12), gasket (19), drive rod guide (13), and drive rod seal (14)

Drive Case Disassembly

- Remove drive rod (4) and roller assembly (5 thru 7). Remove snap rings (7), rollers (6) and dive pin (5) from drive rod (4)
- Remove cover screws (10) and cover (2)
- Remove indicator (11) after marking original position. Drive yoke pin (3c) out of stem. (pin must be driven out of yoke towards markings stamped on the yoke itself as the yoke pin is tapered and can only be removed one way)
- Remove snap rings (3d), stem will now be ready to slide out of case and yoke will be free to take out of case
- Remove o-rings (9) from stem
- Remove bushings (3d) from drive case

Inspection and Cleaning

Inspect o-rings, bushings and gaskets for damage and replace if necessary. Check cylinder bore for scoring. Inspect metal components for wear, corrosion or damage. All parts excluding gaskets (19), may be cleaned with varsol or equivalent as required.

After cleaning, lubricate yoke slots, drive pin, rollers, bushings and guides with a light coat of grease. Apply lubrication to all o-rings.

Assembly

- Install bushings (8) into drive case (1)
- Install o-rings (14) into cylinder plate (12) prior to installing drive rod guide (13)
- Install one o-ring (9) onto stem (3b) and install into case (1) through yoke (3)
- Install another o-ring (9) on stem (3b), and install snap rings (3d) on stem (3b)

Assembly Continued,

- Align stem (3b) with yoke (3) and ensure yoke pin (3c) will line up correctly as the pin is tapered and will only correctly install in one direction, install yoke pin (3c) by gently tapping into yoke (3)and stem (3b) with a hammer
- Make up drive rod assembly by installing drive pin (5), slide drive rollers (6) onto pin (5) and install two snap rings (7)
- Slide completed drive rod assembly through case (1) and position rollers between yoke arms
- Lubricate yoke, drive rod assembly and stem

Spring side cylinder assembly

- Install cylinder plate (12) over drive rod assembly on both sides of case (1), ensure vent holes are in same position on both sides
- Install piston center o-ring (16) on both sides of drive rod assembly
- Install piston (15), (15b) onto drive rod assembly using piston lock nut (18)
- Insert four stay rods(21) into case and tighten
- Place cylinder gasket (19) on cylinder plate (12) and end cap (22)
- Install spring side cylinder (20b)
- Place spring assembly in spring side cylinder (20b)
- Install end cap (22) over stay rods (21), vent hole on end cap (22) should be opposite the vent hole of cylinder plate (12)
- Using four lock washers (23) and four stay rod nuts (24), evenly tighten end cap (22) over spring side cylinder (20b), ensure proper alignment of cylinder
- Torque stay rod nuts (24) to 27 ft lbs.

Piston side cylinder assembly

- Install piston o-ring (17) onto piston (15)
- Place gasket (19) on cylinder plate (12) and end cap (22)
- Slide piston side cylinder (20) over piston (15)
- Install end cap (22) using four cylinder bolts (37) and four lock washers (23), ensure vent hole on end cap (22) is opposite vent hole of cylinder plate (12)
- Torque cylinder bolts (37) to 27 ft lbs.
- Install cover (2) by first applying a silicone sealant around edge of cover, inside bolt pattern to ensure a weather proof seal, install four cover screws (10)

End Stop Installation and Adjustments

- Install end stop (25) into center hole of end caps (22), slide end stop o-ring (26) over end stop, place end stop washer (27) over end stop and install jam nut (28)
- Tighten or loosen end stop (25) to adjust travel for fully open or closed operation, tighten jam nut when set.

Torques

Actuator Model	Min. Operating Pressure (PSIG)	Max. operating Pressure (PSIG)	Calculated Spring Unloading Torque (in.lb) **Starting**	Calculated Spring Unloading Torque (in.lb) **Mid-Stroke**	Calculated Spring Unloading Torque (in.lb) **Ending**	Calculated Hyd. Loading Torque at Min. Operating Pres. (in.lb) **Starting**	Calculated Hyd. Loading Torque at Min. Operating Pres. (in.lb) **Mid-Stroke**	Calculated Hyd. Loading Torque at Min. Operating Pres. (in.lb) **Ending**
Series 35D SRM100	200	275	2730	1060	1530	2710	1050	1500

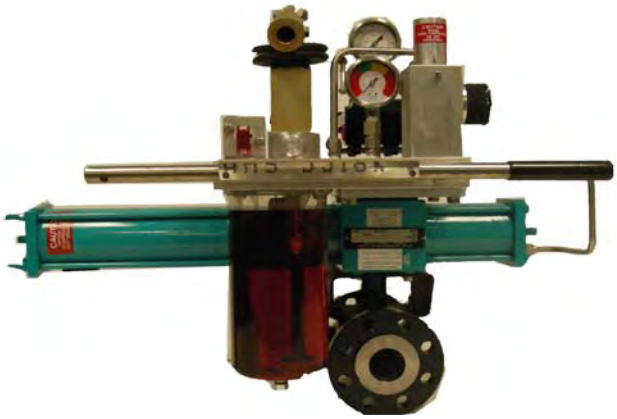
Table 1: Torques

Testing and Trouble Shooting

- With pressure applied to the actuator check gaskets and end stops with soap and water or other leak detecting fluid. A leak may indicate that fasteners may need to be tightened or gaskets/o-rings may need to be replaced.

- Check for leakage from opposite side of the piston. A leak may indicate the necessity to replace the o-rings.

- If the actuator has not been operated for a long period of time, some leakage past piston seals may be observed upon start up. Cycling the actuator a few times may cause the o-rings to regain their resiliency and stop this leakage. Should leak continue, o-rings/gaskets may need to be replaced.



CVS Series 35D SRM 100 with CVS Self Contained Hydraulic Pump, CVS ALS 410 Limit Switch, and CVS Ball Valve.

CVS Series 35D SRM100 Actuator Assembly

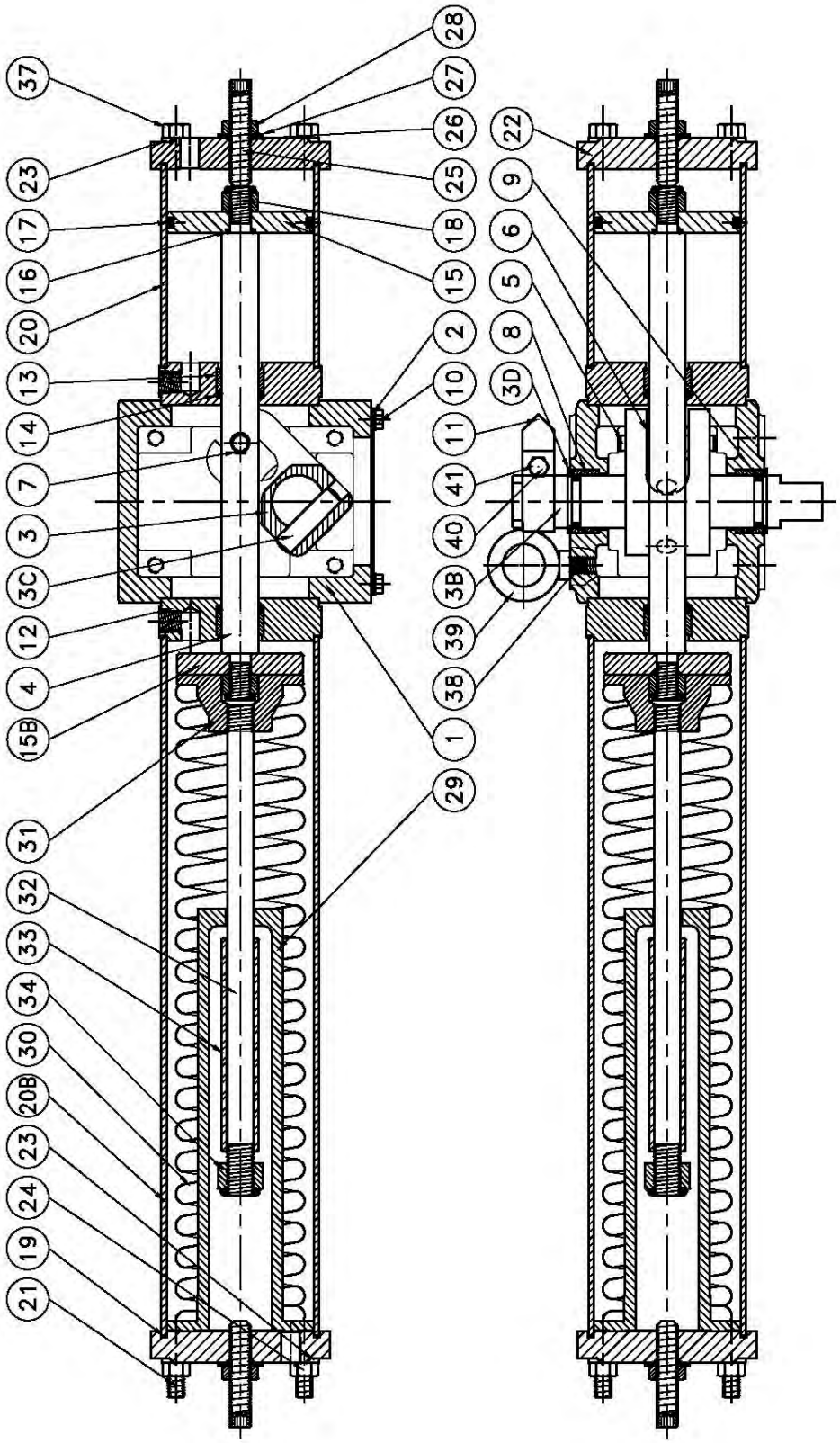


Figure 2: CVS 35D SRM100 Assembly

CVS Series 35D SRM100 Parts Listing

Item	Qty	Material Description, Part Number
1	1	Drive Case, CVS 35D0001
2	1	Cover, CVS 35D0002
3	1	Yoke, CVS 35D0003
3B	1	Stem, CVS 35D0003B
3C	1	Yoke Pin, CVS 35D0003C
3D	2	Snap Ring, CVS 35D0003D
4	1	Drive Rod, CVS 35D0004
5	1	Drive Pin, CVS 35D0005
6	2	Drive Roller, CVS 35D0006
7	2	Snap Ring, CVS 35D0007
8	2	Bushing, CVS 35D0008
*9	2	O-Ring, CVS 35D0009
10	4	Cover Screw, CVS 35D0010
11	1	Indicator, CVS 35D0011
12	2	Cylinder Plate, CVS 35D0012
13	2	Drive Rod Guide, CVS 35D0013
*14	2	Drive Rod Seal, CVS 35D0014
15	1	Piston, CVS 35D0015
15B	1	Piston, CVS 35D0015B
*16	2	Piston Center O-ring, CVS 35D0016
*17	1	Piston O-ring, CVS 35D0017
18	2	Piston Lock Nut, CVS 35D0018
*19	4	Cylinder Gasket, CVS 35D0019
20	1	Cylinder, CVS 35D0020
20B	1	Cylinder, CVS 35D0020B
21	4	Stay Rod, CVS 35D0021
22	2	End Cap, CVS 35D0022
23	8	Lock Washer, CVS 35D0023
24	4	Stay Rod Nut, CVS 35D0024
25	2	End Stop, CVS 35D0025
*26	2	End Stop O-ring, CVS 35D0026
27	2	End Stop Washer, CVS 35D0027
28	2	Jam Nut, CVS 35D0028
29	1	Barrel, CVS 35D0029
30	1	Spring, CVS 35D0030
31	1	Retainer, CVS 35D0031
32	1	Rod, CVS 35D0032
33	1	Spacer, CVS 35D0033
34	1	Lock Nut, CVS 35D0034
37	4	Cylinder Bolt, CVS 35D0037
38	3	Set Screw, CVS 35D0038
39	1	Eye Bolt 3/8”, CVS 35D00030
40	1	Indicator Screw 1/4, CVS 35D0040
41	1	Indicator Nut 1/4, CVS 35D0041

***Recommended Spare Parts**

Table 2: 35D SRM100 Parts Listing

Torque Specifications – CVS Series 35D

Item Description	Item Number	Torque ft-lb
Cover Screws	10	10
Stay Rod-Nuts/Bolts	21, 24	20-30
Piston Nut	18	80
Cylinder Bolts	37	20-30
Mounting Bolts- 3/8NC X 1-1/4 inch	Not Supplied	20-30

Table 3: Torque Specifications

Drive Case and Mounting Dimensions, Top View (inches)

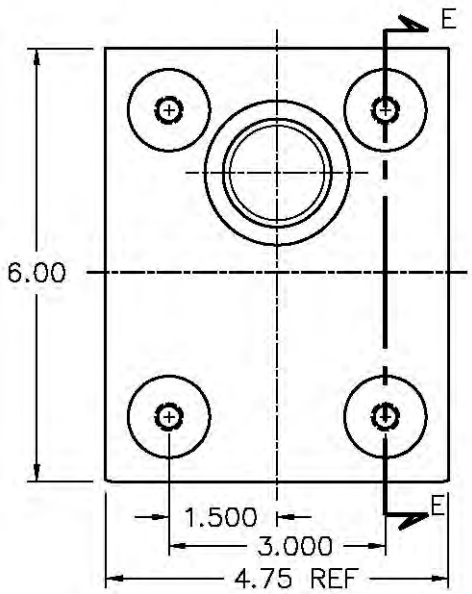


Figure 3: Drive Case

CVS Series 35D SRM100 Dimensions (inches)

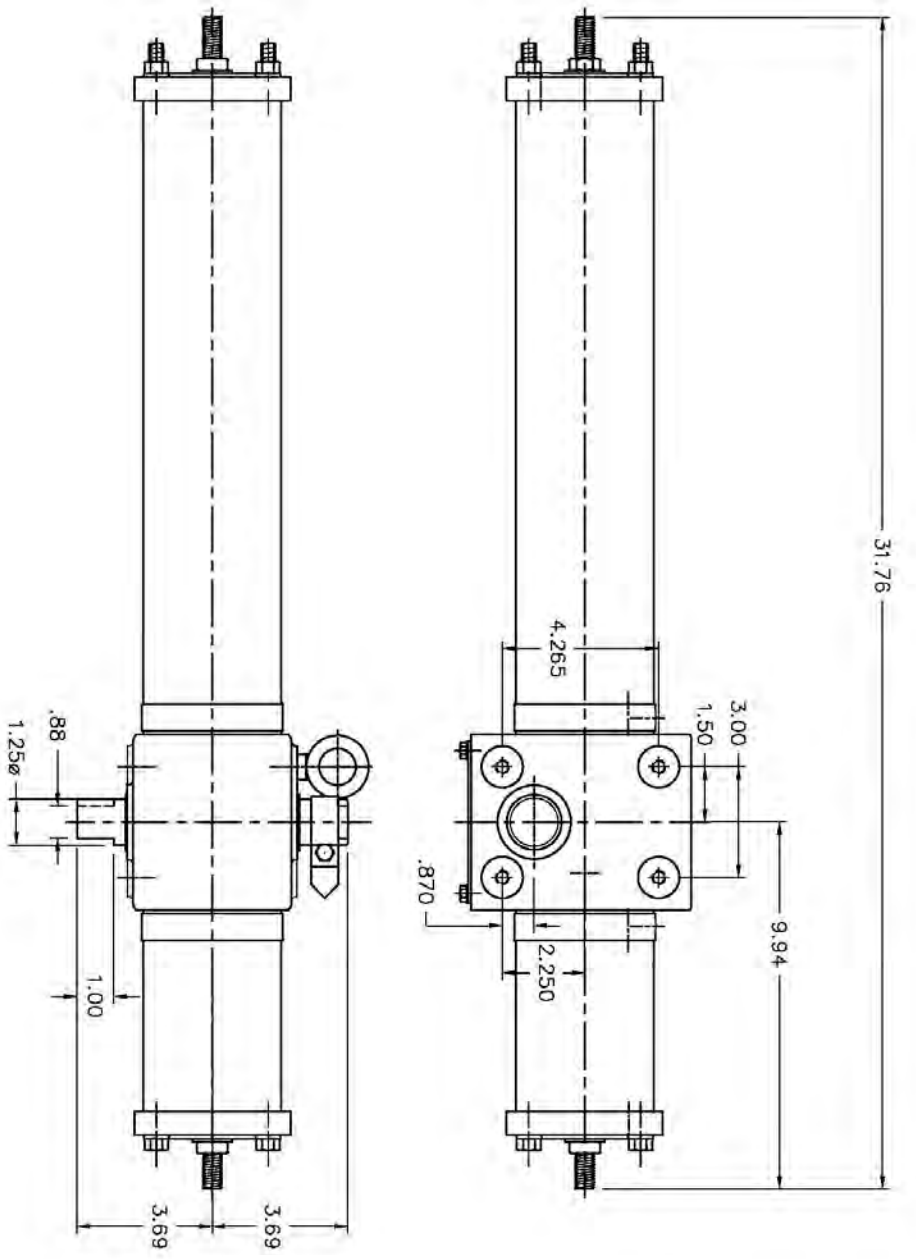


Figure 4: CVS Series 35D SRM100

Notes:

Notes:

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CVS Controls Ltd.

Instruction Manual

CVS Series 2000 Pressure Pilot

Introduction

The CVS Series 2000 Pressure Pilot is a High and Low Pressure sensing unit; used to monitor process or pipeline pressure in high/low pressure shut down installations. It is operated by either hydraulic or pneumatic signal. By utilizing a spring loaded piston, the CVS Series 2000 Pressure Pilot is able to sense the pre set pressure settings and activate the pilot valve.

CVS Series 2000 Automatic Reset

FEATURES

- Adjustable pressure range from 10 psi to 6000 psi (0.7 bar to 413 bar)
- Easy field adjustable set points
- Operating temperature range from -46°C to 100°C (-50°F to 212°F)
- Available in both manual and automatic reset configurations
- Ideal for use as a part of a complete CVS Shutdown System (ESD)
- Signal/Supply pressure up to 150 psig
- Standard 2” NPT threaded input connection (additional options available upon request)

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SPECIFICATIONS

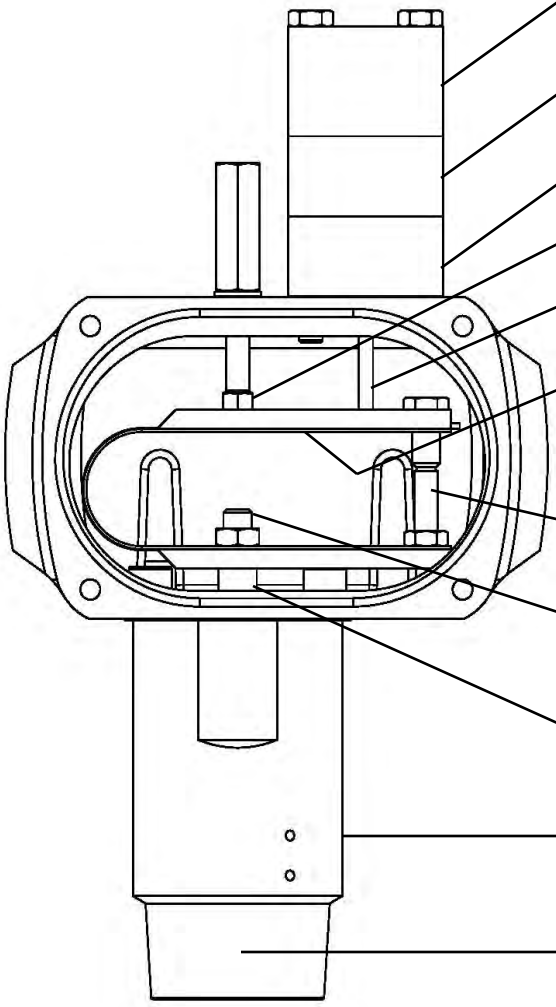
Model		2000	2200	2400
Piston Diameter		5/8”	1-1/4”	3/8”
Automatic Reset		AR - Automatic Reset Pilot Valve		
Manual Reset		MR – Manual Reset Pilot Valve		
Maximum Working Pressure (PSIG)		3500	2800	6000
Range Limit/Max Span (PSIG)	High	3250/1670	820/430	6000/4450
	Low	40/390	10/105	85/1120
Deadband (PSIG)	Minimum	55	25	160
	Maximum	265	95	775
Weight (lbs)	Auto Reset	11		
	Manual Reset	13.5		
Supply Pressure Range (PSIG)	Auto Reset	20-150		
	Manual Reset	60-150		
Temperature Limits	Process	-46°C to 200°C (-50°F to 392°F)		
	Ambient	-46°C to 100°C (-50°F to 212°F)		

CVS Series 2000 Pressure Pilot as part of a complete ESD System

Installation and Adjustments

Note: Prior to beginning installation or disassembly of CVS Controls product, consult and follow the established safety procedures of your facility.

Ensure that all pressure is exhausted from the system prior to performing any service work. Failure to remove the pressure from the system can result in serious personal injury.



Supply Port (**max. 150psi**)

Signal Port – Common with supply when pilot valve spools up, and common with exhaust when pilot valve spools down

Exhaust Port

High Trip Bolt – Turn CW to increase high set point

Pilot Valve Spool

Trip Spring – Acts on pilot valve spool

Low Trip Bolt – Turn CW to increase low set point.

Piston Rod – Moves upward with increasing pressure

Range Screw – Turn CW to increase range limits

Hex Body – Contains Range Spring (not shown)

Piston – (not shown) Smaller piston increases range limits

CVS Series 2000 AR

CVS Series 2000 Pilot, Spring and Model Selection

When selecting the CVS Series 2000 Pressure Pilot to best suit your application, use the softest spring with the largest piston to meet your high/low requirements. This will reduce the pilots deadband.

CVS Series 2000 Pilot - Spring Range Selection

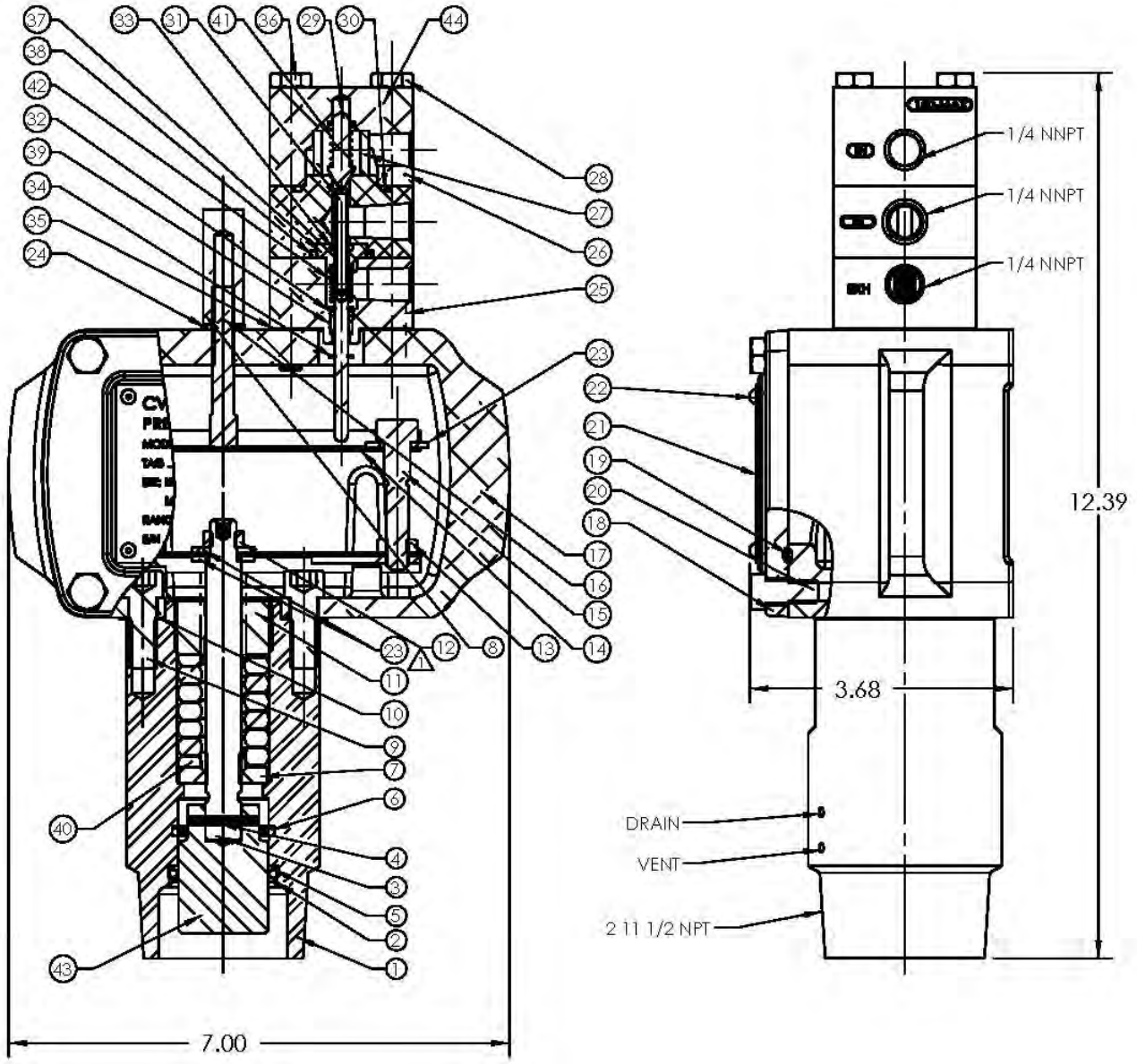
Model	Spring	Range Screw Turns	Span (PSIG)		Range Limit (PSIG)		Deadband (PSIG)	
			Min	Max	Low	High	Min	Max
CVS 2200 (MAWP 2800 PSI)	Blue 2"(-1)	0	55	105	10	(115)	25	--
		7-1/4	65	115	(190)	305	--	40
	Red 2" (-4)	0	90	180	15	(195)	25	--
		5-1/2	95	200	(270)	470	--	65
	Bronze 2" (-7)	0	95	295	15	(310)	30	--
		4	145	340	(385)	725	--	90
	Green 2" (-10)	0	130	395	20	(415)	35	--
		3	160	430	(390)	820	--	95

Model	Spring	Range Screw Turns	Span (PSIG)		Range Limit (PSIG)		Deadband (PSIG)	
			Min	Max	Low	High	Min	Max
CVS 2000 (MAWP 3500 PSI)	Blue 2"(-1)	0	185	390	40	(430)	55	--
		7-1/4	235	455	(745)	1200	--	130
	Red 2" (-4)	0	280	680	55	(735)	75	--
		5-1/2	320	770	(1060)	1830	--	185
	Bronze 2" (-7)	0	410	1190	80	(1270)	85	--
		4	460	1310	(1550)	2860	--	255
	Green 2" (-10)	0	450	1480	140	(1620)	120	--
		3	500	1670	(1580)	3250	--	265

Model	Spring	Range Screw Turns	Span (PSIG)		Range Limit (PSIG)		Deadband (PSIG)	
			Min	Max	Low	High	Min	Max
CVS 2400 (MAWP 6000 PSI)	Blue 2"(-1)	0	550	1120	85	(1205)	160	--
		7-1/4	775	1270	(2050)	3320	--	425
	Red 2" (-4)	0	720	1880	130	(2010)	195	--
		5-1/2	950	2150	(3000)	5150	--	550
	Bronze 2" (-7)	0	1000	3220	230	(3450)	270	--
		4	1400	3600	(4400)	800	--	750
	Green 2" (-10)	0	1100	4100	400	(4500)	360	--
		3	1650	4450	(4400)	8850	--	775

When ordering a CVS Series 2000 Pressure Pilot, add spring designation to end of model number.
For example, CVS 2200-10 is a Model 2200 with Green Spring.

Series 2000 Pressure Pilot Dimensions* and Assembly Parts Listing



*Dimensions in Inches

CVS Series 2000 Parts Listing

Item	Part Number	Description	Qty
1	CVS APB0570-20001	Body, C1018, Model 2000 – 5/8 Piston	1
	CVS APB0570-001	Body, C1018, Model 2200 – 1-1/4 Piston	1
	CVS	Body, C1018, Model 2400 – 3/8 Piston	1
2	CVS APB0570-002	Retaining Ring, Model 2000 – 5/8 Piston	1
	CVS	Retaining Ring, Model 2400 – 3/8 Piston	1
3	CVS APB0570-20002	Piston/Stem Assy. – Model 2000 – 5/8 Piston	1
	CVS APB0570-003-2	Stem only, Piston – Model 2200 – 1-1/4 Piston	1
	CVS	Piston/Stem Assy. – Model 2400 – 3/8 Piston	1
4	CVS APB0570-003-3	Spring Pin, (Model 2200 1-1/4 Piston)	1
5	*	Seal, Piston, Model 2000*	1
	**	Seal, Piston, Model 2200**	1
	***	Seal, Piston, Model 2400***	1
6	*	O-Ring, Model 2000*	1
	**	O-Ring, Model 2200**	1
	***	O-Ring, Model 2400***	1
7	CVS APB0570-007	Spring, Seat	1
8	CVS APB0570-006	High Trip Nut	1
9	CVS APB0570-009	Bolt, Body+	2
10	CVS APB0570-010	Gasket, Body	1
11	CVS APB0570-011	Range Screw	1
12	CVS APB0570-012	Jam Nut, Trip Spring+	1
13	CVS APB0570-013	Jam Nut, Low Trip Bolt+	1
14	CVS APB0570-014	Trip Spring Assembly	1
15	CVS APB0570-015	Adjust Bolt	1
16	CVS APB0570-016	Adjust Bolt, Low	1
17	CVS APB0570-017	Housing	1
18	CVS APB0570-018	Cover Plate	1
19	CVS APB0570-019	O-Ring, Cover*	1
20	CVS APB0570-020	Bolt, Cover+	4
21	CVS APB0570-021	Name Plate, 316 SST	1
22	CVS APB0570-022	Drive Screw, Name Plate	4
23	CVS APB0570-023	Washer, Trip Spring+	3
24	CVS APB0570-024	Stat-O-Seal, Adjust Bolt*	1
25	CVS APB0570-025	Lower Pilot Body	1
26	CVS APB0570-027	End Cap	1
27	CVS APB0570-028	Filter, Bonded Felt	1
28	CVS APB0570-029	Cap Screw, End Cap+	2
29	CVS APB0570-031	Pilot Poppet	1
30	CVS APB0570-032	O-Ring, Upper body*	1
31	CVS APB0570-033	Pilot	1
32	CVS APB0570-034	Retaining Ring, Seal+	1
33	CVS APB0570-035	O-Ring, Spool*	2
34	CVS APB0570-037	Retaining Ring, Seal	2
35	CVS APB0570-038	Gasket	1
36	CVS APB0570-039	Cap Screw, pilot Mount+	2
37	CVS APB0570-040	Sleeve, Pilot	1
38	CVS APB0570-041	O-Ring, Sleeve*	1
39	CVS APB0570-042	Pilot Bushing	1
40	Refer to pg. 4 for Model and Spring selection	Range Spring – Blue (-1), Red (-4), Bronze (-7), Green (-10)	1
41	CVS APB0570-030	Poppet Spring	1
42	CVS APB0570-036	Spool Spring	1
43	CVS APB0570-003-1	Piston, Model 2200 – 1-1/4 Piston	1
44	CVS APB0570-026	Pilot Upper Body	1

***Part of Seal Kit – CVS APB05705/8-SKF, Seal Kit Model 2000**

****Part of Seal Kit – CVS ABB05701.125-SKF, Seal Kit Model 2200**

+Part of Bolt Kit, Series 2000 – CVS PAR-2000-Kit, Bolt Kit all Series 2000

CVS Series 2000 Set Point Adjustment

Ensure that all pressure is exhausted from the system prior to performing any service work. Failure to remove the pressure from the system can result in serious personal injury.

High and Low Set Point Adjustment:

- The Low set point is to be adjusted first. Once set, it will not be changed while setting the high set point. This prevents changes in high set point adjustment as the low point is being set.

1. Turn the High Trip Bolt (16) counter clockwise, to be completely away from the trip spring.

2. Adjust Low Trip Bolt (15) by repeatedly turning clockwise to increase the low set point, until low trip occurs at required pressure. Tighten low trip bolt jam nut (13) to secure and recheck. Ensure there is at least 0.02" of piston travel to low trip bottom stop.

- The Low trip bolt is easily adjusted by hand by pushing down on the trip spring while turning the low trip bolt.

3. Continually adjust the high trip bolt by turning clockwise to increase the pressure for required high trip set point. Tighten the high trip locknut (8) to secure high set point and double check settings.

Low Set Point Only Adjustment:

1. Turn the High Trip Bolt (16) counter clockwise, to be completely away from the trip spring.

2. Adjust Low Trip Bolt (15) by repeatedly turning clockwise to increase the low set point, until low trip occurs at required pressure. Tighten low trip bolt jam nut (13) to secure and recheck set point. Ensure there is at least 0.02" of piston travel to low trip bottom stop.

3. Disable High Trip by increasing pressure until the piston is at the upper stop. Adjust high trip bolt downward until high trip occurs, then back off high trip bolt ½ turn. Ensure that high trip does not occur when piston travels to upper stop. This adjustment is required to prevent the trip spring from placing unnecessary force on the spool.

High Set Point Only Adjustment:

1. In order to disable the low trip set point, adjust the low trip bolt until low trip occurs when piston is within 0.02" of bottom stop. Back off low trip bolt by turning counterclockwise three full turns. Tighten low trip bolt jam nut, and ensure that low trip does not occur when piston travels to bottom stop.

2. Continually adjust the high trip bolt by turning clockwise to increase the pressure for required high trip set point. Tighten the high trip locknut (8) to secure high set point and recheck.

CVS Series 2000 Range Screw Adjustments

When purchasing a CVS Series 2000 Pressure Pilot, the range/span is set to the requirements specified by end user. Should further range/span adjustments be required please contact a CVS Controls representative for information.

Notes:

Rev 0, July 2010

CVS Controls Ltd.

Product Manual

Type 4057 3-Way Valve

OPERATION

The CVS 4057 3-Way Valves features modular construction and incorporates a sliding spool. The standard spool has a small center dead spot position and no valve port overlap. With the spool in the unlatched (rest position) as shown in the diagrams, Port 2 is open to Port 3 and Port 1 is closed. With the spool in the latched (actuated position), Port 2 is open to Port 1, and Port 3 is closed.

CVS offers two types of 4057 3-way valves:

CG: Pressure operated spring return
CP: Manual latch or pressure operated with spring return

Fig. 1. CVS Series 4057 3-Way Valve CP Type

Fig. 1.1 CVS Series 4057 3-Way Valve CGType

SPECIFICATIONS

Body Material: Precision cast aluminum
Standard Spool Material: Aluminum
Standard Seal Material: Buna

Maximum Temperature:
- 40°C ~ 120°C (- 40°F ~ 250°F)

Flow Coefficient (equivalent to 9/32 dia. Port):
Cv = 1.2
Maximum Pressure at Ports 1, 2, or 3: *125psi (860 kPa)

Net Weight: 0.6 ~ 2.0 lbs. (0.3 ~ 0.9 kg)
150psi (1034 kPa) if a slight increase in operating force and pressure are acceptable.

FEATURES

BALANCED FORCE DESIGN: Pressure can be applied to any port

CENTER DEAD SPOT: Standard

ARRANGED FOR PANEL OR BRACKET MOUNTING

HYDRAULIC FLUID CONTROL

ACTUATOR CONTROL

PNEUMATIC PANEL SYSTEMS

SAFETY CONTROL SYSTEMS

The CVS 4057 valve is for use in manual and automatic hydraulic or pneumatic control systems. They offer versatility in operating requirements and allowable pressure limits. For a 1/4" size control valve, they offer exceptional flow capacity.

These valves are suitable for use on clean air, natural gas, L.P. gases, petroleum-base lubricants, hydraulic oils, and many other fluids.

Each valve is carefully assembled, tested, and inspected to ensure that high quality standards are met. Valves are made from precious cast and machined aluminum. Standard construction permits valve pressure to 125psi.

The CVS 4057 offers a unique and dynamic characteristic for the oil and gas industry. For instance, the 4057 model CP has a manual reset latch which will automatically drop out upon the introduction of pilot pressure, and allows the return stroke on loss of pilot pressure.

INSTALLATION

All connections on 4057 Valves are made with ¼" pipe thread fitting. Apply a quality thread sealant to pipe thread connections but do not permit it to enter the valve passage. Teflon thread sealing tape may be used but must be applied so that the threads of the tape do not enter the valve.

IMPORTANT
Avoid over tightening fittings on the valve port bosses as they may be cracked, especially when Teflon thread sealing tape is used.

MAINTENANCE

To check the seal rings, the valve spool can be removed. This is done on most versions by simply removing the end cap and pulling out the spool. Spools on panel mounted valves can be removed from in front of the panel without disconnecting any piping.

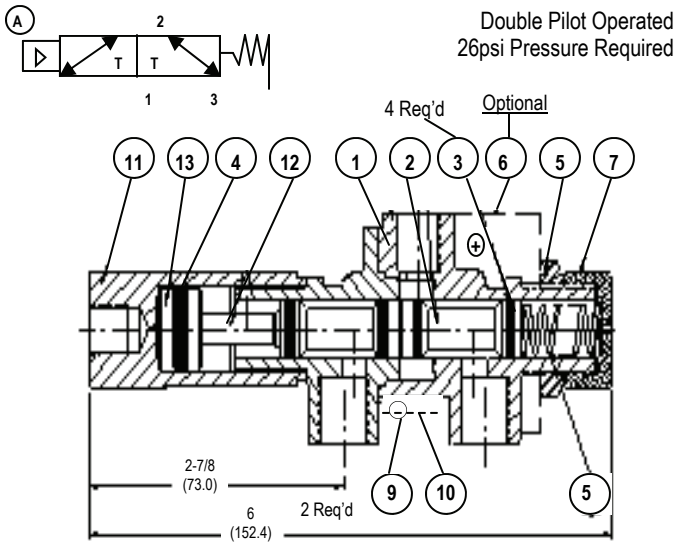
To replace O-rings, remove the spool, take off the old O-rings, thoroughly clean the grooves, and coat the grooves with Dow Corning No. 55 grease. Lightly coat the new rings with grease and install them. Remove excess grease and reinstall the piston.
When these valves are used in safety control systems, it is recommended that the system be checked monthly for proper functioning.

When communicating with CVS sales representative regarding operation of a control, always give the Model No. and Serial No. If ordering service parts always include the description, Part No., and quantity desired.

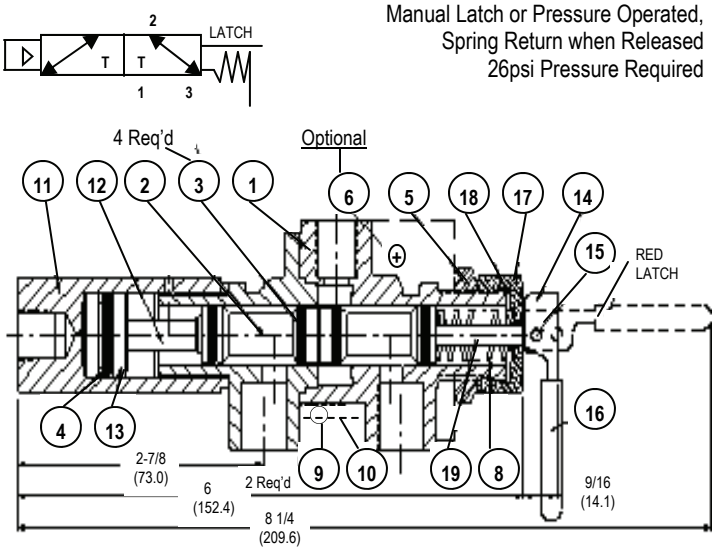
* - denotes recommended spare part

VALVE TYPE DESCRIPTION TABLE

TYPE CG



TYPE CP



Ref. #	Part #	Description
1	**7909X001 - CG & CP**	Body Assembly, NPT, Standard Finish
2	**7893 - CG & CP**	Spool, Center Dead Spot (Standard)
3	**7896L001 - CG & CP**	Seal Ring, Nitrile - (4 Required) *
4	**7898L001 - CG & CP**	Seal Ring, Buna N (Standard) *
5	**3496 - CG & CP**	Nut, Standard Finish
6	**5186 - CG & CP**	Bracket (Optional)
7	**3626L004 - CG & CP**	Cap, Standard Finish
8	**7154L034 - CG & CP**	Spring
9	**705L001 - CG & CP**	Drive Screw (Optional)
10	**7895 - CG & CP**	Name Plate
11	**7923L001 - CG & CP**	End Cap, NPT, Standard Finish
12	**7865L001 - CG & CP**	Stem
13	**7899 - CG & CP**	Piston
14	**6492X - CP**	Reset Latch Assembly, Standard Finish
15	**236L001 - CP**	Pin
16	**3423 - CP**	Latch Protector
17	**3626L003 - CP**	Cap, Standard Finish
18	**6073 - CP**	Spacer, Stainless Steel #416 (Standard)
19	**6656L001 - CP**	Rod

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