

Instruction Manual

CVS Series 50 Chemical Injection Pump

Introduction

The CVS Series 50 Chemical Injection Pump is a positive displacement pump that uses a molded diaphragm to drive a piston through packing in the fluid end. The pump capabilities cover a broad range of applications due to the ability to achieve high discharge pressures (up to 12000 psi) and a wide volume range. High operating efficiency is met by the horizontal plunger and vertical valve check arrangement. The standard fluid end is ductile iron with stainless steel trim and plunger. The pump body casting and frame are high strength aluminum to make it light weight. Integrated priming valve enables the operator to easily check operation of the pump. All CVS series 50 chemical injection pump models are furnished with a micro switch that pilots a high volume pneumatic valve. Operating mechanism is gasket sealed to protect from the environmental elements. Safety valve provides for protection on case of accidental overpressure of the main diaphragm. A grease jack for lubricating the plunger and packing ring, along with adjustable packing equipped with lantern ring insure long life.



Figure 1: CVS Series 50 Chemical Injection Pump

Applications

- Methanol and alcohol injection in gas systems to prevent freezing
- Water Treatment
- The introduction of De-emulsifiers, corrosion inhibitors, De-scaling agents
- High and low pressure lubrication systems
- High pressure addition of fluid compounds in chemical processing and blending
- Injection of Surfactant (soap) in wells with high water content

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Installation and Operation

- Upon removing the pump from carton, inspect for possible damaged or missing components from transit from CVS Controls. Contact a CVS controls representative should there be any concerns.
- Blow out and remove potential debris from supply line before hooking up supply air/gas to inlet. Supply pressure should be regulated with a maximum setting of 50 psi.
- Connect suction line to pump head.
- A line check should be installed in the discharge line close to the point of injection. (note the direction of the flow arrow) CVS Controls offers the CVS-B-0283 line check in stainless steel, for all plunger sizes which will withstand a working pressure of 6000 psi.
- Connect the discharge line to the ¼" FNPT in both the line check and the Top Bushing (CVS-A-0152) of the head assembly. Ensure the line is clear of all debris.
- Partially open Bleeder Valve (CVS-A-0123)
- Connect the gas supply line, considering the pressure required of the pump. If the gas exceeds 50 psi, the supply should be equipped with a regulator to reduce the pressure to 50 psi.

Lubrication

A stick lubricator (CVS-A-3179) is inserted into the grease assembly (CVS-A-0558) upon manufacturing. CVS controls has available and recommends CVS-A-3179 for most fluids. No lubrication stick is required if the pump is equipped with Teflon packing and chrome plated plunger.

Operation

1. Remove the body cover (CVS-B-0004) and cover gasket (CVS-B-0036)
2. Open the main air/gas supply valve and slowly open the exhaust valve (CVS-A-2489). The pump should automatically start. Ensure the suction line is primed with fluid, and then test the pump head by opening the Bleeder Valve (CVS-A-0123). The fluid escaping from the bleeder valve may contain bubbles. As soon as the bubbles subside, close the bleeder valve for normal operation.
3. Adjust for desired volume by considering pump speed using the flow control. Consider the position of Brass Adjusting Pin (CVS-A-0035) to adjust stroke.

Operation Continued,

4. Refer to Technical Data for volumes achieved by long and short stroke settings. The pump is assembled with the adjusting pin inserted in the hole of the plunger, nearest the plunger packing gland nut. This is the position of the longest stroke. To shorten stroke place the brass adjusting pin in the other hole.
5. Check the packing gland for leakage. If leakage is occurring, use a flathead screwdriver to tighten the Gland Nut until leak just stops. Do not over tighten the gland nut. This may stall the pump or generate excessive wear on the packing and/ or plunger. Do not adjust packing under pressure.

Note: If low volumes are being pumped, the pump head, fluid discharge line, and all other fittings up to the line check should be thoroughly purged of all air bubbles.

6. Replace cover gasket and body cover, secure with wing screw.

Maintenance and Troubleshooting

- Keep the cover in place and periodically oil the thrust rod.
- Regularly check packing for leaks, tighten or replace as required.

***NOTE: Ensure the plunger packing is not over tightened. This may score the plunger and decrease the lifespan of the packing.**

- CVS chemical pumps used for alcohol or methanol injection must be fitted with Buna-N o-rings. Pumps used for most chemical injection should be fitted with Viton o-rings. The o-rings are located in the Top Check Valve Seat (CVS-B-0368), and the Bottom Check Valve Seat (CVS-B-0698). Refer to manufacturer specifications for elastomer sealing fluid compatibilities.
- If the pump fails to stroke, and air/gas constantly flows from the exhaust, the diaphragm may be ruptured. Disconnect air supply and bleed off pressure. Remove the cover (CVS-C-0001), and inspect main Diaphragm (CVS-B-0010) for rips and tears. Replace as required. See below for diaphragm replacement procedures.

Diaphragm Replacement

***NOTE: If installing new diaphragm, shutoff and disconnect air/gas supply and ensure the pressure has been bled off.**

- Remove Wing Screw (22), Body Cover (26), and Cover Gasket (28)
- Insert a punch or screwdriver into the forward slot of the thrust rod containing the roll pin, this will prevent the rod from shooting out of the body. Pry the thrust rod back and secure by resting the punch/screwdriver at the bottom of the pump body. At this point visually inspect the return spring (6) for damage.

Diaphragm Replacement Continued,

- Remove Connecting Pipe I (1/4" tubing) and Connecting Pipe II (3/8" tubing)
- Remove sixteen 5/16 fasteners (16, 20) that secure the Cover (30) to the Housing (35)
- Lay cover face down and remove two Main Diaphragms (27)

Replace Main Diaphragms as required, reassemble in reverse order that it was disassembled.

Maintenance and Troubleshooting continued,

- If no air/gas venting, check the supply pressure (50 psi max). Erratic changes in pressure may cause the pump to stall.
- If pump stalls in the forward discharge position, shut off the air/gas supply. Check if the packing gland nut is over tightened. Re-adjust packing as required.
- If the pump is running, but not pumping, the injection head could be air locked. Open the priming valve and bleed fluid until no bubbles are present. If still not pumping, the bottom seat of the injection head may have failed and needs replacing.
- A constant fluctuation in down line pressure may indicate a top seat failure of the injection head and needs replacing.

Micro Switch Replacement

If Micro Switch (CVS-MV-004) needs replacement, shutoff air/gas supply ensuring all pressure is bled off. Disconnect supply and output tubing. Remove 5/16 bolts (CVS-A-0143) that secure the micro switch to the pump body. Remove the micro switch with plate (CVS-MV-0014) and separate. Mount a new micro switch to the micro valve switch plate, and secure assembly to body. Ensure the micro switch extension is centered between both trip arms on trip bar assembly.

Technical Data: Performance

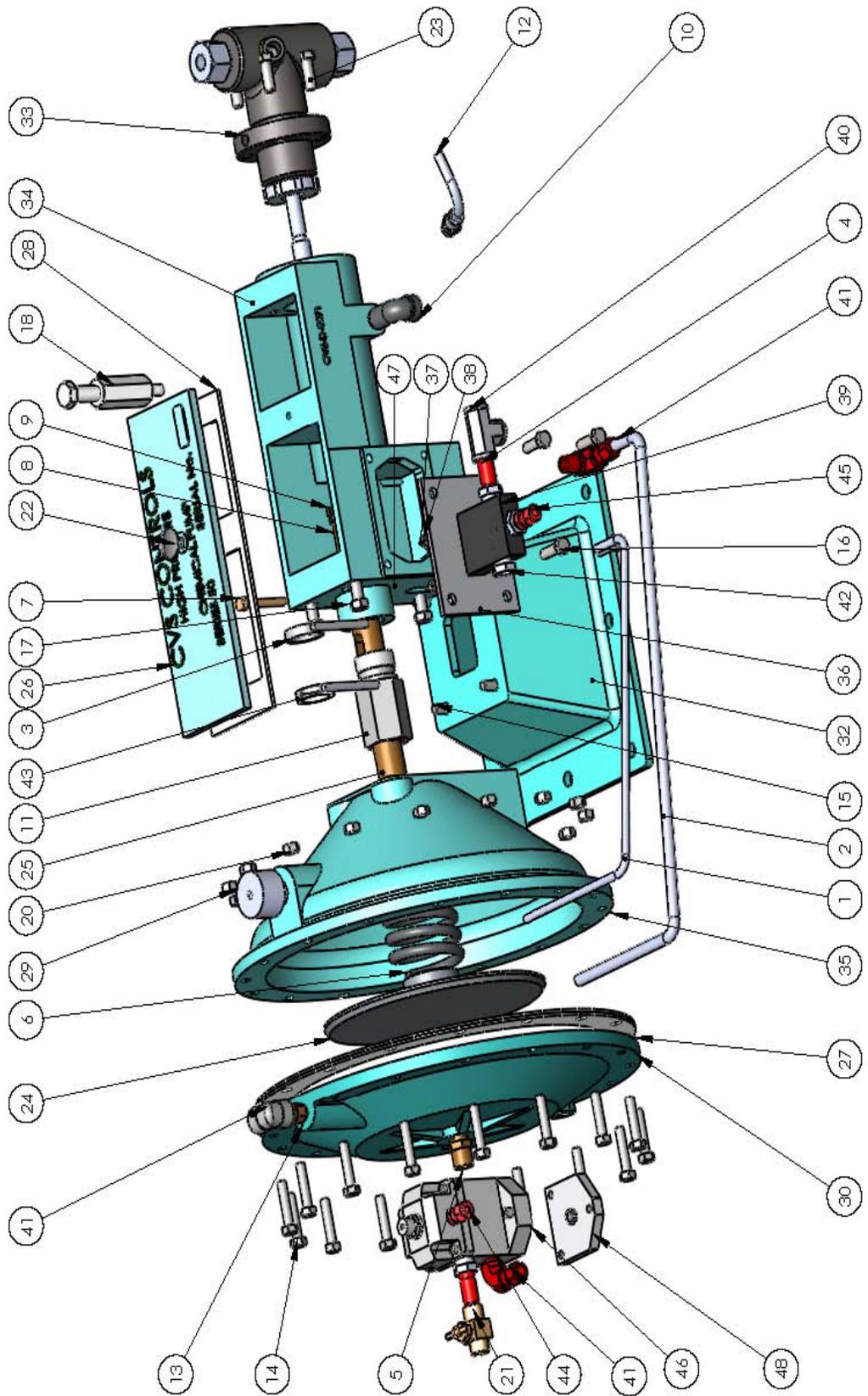
Model Number	Plunger Size	Operating Ratio Gas to Fluid	Maximum Discharge (PSIG)		Maximum Volume Continuous		Maximum Volume Intermittent	
			Soft Packing	Hard Packing	GPH	GPD	GPH	GPD
			50-14-DMV	1/4	1000:1	3000	12,000	0.67
50-38-DMV	3/8	500:1	3000	12,000	1.8	43	2.33	56
50-12-DMV	1/2	265:1	3000	12,000	3.55	85	4.38	105
50-34-DMV	3/4	115:1	3000	5000	6.67	160	7.42	190
50-1-DMV	1	65:1	3000	N/A	13.33	320	16.66	400
50-114-DMV	1-1/4	42:1	2000	N/A	20.83	500	26.04	625
A. Maximum Power Gas Pressure: 50 PSI								
B. Stroke Length: Long- 1-1/4", Short- 1/2"								
C. Specify an inlet regulator and gauge when the inlet pressure is over 50 PSI								

Gas Consumption

Gas Consumption Chart (Standard Cubic Feet of gas required to pump one gallon)

Injection Pressure PSI	50	100	150	200	250	300	400	500	600	700	800	900	1000	1500	2000	3000	3500	4000	5000	6000	7000	8000	9000	10000
1/4" Short Stroke	700	703	706	707	709	712	720	724	731	737	740	748	756	779	802	854	872	897	937	984	1017	1057	1090	1122
1/4" Long Stroke	280	281	282	284	285	286	289	292	295	297	300	303	306	318	330	356	368	380	404	428	454	476	500	522
3/8" Short Stroke	355	356	356	357	357	358	360	361	362	364	365	367	368	374	380	393	399	405	417	429	441	453	465	477
3/8" Long Stroke	140	141	141	142	142	143	145	146	147	149	150	152	153	159	165	178	184	190	202	214	226	238	250	262
1/2" Short Stroke	201	201	201	202	203	204	205	206	207	208	210	211	212	218	224	236	242	248	260	272	284	296	308	320
1/2" Long Stroke	81	81.2	81.8	82.4	83	84	85	86	87.2	88.4	90	90.8	92	98	104	116	122	128	140	152	164	176	188	200
3/4" Short Stroke	89	91	92	94	95	96	99	101	105	109	111	113	117	132	145	172	183	190	191					
3/4" Long Stroke	36	37	38	39	40	41	43	45	47.5	49.5	51.5	53	56	66	76.5	97	107	114	212					
1" Short Stroke	51	51.2	52	53	53	54	55	56	57	58.5	59.8	61	62	68	74	86								
1" Long Stroke	20.6	21.2	21.8	22.5	23	23.6	25	26	27.5	28.5	29.6	31	32	38	44	56	62							
1-1/4" Short Stroke	32.6	33.2	33.8	34.5	35	35.6	36.8	38	39.2	40.4	41.6	42.8	44	50	56									
1-1/4" Long Stroke	13.6	14.2	14.8	15.5	16	16.6	17.8	19.2	20.2	21.4	22.6	23.8	25	31	37	49								

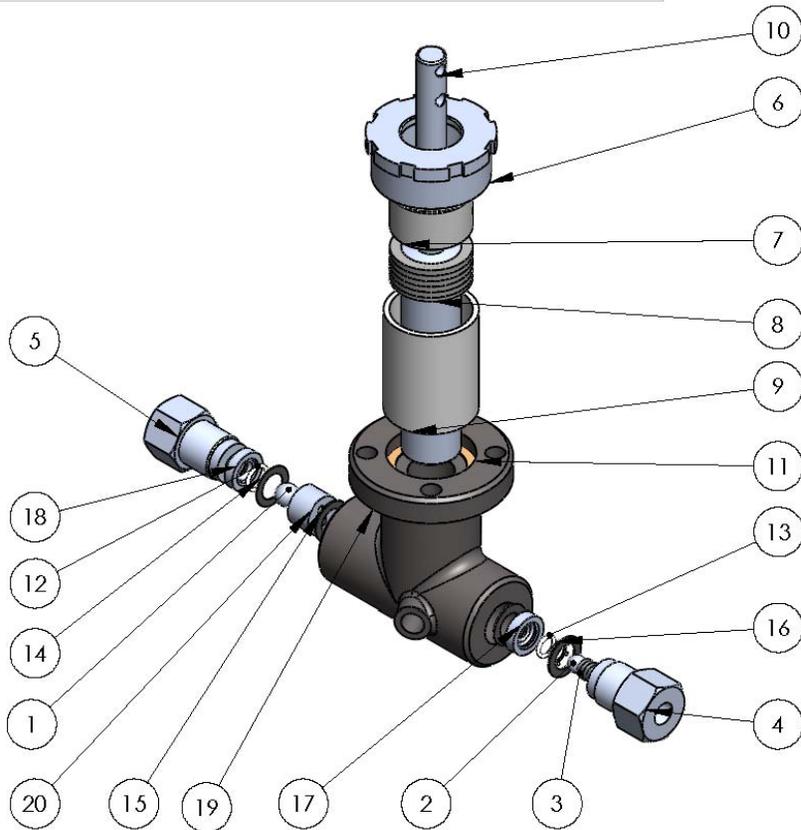
CVS Series 50 Chemical Injection Pump – Assembly



CVS Series 50 Chemical Injection Pump - Parts Listing

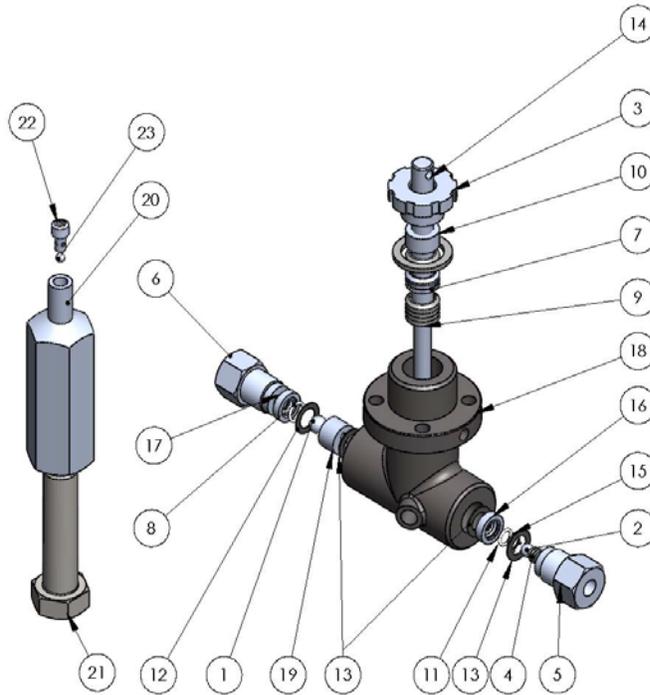
Item Number	Part Number	Description	QTY.
1	1/4" Tube	Connecting Pipe I (1/4" Pipe)	1
2	3/8" Tube	Connecting Pipe II (3/8" Pipe SCH40)	1
3	CVS-50-Trip	Series 50 - Trip Bar Assembly	2
4	CVS-50MV-001	1/4" Nipple 2" Length	2
5	CVS-A-0009	Attachment Nipple (3/8")	1
6	CVS-A-0025	Spring	1
7	CVS-A-0035	Series 50 - Brass Adjusting Pin	1
8	CVS-A-0038	Series 50 - Stuffing Box	1
9	CVS-A-0041	Packing Nut	1
10	CVS-A-0075	90 Degree Elbow (1/4"MX 1/4" F)	1
11	CVS-A-0076	Series 50 - Bushing	1
12	CVS-A-0123	Bleeder Valve	1
13	CVS-A-0131	Safety Valve	1
14	CVS-A-0142	5/16-18UNC Hex Bolt, 1.5" Long	16
15	CVS-A-0143	5/16-18UNC Hex Bolt	4
16	CVS-A-0143	5/16 Bolt	4
17	CVS-A-0143-1	3/8-16UNC Hex Bolt	4
18	CVS-A-0558	Grease Assembly	1
19	CVS-A-1034	1/4" Plug	2
20	CVS-A-139	5/16-18UNC Hex Nut	16
21	CVS-A-2489	Exhaust Valve	1
22	CVS-A-2970	Wing Screw	1
23	CVS-A-4452	3/8" Hex Bolt	4
24	CVS-B-0002	Series 50 - Diaphragm Disc	1
25	CVS-B-0003	Series 50 - Thrust Rod	1
26	CVS-B-0004	Series 50 - Cover Body	1
27	CVS-B-0010	Main Diaphragm	2
28	CVS-B-0036	Cover Gasket	1
29	CVS-BF68.5	Air Filter 1/2" NPT Connection	1
30	CVS-C-0001	Cover	1
31	CVS-C-0001-1	1/4" Elbow	1
32	CVS-C-0004	Series 50 - Base Stand	1
33	CVS-C-0068	Injector Assembly	1
34	CVS-D-0071	Series 50 - Housing, Body	1
35	CVS-D-0434	Series 50 - Housing	1
36	CVS-MV-0014	Micro Valve Switch Plate	1
37	CVS-MV-0014-1	1/4" Hex Bolt	2
38	CVS-MV-0014-2	1/4" Spring Washer	2
39	CVS-MV-004	Micro Switch	1
40	CVS-MV-004-1	1/4" Female Tee	1
41	CVS-MV-006	90 Degree Elbow (1/4"FM X 3/8" T)	2
42	CVS-MV-007	3/8" to 1/4" NPT Reducer	4
43	CVS-MV-013	Socket Setting Screw #10-32	2
44	Male Connector	Male Connector 1/8" NPT (M)X 1/4" T	1
45	Male Connector	Male Connector 1/4" NPT (M)X 1/4" T	1
46	NVSA3135-03N	Air Valve	1
47	CVS-B-0011	Diaphragm Casing Gasket	1
48	CVS 5000RC001	Regulator Vent Cover	1

CVS Series 50 Chemical injection Pump – 1-1/4" Injector assembly



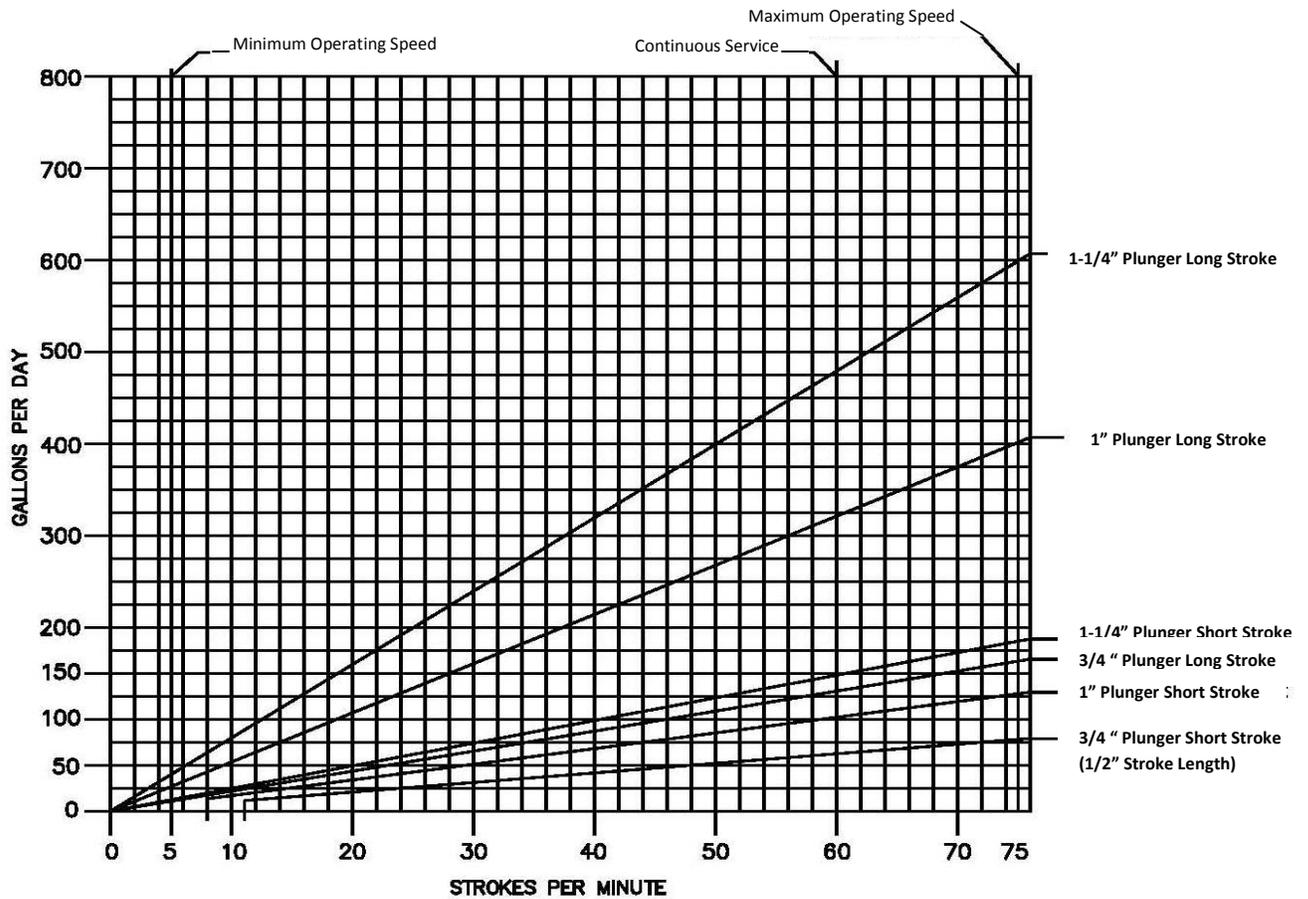
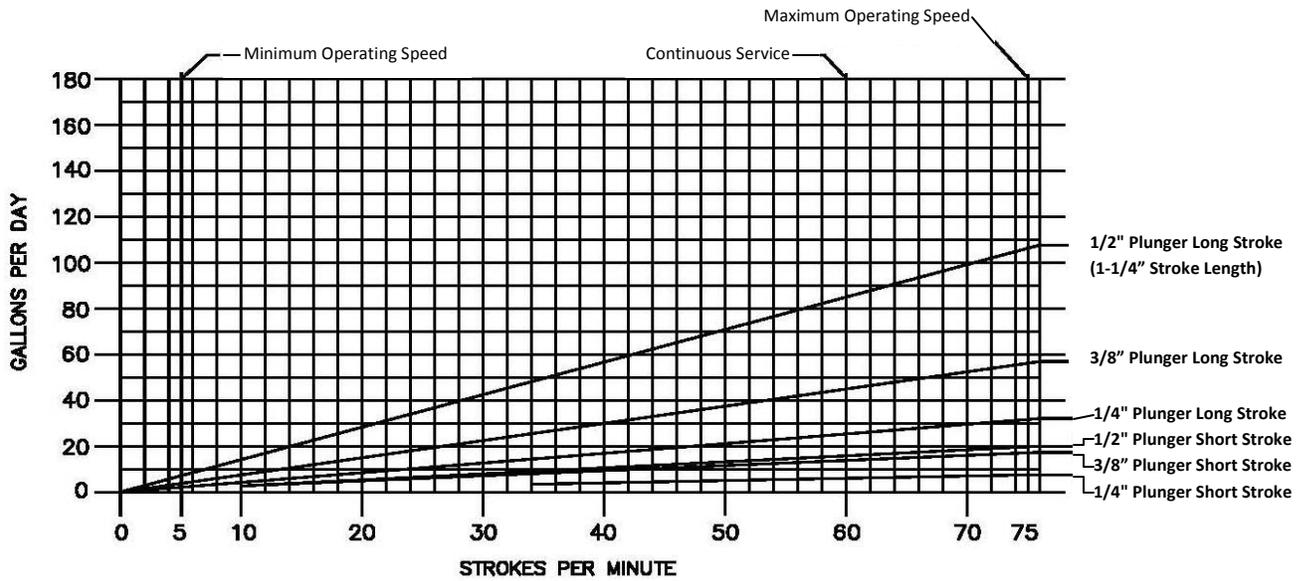
Item Number	Part Number	Description	Qty.
1	CVS-A-0053	Bottom Check Ball 1/2", 316SS	1
2	CVS-A-0054	Top Check Ball 3/8", 316SS	1
3	CVS-A-0077	Check Ball Spring, 316SS	1
4	CVS-A-0152	Series 50 - Top Bushing	1
5	CVS-A-0153	Series 50 - Bottom Bushing	1
6	CVS-A-0403	Series 50 - Packing Nut, 1-1/4"	1
7	CVS-A-0404	Series 50 1-1/4" Plunger Packing Gland	1
8	CVS-A-0405	Packing	1
9	CVS-A-0406	Series 50 - 1-1/4" Adapter	1
10	CVS-A-0408	Series 50 - 1-1/4" Plunger	1
11	CVS-A-0521	Gasket	1
12	CVS-A-0612	Injector Bottom o-ring	1
13	CVS-A-2097	Top o-ring	1
14	CVS-A-2338	Gasket	1
15	CVS-A-2350	Gasket	3
16	CVS-A-3523	Retainer Ring (.39" ID)	1
17	CVS-B-0368	Series 50 - Top Check Valve Seat	1
18	CVS-B-0698	Series 50 - Bottom Check Valve Seat	1
19	CVS-C-0049	Series 50 - Pump Head, 1/2" Stem	1
20	CVS-C-0444	Series 50 - Ball Cage	1

CVS Series 50 Chemical Injection Pump – 1/4" – 1" Plunger Injector and Grease Assembly



Item Number	Part Number	Description	Qty.
1	CVS-A-0053	Bottom Check Ball 1/2", 316SS	1
2	CVS-A-0054	Top Check Ball 3/8", 316SS	1
3	CVS-A-0055	Series 50 - Packing Nut, 1"	1
4	CVS-A-0077	Check Ball Spring, 316SS	1
5	CVS-A-0152	Series 50 - Top Bushing	1
6	CVS-A-0153	Series 50 - Bottom Bushing	1
7	CVS-A-2766	Series 50 - Lantern Ring, 1/4"	1
7a	CVS-A-0742	Series 50 - Lantern Ring, 3/8"	1
7b	CVS-A-0447	Series 50 - Lantern Ring, 1/2"	1
7c	CVS-A-2770	Series 50 - Lantern Ring, 3/4"	1
7d	CVS-A-0448	Series 50 - Lantern Ring, 1"	1
8	CVS-A-0612	Injector Bottom o-ring	1
9	CVS-A-1461	Packing, 1/4" - Buna	1
	CVS-A-1642	Packing, 1/4" - Teflon	1
9a	CVS-A-1456	Packing, 3/8" - Buna	1
	CVS-A-1234	Packing, 3/8" - Teflon	1
9b	CVS-A-0959	Packing, 1/2" - Buna	1
	CVS-A-1012	Packing, 1/2" - Teflon	1
9c	CVS-A-2771	Packing, 3/4" - Buna	1
	CVS-A-2988	Packing, 3/4" - Teflon	1
9d	CVS-A-0050	Packing, 1" - Buna	1
	CVS-A-1013	Packing, 1" - Teflon	1
10	CVS-A-1463	Series 50 - Plunger Packing Gland, 1/4"	1
10a	CVS-A-0957	Series 50 - Plunger Packing Gland, 3/8"	1
10b	CVS-A-1219	Series 50 - Plunger Packing Gland, 1/2"	1
10c	CVS-A-2769	Series 50 - Plunger Packing Gland, 3/4"	1
10d	CVS-A-0043	Series 50 - Plunger Packing Gland, 1"	1
11	CVS-A-2097	Top o-ring	1
12	CVS-A-2338	Gasket	1
13	CVS-A-2350	Gasket	3
14	CVS-A-2764	Series 50 - Plunger, 1/4"	1
14a	CVS-A-0743	Series 50 - Plunger, 3/8"	1
14b	CVS-A-0032	Series 50 - Plunger, 1/2"	1
14c	CVS-A-2767	Series 50 - Plunger, 3/4"	1
14d	CVS-A-0158	Series 50 - Plunger, 1"	1
15	CVS-A-3523	Retainer Ring (.39" ID)	1
16	CVS-B-0368	Series 50 - Top Check Valve Seat	1
17	CVS-B-0368	Series 50 - Bottom Check Valve Seat, 1/4"	1
		Series 50 - Bottom Check Valve Seat, 3/8"	1
17a	CVS-B-0698	Series 50 - Bottom Check Valve Seat, 1/2" - 1"	1
18	CVS-C-1608	Series 50 - Pump Head, 1/4" Stem	1
18a	CVS-C-0084	Series 50 - Pump Head, 3/8" Stem	1
18b	CVS-C-0022	Series 50 - Pump Head, 1/2" Stem	1
18c	CVS-C-0333	Series 50 - Pump Head, 3/4" Stem	1
18d	CVS-C-0020	Series 50 - Pump Head, 1" Stem	1
19	CVS-A-0444	Series 50 - Ball Cage	1
Item Number	Part Number	Description	Qty.
20	CVS-A-0559	Series 50 - Body, Grease Jack	1
21	CVS-A-0560	1/2" Hex Bolt	1
22	CVS-A-0562	Series 50 - Retainer, Grease Jack	1
23	CVS-A-0564	Ball, 316SS	1

CVS Series 50 Chemical Injection Pump – Technical Data: Volume



Notes:

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