

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

Head Office
1107 8A Street
Nisku, Alberta
T9E 7R3
Canada
Office: (780) 437-3055

CVS
CONTROLS

Calgary Sales Office
3516 114 Avenue SE
Calgary, Alberta
T2Z 3V6
Canada
Office: (403) 250-1416

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

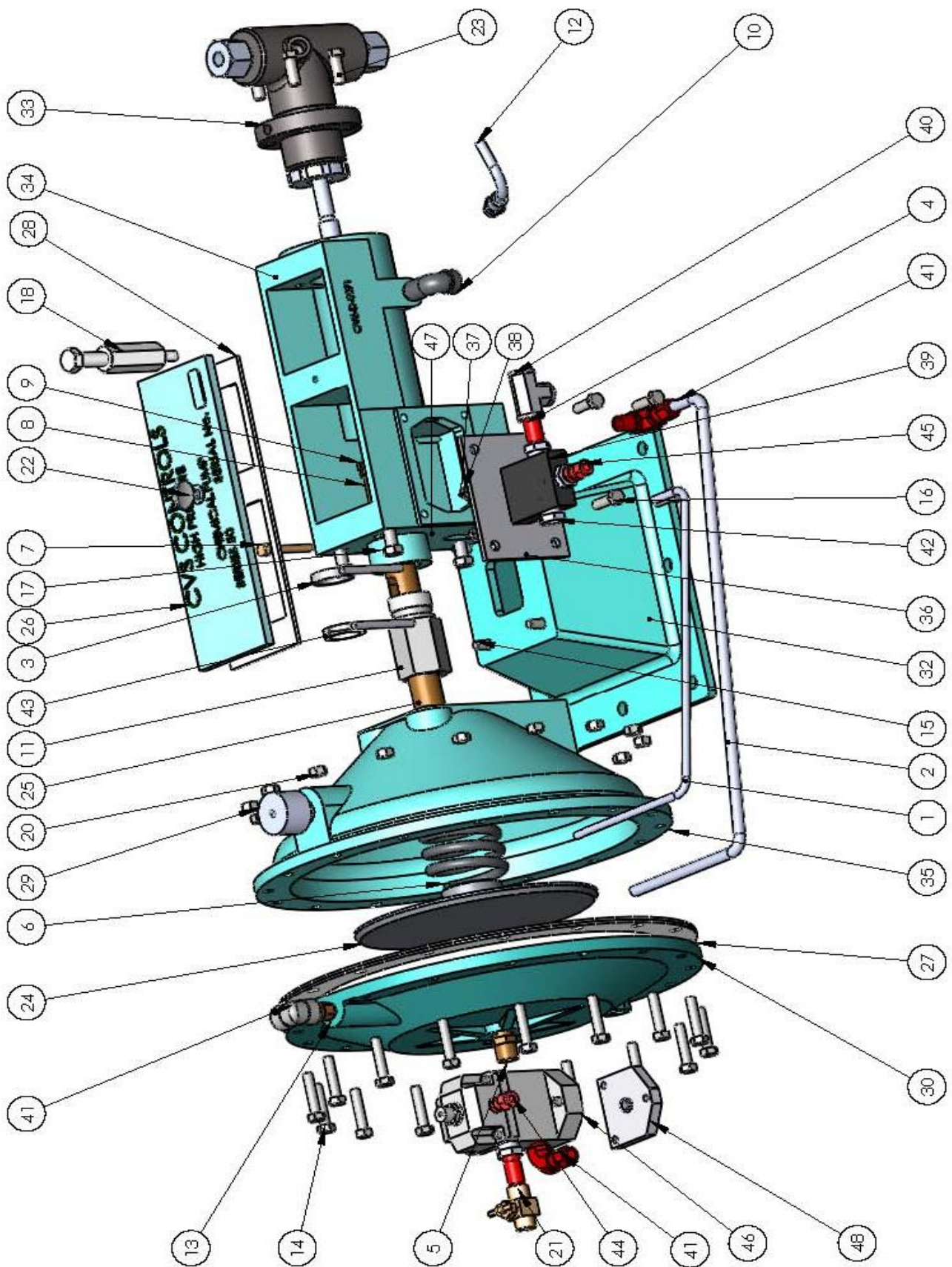
| Model Number | Plunger Size | Operating Ratio Gas to Fluid | Maximum Discharge (PSIG) | | Maximum Volume Continuous | | Maximum Volume Intermittent | |
|--|--------------|---------------------------------|-----------------------------|-----------------|------------------------------|-----|--------------------------------|-----|
| | | | Soft Packing | Hard Packing | GPH | GPD | GPH | GPD |
| 50-14-DMV | 1/4 | 1000:1 | 3000 | 12,000 | 0.67 | 16 | 0.83 | 20 |
| 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 guage 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 | | | | | | | | |

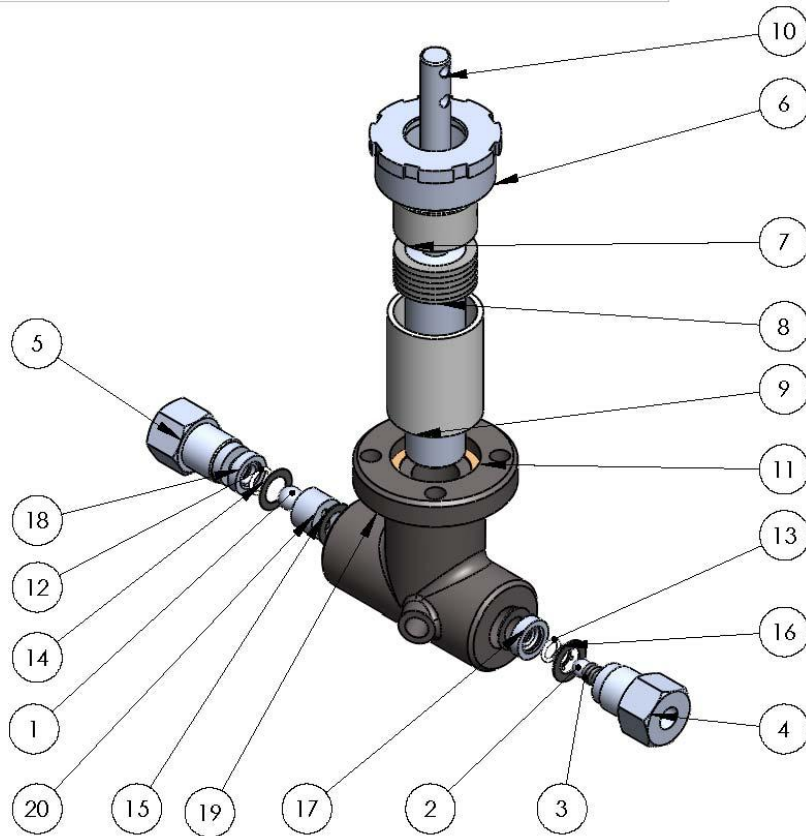
CVS Series 50 Chemical Injection Pump – Assembly



CVS Series 50 Chemical Injection Pump - Parts Listing

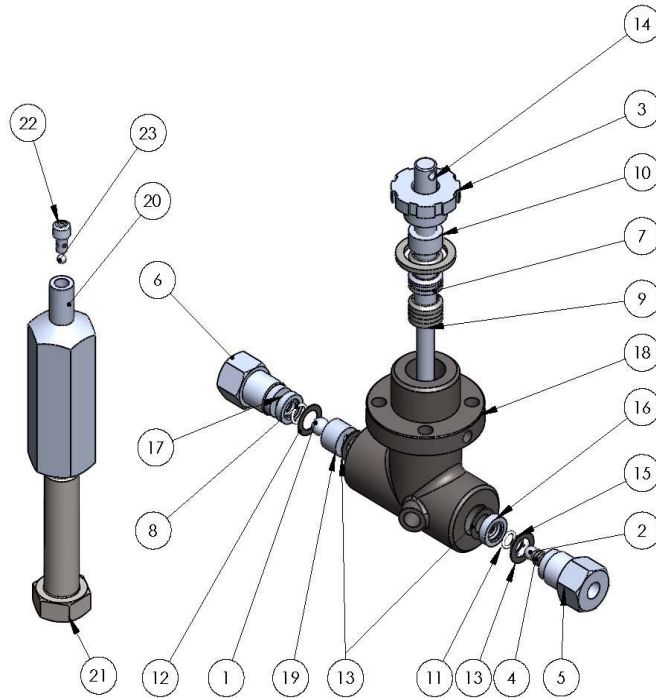
| Item Number | Part Number | Description | QTY. |
|-------------|----------------|--------------------------------------|------|
| 1 | 1/4" Tube | Connecting Pipe I (1/4" Pipe) | 1 |
| 2 | 3/8" Tube | Connecting Pipe II (3/8" Pipe SCH40) | 1 |
| 3 | CVS-50-Trip | Series 50 - Trip Bar Assembly | 2 |
| 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" M X 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



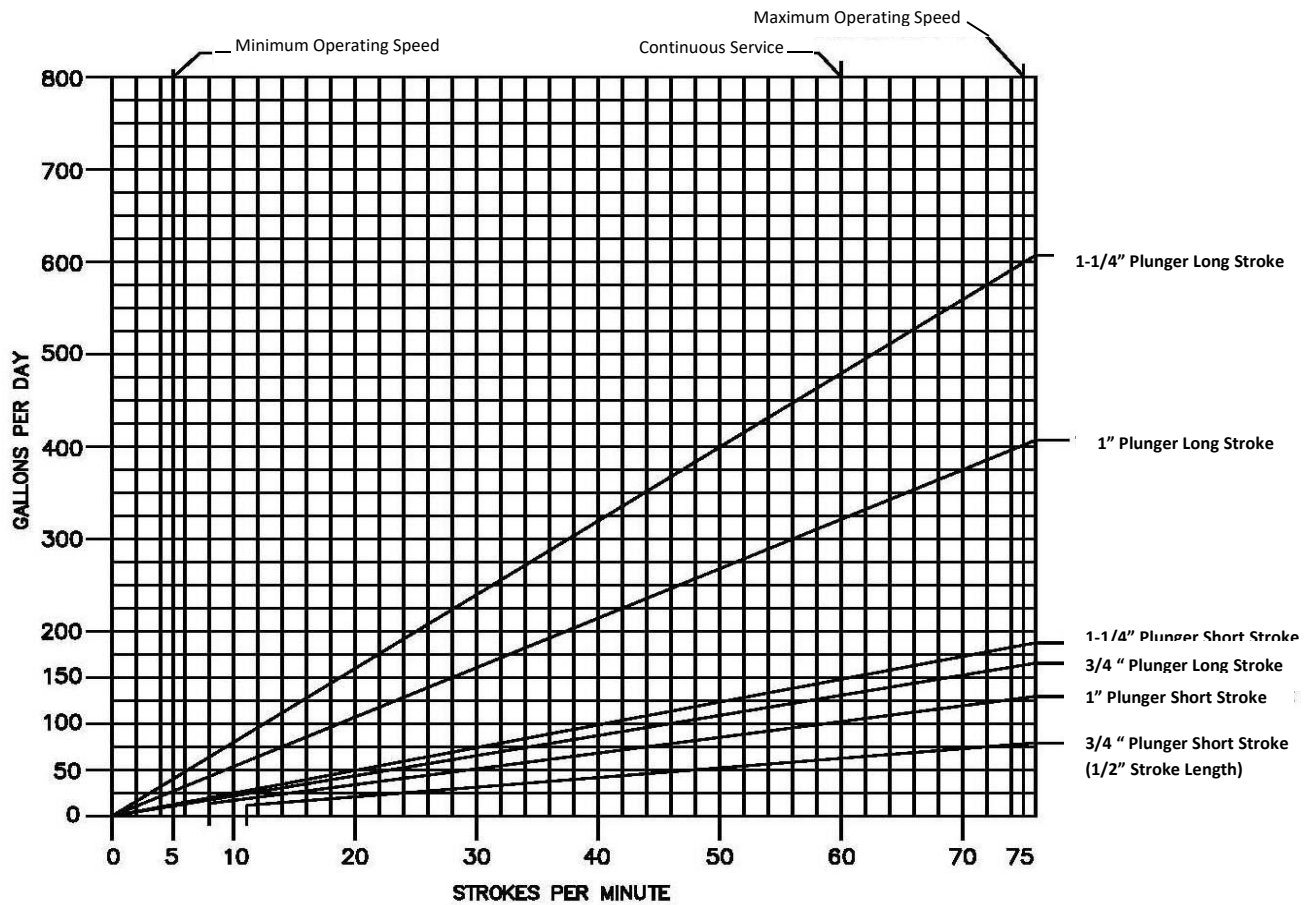
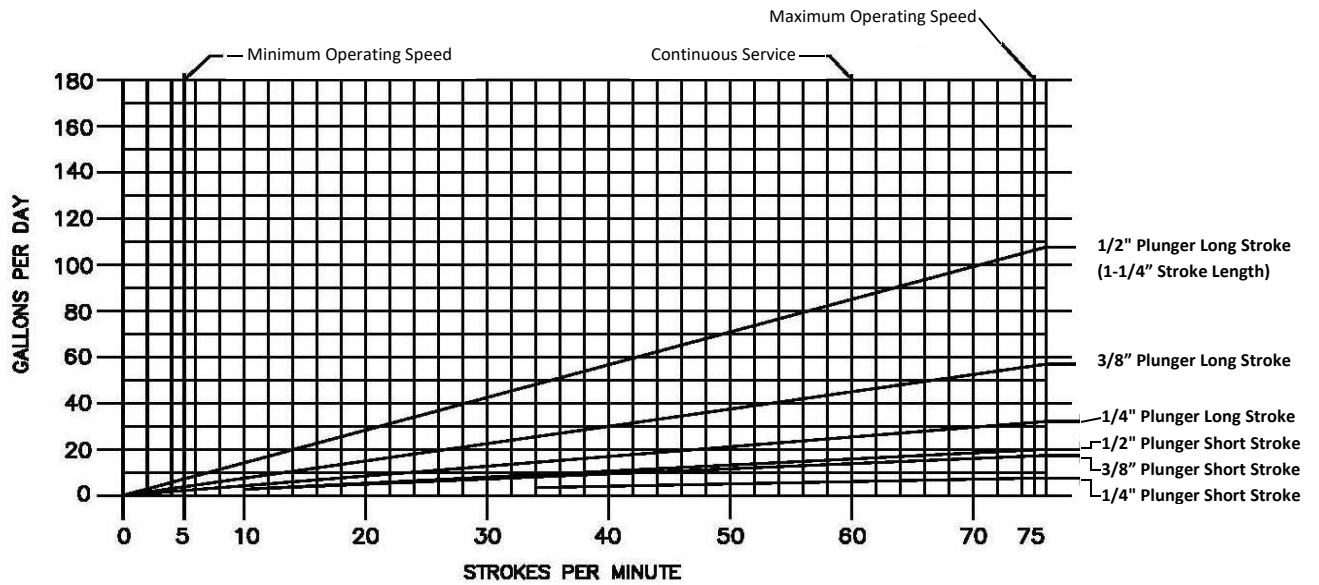
| Item Number | Part Number | Description | Qty. |
|-------------|-------------|--|------|
| 1 | CVS-A-0053 | Bottom Check Ball 1/2", 316SS | 1 |
| 2 | CVS-A-0054 | Top Check Ball 3/8", 316SS | 1 |
| 3 | CVS-A-0077 | Check Ball Spring, 316SS | 1 |
| 4 | CVS-A-0152 | Series 50 - Top Bushing | 1 |
| 5 | 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 – ¼" – 1" Plunger Injector and Grease Assembly

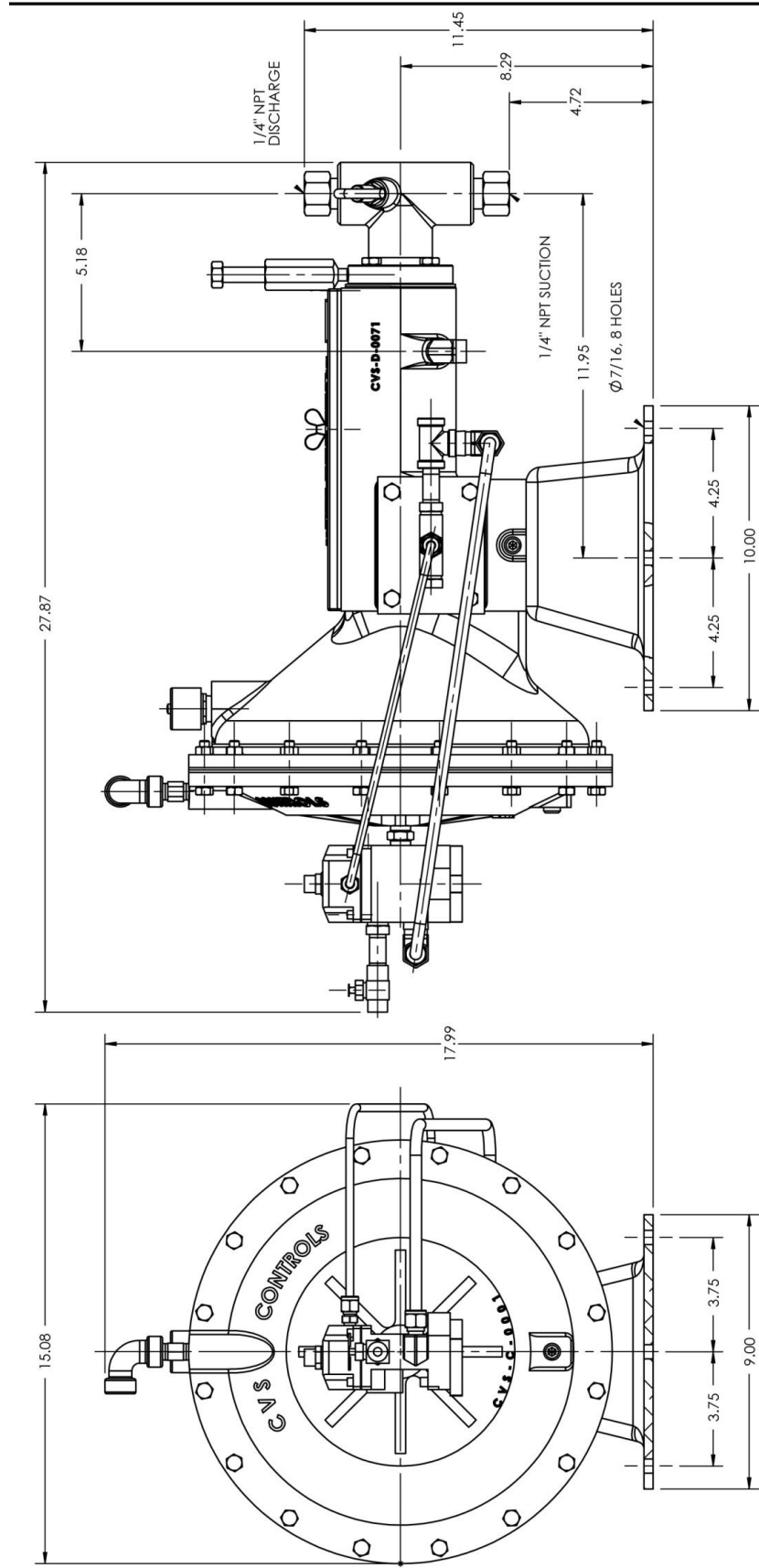


| Item Number | Part Number | Description | Qty. |
|-------------|-------------|--|------|
| 1 | CVS-A-0053 | Bottom Check Ball 1/2", 316SS | 1 |
| 2 | CVS-A-0054 | Top Check Ball 3/8", 316SS | 1 |
| 3 | CVS-A-0047 | Series 50 - Packing Nut, 1" | 1 |
| 4 | CVS-A-0077 | Check Ball Spring, 316SS | 1 |
| 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



Dimensions - Inches





Head Office

1107 8A Street
Nisku, Alberta
T9E 7R3
Canada
Office: (780) 437-3055

Calgary Sales Office

3516 114 Avenue SE
Calgary, Alberta
T2Z 3V6
Canada
Office: (403) 250-1416
Fax: (403) 291-9487

Website: www.cvs-controls.com

Email: info@cvs-controls.com

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