

## **Series 1500 Pneumatic Chemical Injection Pump Operating Manual**



**Louisiana, US**  
21356 Marion Lane  
Mandeville, LA 70471  
+1 (504) 340-0770

**Aberdeen, UK**  
Unit C2 Lombard Centre  
Kirkhill Place, Kirkhill Industrial Estates  
Dyce, Aberdeen, AB21 0GU Scotland  
+44 (0) 1224 775205

**CP Pumps & Systems FZE**  
Unit AA08, LIU 10  
Jebel Ali South | PO Box 262131  
Dubai | UAE  
+971 (4) 8806278

**Ras Al Khaimah, UAE**  
RAK Technology Park, Shed 2, Warehouses 7 & 8  
Al Hamra Industrial Zone  
PO Box 54796  
Ras Al Khaimah, United Arab Emirates  
+971 (07) 223-9961

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Congratulations! You have chosen the finest, most versatile chemical injection pump made; designed to exacting specifications for long life, reliable performance, and low maintenance. To ensure proper operation and to maximize the Series 1500's durability, please read and follow this guide. Failure to correctly install and maintain the pump is a primary cause for future service problems and may void certain warranty provisions.

**NOTE:** This Guide applies to all CheckPoint Chemical Injectors, Part Numbers P50-XXX-XX-XXX-XX.

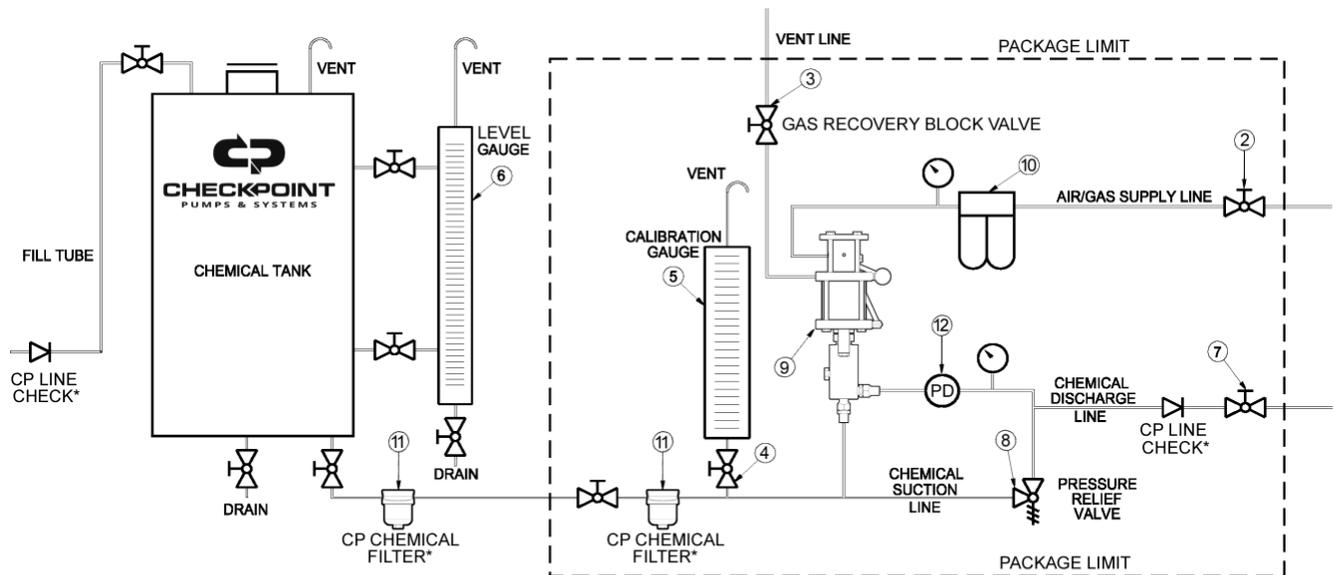
**NOTE:** Important illustrations, graphs, and charts are located throughout this Guide, with cutaway drawings of the pump in the back.

## 1. PUMP INSTALLATION

### 1.1 Process Design & Setup

1.1.1 Prior to installing your injector, please inspect the pump carefully for any possible in-transit damage. If the pump appears damaged, call your authorized CheckPoint distributor or call CheckPoint customer service directly at (800) 847-7867 or (504) 340-0770 to confirm damaged condition. If we determine that damage has occurred in transit, you will need to file a claim with the carrier.

**FIGURE 1: TYPICAL INSTALLATION SCHEMATIC**



CheckPoint packages are available for the 1500 Series pumps that contain all necessary components as indicated within the Package Limit Line. We can supply packages that contain ALL the components, including the tank, mounted on a single skid with or without full leak containment.

- |                               |                                  |                               |                                 |
|-------------------------------|----------------------------------|-------------------------------|---------------------------------|
| 1. Suction line block valve   | 4. Calibration gauge block valve | 7. Discharge line block valve | 10. Regulator/Lubricator/Filter |
| 2. Air/Gas supply block valve | 5. CP Calibration gauge*         | 8. PRV - discharge line       | 11. CP Chemical Filter*         |
| 3. Gas recovery block valve   | 6. Tank gauge                    | 9. CP 1500 Chemical pump*     | 12. Pulsation Dampener          |

All items in Figure 1. can be purchased from CheckPoint. Call today for our latest prices on pumps, gauges, packages and other components.

\*CheckPoint OEM products

1.1.2 Referring to Figure 1 above, ensure that all necessary components are present in your injection system and in good working order. All the components shown above are recommended by CheckPoint to maximize productivity

and life of the pump in typical field or plant use. CheckPoint is available to answer your process questions or to help design and build a skid system utilizing components appropriate for your application.

**NOTE:** In Figure 1, the pressure relief valve, secondary chemical filter, vent line, and pressure regulator are optional under certain conditions but are highly recommended.

1.1.3 CheckPoint recommends vertical mounting for its pumps where possible. This allows the suction check valve to have gravity assistance in closing. However, you may also mount the pump in other orientations, subject to the condition that the chemical head should be no higher than level with the motor. If mounting will be other than vertically, you must order your pump with a spring-loaded suction check, or order the appropriate suction check spring sent to you prior to installation. For placement on a horizontal surface or for mounting to a skid or other fixed horizontal or vertical surface, CheckPoint recommends using the M68 Series Mounting Bracket.

**CAUTION: Under no conditions should the pump be oriented so the suction check valve is above the centerline of the motor, such as upside down. Doing so may cause chemical leakage to collect on the motor, breach the motor seals, and be atomized into the environment.**

1.1.4 CheckPoint recommends use of a calibration gauge for your assurance of proper pump function and chemical delivery rate. Please read the section in this Guide entitled *3.2.1 Setting Pump Speed Using a Calibration Gauge* on page 9 for more information. The proper position of the calibration gauge (labeled #5) is shown in Figure 1.

**NOTE:** It is necessary to attach a vent tube to the top of all calibration gauges, chemical tanks, and tank level gauges. The height of the top of each vent tube should always be greater than the highest possible liquid level in the system, and the tube should have means to prevent water entry, such as a 180 degree bend.

1.1.5 The Series 1500 does not require flooded suction or positive chemical pressure to prime, and can therefore be mounted above the chemical container. For a chemical with average viscosity, the pump will pull air out of the chemical line and prime from up to twelve feet above the liquid level in the tank. This feature is dependent upon proper packing adjustment and adherence to all points made in Paragraph 1.1.6 below.

1.1.6 ALL VALVES, FITTINGS, AND PIPING BETWEEN THE SOURCE OF CHEMICAL AND THE PUMP'S SUCTION CHECK VALVE MUST BE 100% BUBBLE-TIGHT AND FULLY COMPATIBLE WITH THE CHEMICAL BEING DELIVERED AND WITH EACH OTHER. FAILURE TO ADHERE STRICTLY TO THIS RULE WILL LEAD TO GAS BUILD-UP IN THE CHEMICAL HEAD AND LOST PRIME. SPECIFICALLY:

1.1.6.1 Any fitting or screw-on joint without Teflon™ tape or other acceptable sealant may allow air at atmospheric pressure to enter the suction tubing, even if no chemical leakage is visible.

1.1.6.2 Dissimilar metals, when joined together in the suction pipe work may react with each other, creating gas bubbles that will end up being carried into the pump head. CheckPoint generally recommends all suction components, including all tubing, piping, fittings, and valves, be of similar material, preferably stainless steel or other chemically resistant metal.

1.1.6.3 Incompatibilities between the chemical and the metallic elements in the suction pipe work can also create such gas bubbles. In particular, some acids require Hastelloy™ or PVC fittings and tubing, while other chemicals may only require 316 SS.

1.1.7 The pump may be clamped to a skid or other surface in a number of ways, however, clamping around the outside of the pump reduces accessibility during maintenance and troubleshooting and is therefore not recommended. Also, aggressive clamping around the air cylinder of the motor has sometimes been found to deform

the cylinder and slow or stop the piston from moving. To maximize stability and accessibility, use our M68 Series Mounting Bracket or equivalent.

1.1.8 Always check to ensure that all process block valves (labeled as nos. 2, 3 & 7 in Figure 1) are closed prior to disconnecting or re-installing any chemical injection pump. There should always be a block valve placed between a properly installed pump and the process flow, the gas supply, the chemical supply, and, in the case of Gas Recovery models, the gas recovery outlet. Conversely, while the pump is running, all such block valves should always be open.

1.1.9 All suction lines should be at least 1/2 inch diameter, and all discharge lines should be at least 3/8 inch diameter to ensure sufficient flow rates of chemical and minimize pressure drop through the lines. For multiple pump installations and for extremely viscous chemicals, additional allowances are needed. Contact CheckPoint or your authorized CheckPoint distributor for design assistance.

1.1.10 To avoid over-pressuring chemical discharge lines, CheckPoint recommends placing a pressure relief valve between the discharge check valve of the pump and the process flow. The pressure relief valve discharge can be run to a tee upstream of the pump's chemical suction check valve.

**CAUTION: When using a pressure relief valve, the chemical tank or vessel MUST BE properly vented to atmosphere to avoid the possibility of over-pressurizing the tank if the pressure relief valve opens.**

1.1.11 Pulsation dampeners are sometimes specified in systems utilizing 1500 Series pumps. CheckPoint does not recommend their use because the low flow rates of 1500 Series pumps do not generate harmful pulsation in most systems.

## **1.2 Connecting The Chemical Supply**

1.2.1 Clean suction lines and check chemical containers to ensure that they are free of all foreign matter, sand, sludge, or chemical buildup.

**NOTE:** Removing foreign debris from suction lines and chemical containers will substantially extend the life of the packing and other components of the pump. Even a new chemical tank can contain debris that can be carried into the pump and damage it.

**NOTE:** CheckPoint recommends using filtration to ensure a maximum particulate size of 140 microns. Multiple stages of filtration should be considered, depending upon the initial cleanliness level of the fluid media being pumped, to prevent cavitation and an increase in maintenance.

**NOTE:** If premature scoring of the pump plunger or early packing failure is observed during operation, a likely cause is abrasive particles carried into the pump through the suction plumbing. Use of a pre-suction in-line chemical filter such as the CheckPoint Series FSTS and/or a ceramic or Hastelloy™ plunger is recommended if symptoms continue. Call CheckPoint for appropriate filter element sizing criteria.

**CAUTION: Substantial scoring of the plunger can lead to severe leakage of chemical into the surrounding environment.**

1.2.2 Connect the chemical suction line to the suction check valve on the pump head. The suction check valve has a 1/2" NPT male thread, with an arrow indicating chemical flow direction towards the pump (see illustrations at the end of this Guide).

**NOTE:** Always apply Teflon™ tape or other appropriate thread sealant to the check valve threads prior to attachment to prevent leakage.

**CAUTION: Never re-locate the suction or discharge check valves away from the chemical head. To operate properly, check valves must remain directly attached to the chemical head. If desired, a secondary discharge check may be placed downstream of the primary discharge check valve.**

1.2.3 Connect your discharge line to the discharge check valve. This is a 1/4" NPT male thread. An arrow is stamped on the discharge check valve pointing away from the pump.

1.2.4 Check that the packing nut is properly adjusted. In a new pump, proper adjustment is finger-tight, plus 1/8 of a turn. Use a packing adjustment tool (available from CheckPoint at no charge) for best results. **IMPORTANT: PLEASE REVIEW Section 5.1: Packing Adjustment on page 14.**

**NOTE:** DO NOT OVER-TIGHTEN THE PACKING NUT. Applying excess torque to the packing nut will decrease the life of the packing.

1.2.5 Open the process block valve, allowing the process pressure to reach the chemical head. Correct any leakage observed.

**CAUTION: The Series 1500 chemical head is rated for a maximum working pressure of 10,000 psig. At air/gas supply pressures above 100 psig in the 1/2" plunger size, if blockage in the discharge plumbing exists, pressures exceeding 18,000 PSIG may be developed. A relief valve must be placed between the discharge check and the process flow whenever:  $[\text{supply air pressure}] \times [\text{amplification ratio}] \geq [\text{discharge plumbing design pressure}] \geq 10,000 \text{ psig}$ . To find the amplification ratio for your pump, please see Figure 2 on page 7.**

**NOTE:** Always remember to open the process block valve (shown as number 7 in Fig 1) prior to operating the pump. Operating the pump with a closed block valve can generate enough pressure to rupture the discharge line, permanently damage the block valve, or reduce the useful life of the pump.

### 1.3 Connecting The Supply Gas

1.3.1 Gas supply to the pump should be clean compressed air or natural gas at 20 psig minimum, 200 PSIG maximum. "Clean" means free of abrasive dust, sand or other grit that could abrade the seals inside the pump. The pump does not require a pressure regulator when operated within these recommended supply pressures, as long as the supply pressure remains relatively constant ( $\pm 5\%$ ).

It is not necessary to remove most liquids, such as distillate carryovers, from the supply gas. The pump will not stall no matter how much liquid reaches the air/gas inlet. However, alcohols such as methanol can attack the seals in the motor end of the pump, and should be removed prior to reaching the pump air/gas inlet. Alternatively, if alcohols or other unusual liquids will be present in the supply gas, CheckPoint can supply other seal materials for the motor.

**CAUTION:** Always use a gas pressure regulator if the possibility of supply pressures in excess of 200 psig exists. Allowing higher gas pressures to enter through the air/gas inlet will most probably result in damage to the motor seals. Also, such pressures will translate into excessive discharge pressures, which can rupture chemical discharge tubing.

1.3.2 Liquids may also be used as a driver fluid, but pump speed will vary widely with the liquid viscosity. Call CheckPoint for performance data for the liquid you intend to use.

1.3.3 Blow the supply gas line clean to remove all foreign matter and debris.

**NOTE:** Take care to prevent debris in the supply gas line from entering the main spool housing and switching valves, where it could accelerate seal wear and damage the main switching valve components.

**NOTE:** In situations where sand, dirt, and other particulate matter may be carried in with the supply gas, a CheckPoint F40 Series In-Line Filter or a gas scrubber is recommended.

1.3.4 Connect the supply gas line to the 1/4" NPT female connection on the housing. To ensure positive injection, the supply gas pressure should be a minimum of 20 PSIG and a maximum of 200 PSIG, set according to the following formula:

$$\text{REQUIRED GAS INLET PRESSURE} = \frac{[\text{DISCHARGE PRESSURE}]}{[\text{AMPLIFICATION RATIO}]} \times 1.3$$

1.3.5 Faster pump speeds can be obtained by increasing the gas inlet pressure from the minimum required by the formula above.

**NOTE:** To find the Amplification Ratio for your pump, please see Figure 2 below.

**NOTE:** If this formula yields a result of < 20 PSIG, use 20 PSIG as your supply pressure.

**FIGURE 2: AMPLIFICATION RATIO TABLE, 1500 SERIES**

PLUNGER DIAMETER (IN)	AMPLIFICATION RATIO
3/8	175
1/2	99
3/4	43
1	24
1-1/2	11

1.3.6 If you do not have a Gas Recovery pump or if you are not going to be recovering the exhaust gas of your pump to a lower pressure gas system, skip to *Section 3: Pump Operation*.

## **2. GAS RECOVERY SYSTEMS – INSTALLATION**

2.1.1 For Gas Recovery (GR) Models (P50-GXX-XXX-XX), the exhaust gas can be recovered to a lower pressure gas system. Connect the gas recovery line from the process to the open ¼” tubing connector on the lower branch tee of the injector. The pressure in the recovery line (“recovery pressure”) must be lower than the supply pressure. To calculate the recovery pressure given your supply pressure in PSIG, use the following formula:

$$\text{RECOVERY PRESSURE} = \text{SUPPLY PRESSURE} - \frac{[\text{DISCHARGE PRESSURE}]}{[\text{AMPLIFICATION RATIO}]} - 30 \text{ PSIG}$$

2.1.2 For a GR pump, the maximum recovery pressure, based on a supply pressure of 200 PSIG (the maximum allowable supply pressure) is given by:

$$\text{MAXIMUM RECOVERY PRESSURE} = 170 \text{ PSIG} - \frac{[\text{DISCHARGE PRESSURE}]}{[\text{AMPLIFICATION RATIO}]}$$

2.1.3 For more information on how to set up a recovery system for the GR Series chemical injectors, please contact CheckPoint or an authorized distributor. In many cases CheckPoint may elect to run a test at our factory to determine if the GR will handle your specific needs.

## **3. PUMP OPERATION**

Once you have properly installed the pump, you will need to bleed the air out of the chemical head prior to operating it.

### **3.1 Bleeding/Priming the Pump**

3.1.1 Prior to bleeding air from the pump head, check to ensure that the packing nut is properly adjusted. Before attempting to adjust or tighten the packing nut, please read *Section 5.1: Packing Adjustment on page 14*. It is important not to over-tighten the packing nut.

3.1.2 Open the chemical supply block valve (if necessary) and the air supply block valve or regulator (if used).

3.1.3 Open the process block valve.

NOTE: Other than during brief testing, NEVER operate the pump without chemical supply available and flowing freely. Doing so will create undue friction and heat, decreasing the life of the packing, hastening chemical leakage, and voiding the pump warranty.

3.1.4 Open the speed control valve by turning the knob counterclockwise. The pump should pick up speed as the knob is rotated. Continue to turn the knob until the pump is cycling a minimum of 60 strokes/minute. This may take up to eight (8) turns of the needle valve.

3.1.5 Open the bleed screw 2 complete turns (counterclockwise). The pump will begin to pull air and chemical through the chemical supply plumbing, into the head, and out the port in the bleed valve. Leave the valve open until a solid stream of chemical pumps out the bleed port with each stroke of the pump.

**NOTE:** If the pump is not new, it is very possible for dried or solidified chemical to be present in the bleed assembly. If your pump does not bleed when following the directions above, try cleaning these items in solvent and replacing them.

3.1.6 Reclose the bleed screw until chemical flow through the bleed port stops, then reduce the pumping rate via the speed control until the pump is cycling at your desired rate.

**NOTE:** DO NOT OVER-TIGHTEN THE BLEED SCREW. Tighten the bleed screw ONLY until chemical stops flowing. Applying excess torque to the bleed valve may impair future valve operation.

**NOTE:** Occasionally, soon after closing the bleed assembly, you may observe packing leakage. If so, this is usually due to a loose packing nut. Adjust the packing nut per the instructions in *Section 5.1: Packing Adjustment* on page 14.

## **3.2 Setting The Pump Stroke Rate**

### **3.2.1 Setting Pump Speed Using a Calibration Gauge**

The following directions are for setting the pump speed using a calibration gauge. There are a variety of calibration gauges available, including a complete line of appropriately-sized CheckPoint gauges for every CheckPoint pump. To ensure that your pump is working as it should and that chemical is being delivered at the rate you need, it is important to use a calibration gauge.

3.2.1.1 Most calibration gauges are designed to read properly when one full minute of pumping has taken place. However, if the liquid level drops too fast to allow for a full minute, shorter periods are acceptable. Try to size the gauge so that at least a 30 second test can be made, however, or a loss of accuracy will result.

3.2.1.2 Proper gauge placement and plumbing is important. Please refer to Figure 1 for appropriate valving and placement, and for reference numbers as used in this section. The calibration gauge is labeled as number 5.

3.2.1.3 With the pump either running or stopped, open the Gauge Fill Valve (shown as #4 in Figure 1). The gauge (shown as #5 in Figure 1) should begin to fill. Continue filling until the chemical level is at or near the top markings on the gauge, then close the Gauge Fill Valve.

3.2.1.4 Now ensure that the CheckPoint pump is running. Take note of the level of chemical in the gauge using the appropriate scale for the volume units you want to measure the pump's output in. Usually the gauge will show liters on one scale and quarts or gallons on the other. It is best to write down the number so that you can calculate flow accurately.

3.2.1.5 Open the Gauge Fill Valve (#4), and simultaneously close the Chemical Supply Valve (shown as #1 in Figure 1). This isolates the pump and gauge so that the pump is being supplied all its chemical directly from the gauge.

3.2.1.6 The level in the gauge should begin to fall. (If it does not, or if the level seems to go down and then back up with each stroke, refer to troubleshooting in *Section 6.1 on page 17*). When the liquid level in the gauge gets

near the bottom of the gauge, or when one minute has expired (whichever comes first), stop timing, note the ending level on the gauge, and reopen the Chemical Supply Valve.

3.2.1.7 Write down the amount of time in seconds and the final gauge reading, then close the Gauge Fill Valve.

**NOTE:** Failure to reopen the Chemical Supply Valve will result in the pump quickly depleting the remaining chemical in the gauge and running on air, necessitating pump re-priming.

**NOTE:** In cases where the chemical flow rate is extremely low, you may need to time for longer than one minute to allow an adequate amount of chemical to move out of the gauge.

3.2.1.8 The pumping volume (in the units specified on the gauge scale) will be given by the following equation:

$$\text{PUMPING VOLUME} = \frac{[\text{END READING}] - [\text{BEGINNING READING}]}{[\text{DURATION OF READING IN SECONDS}]} \times 60$$

**NOTE:** To ensure accurate stroke rate measurement, allow sufficient measurement duration. Where possible, allow at least thirty seconds of gauge drawdown.

**NOTE:** At extremely slow stroke rates, only a small turn of the speed control valve is required to alter the stroke rate, so if readjusting the rate of the pump, it is helpful to turn the valve only a small increment (a couple of angular degrees) at a time.

**3.2.2 Calculation of Stroke Rate**

It is possible to calculate your pump’s required stroke rate. To do so, you have to look up a volume factor, multiply it by your desired chemical flowrate requirement, compensating for the discharge pressure using a graph. The instructions below will detail this process. This is most helpful when determining if a particular plunger or pump size will output a required volume.

**NOTE:** This procedure should not be used as the sole means of setting the pump’s speed in the field. Without checking pump output with a calibration gauge, you cannot be assured that the pump is delivering the correct liquid flow rate. For example, if the suction check valve is stuck due to trash or thickened chemical, chemical would not be injected even if the stroke rate has been properly set.

3.2.3 Using your desired chemical flow rate, calculate an Unrated Stroke Rate (USR). UNRATED STROKE RATE (USR) (STROKES/MIN) = FLOWRATE (GAL/DAY) X VOLUME FACTOR. Figure 3 contains basic conversions to assist you. Figure 4 gives the Volume Factor used to determine the USR.

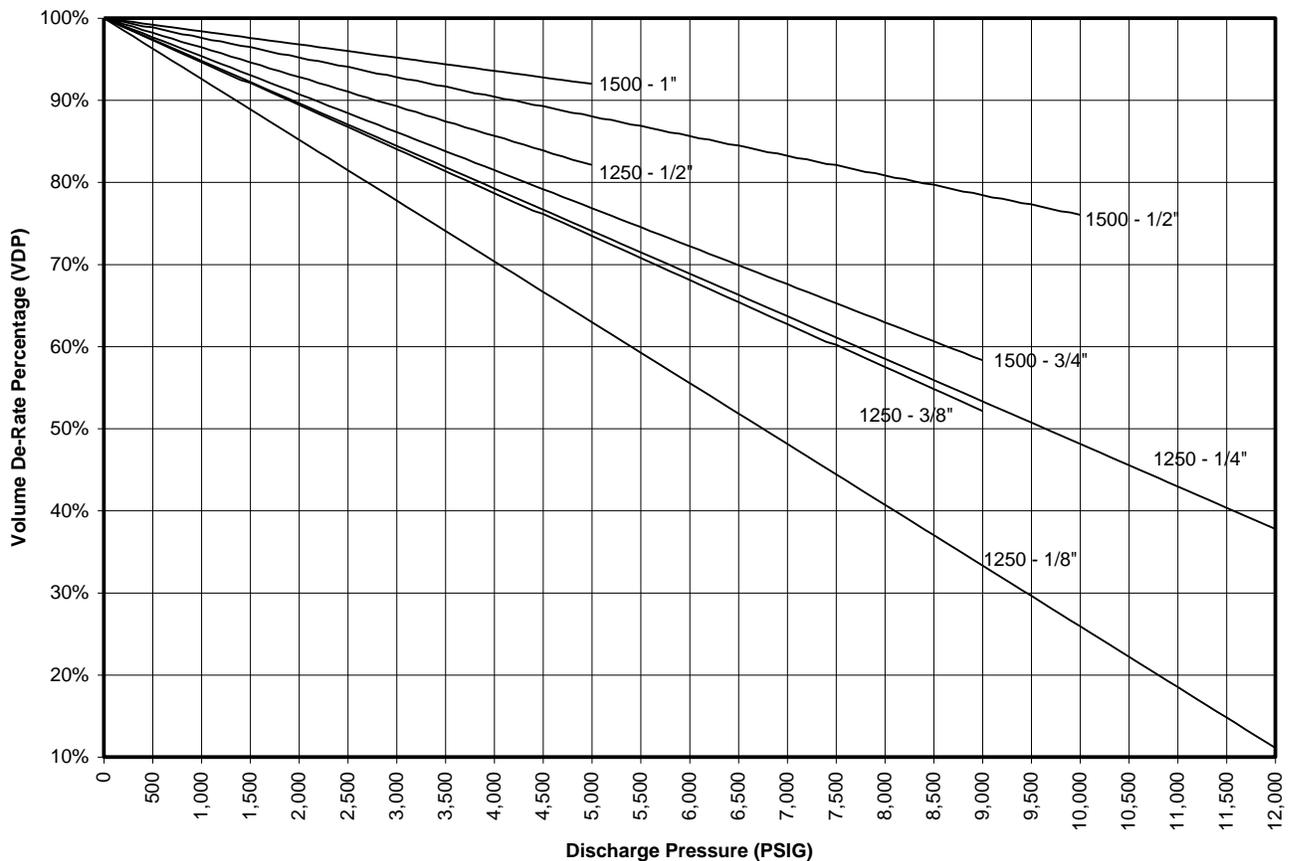
**FIGURE 3: GENERAL CONVERSION TABLE**

<b>TO CONVERT:</b>	<b>TO:</b>	<b>MULTIPLY BY:</b>
<b>QUARTS</b>	<b>GALLONS</b>	<b>0.25</b>
<b>LITERS</b>	<b>GALLONS</b>	<b>0.2646</b>
<b>CUBIC INCHES</b>	<b>GALLONS</b>	<b>0.004329</b>
<b>MINUTES</b>	<b>DAYS</b>	<b>0.000694</b>

**FIGURE 4: VOLUME FACTOR TABLE, SERIES 1500**

PLUNGER DIAMETER	VOLUME FACTOR
3/8 INCH	3.208
1/2 INCH	1.049
3/4 INCH	0.370
1 INCH	0.227
1-1/2 INCH	0.092

**FIGURE 5: VOLUME DE-RATING PERCENTAGE VS DISCHARGE PRESSURE**



3.2.4 Volume per stroke decreases as the discharge pressure rises. It is necessary to apply a Volume De-Rating Percentage (VDP) to the Unrated Stroke Rate (USR). The VDP is based on the expected discharge pressure the pump will experience. Use the VDP Graph (Figure 5) to find the VDP, taking care to use the curve for your specific plunger diameter:

3.2.5 Use the resulting VDP to calculate the Target Stroke Rate as follows:

$$\text{TARGET STROKE RATE} = \frac{[\text{USR}]}{[\text{VDP}]}$$

3.2.6 Finally, ensure that the Target Stroke Rate does not exceed the maximum stroke rate. If the Target Stroke Rate exceeds the maximum stroke rate, it will be necessary to use a larger plunger size.

**FIGURE 6: MAXIMUM STROKE RATE, SERIES 1500**

<b>TYPE OF SERVICE</b>	<b>MAXIMUM STROKE RATE</b>
<b>CONTINUOUS USE</b>	<b>85 STROKES PER MINUTE</b>

3.2.7 Assuming your pump is correctly sized, simply adjust the speed control valve on your pump until the Target Stroke Rate is achieved.

NOTE: To ensure accurate stroke rate measurement, allow sufficient measurement duration. Count all exhaust discharges for at least thirty (30) seconds, then convert to a stroke per minute rate. When attempting to control the pump at a frequency lower than 2 strokes per minute, time at least three strokes, then divide by the number of minutes to calculate the stroke per minute rate.

**4. AIR/GAS CONSUMPTION**

If emissions are a concern, call CheckPoint for details on gas recovery options.

Use the following equation along with the appropriate gas consumption factor from Figure 7 to calculate air/gas consumption.

Gas Consumption [SCFM] @ 68F = Chemical Flow Rate [GPH] \* Gas Supply Pressure [PSIA] \* English Gas Consumption Factor

Gas Consumption [Nm<sup>3</sup>/Hr] @ 0C = Chemical Flow Rate [LPH] \* Gas Supply Pressure [BARA] \* SI Gas Consumption Factor

NOTE: Gas supply pressure value must be absolute pressure, not gauge pressure (Absolute pressure = gauge pressure + atmospheric pressure). For reference, the Earth's atmospheric pressure at sea level is approximately 1 atm or 14.696 psi or 1.0133 bar.

NOTE: This is a theoretical consumption rate that will vary depending on gas density and other actual field conditions. Air/Gas consumption can be minimized by using the minimum supply pressure required to achieve the target application. Please contact CheckPoint for assistance estimating optimal supply pressure and associated consumption rate for a particular application.

**FIGURE 7: GAS CONSUMPTION FACTORS**

PUMP SERIES	PLUNGER DIAMETER [IN]	GAS CONSUMPTION FACTOR	
		ENGLISH SCFM @ 68F	SI METRIC NM <sup>3</sup> /HR @ 0C
1500	3/8	0.0566	5.0017
	1/2	0.0318	2.8134
	3/4	0.0144	1.2729
	1	0.0088	0.7803
	1 1/2	0.0036	0.3184

## **5. PUMP MAINTENANCE**

The CheckPoint Series 1500 is designed to provide trouble-free operation for many years with little adjustment, lubrication, or other routine maintenance. However, like any other device, proper maintenance can extend the life of the product. This can include packing adjustment, periodic cleaning of the gas and chemical inlets, and lubrication.

### **5.1 Packing Adjustment**

Packing adjustment is usually indicated whenever adjustable packing is installed in the pump and leakage can be observed around the packing nut or coming out of the weep hole drilled through the packing nut. In most cases, if there is no leakage, no adjustment is necessary.

5.1.1 Use a CheckPoint T100-10 packing adjuster, which is specifically designed for this purpose. If one is not available, you may order one at no charge directly from CheckPoint. In an emergency or if time is short, a 6" length of ¼" OD tubing or metal rod may be used.

5.1.2 Packing should generally be adjusted while pump is running if it is already in service.

5.1.3 To tighten the packing, insert the tool into one of the six shallow radial holes in the packing nut, and tighten the nut clockwise (when looking at the pump from above) or from right to left (when viewing the pump from the side while it is in a vertical position). Snug the nut until light pressure with one finger on the packing nut tool no longer moves the packing nut.

5.1.4 From this point, TIGHTEN THE NUT 1/8 TURN ONLY (there are eight holes, so each 1/8 turn moves the next hole into the position of the previous one):

5.1.5 If adjusting the packing while pump is operating, pause after each 1/8 turn to determine if the leakage has stopped, allowing for enough time to ensure previous leakage has already drained from the nut weep holes and threads. If pump is still leaking, turn packing nut an additional 1/8 turn and check again. Continue turning the nut 1/8 turn at a time as often as necessary to stop the leakage. If the leakage cannot be stopped, or if excessive force is required to stop leakage, it is time to replace the packing.

5.1.6 If adjusting the packing prior to new installation or when not currently running, tighten the nut 1/8 turn from the finger tight position.

<p>NOTE: If the packing is being adjusted while the pump is running, the pump will typically not stall no matter how much the packing nut is tightened. Care must thus be taken not to apply too much pressure when adjusting the packing nut, as this will reduce packing life.</p>
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### **5.2 Packing Replacement**

Follow the steps below to change the packing in your Series 1500.

<p>NOTE: The 1/2" and 3/4" plunger sizes require a metal adapter sleeve with an O-ring and a backup ring in the packing gland. When removing the packing, this sleeve must also be removed and cleaned. It is important to remember to re-install the sleeve prior to installing the new set of packing.</p>
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5.2.1 Remove pump from service by first shutting off air supply to the pump.

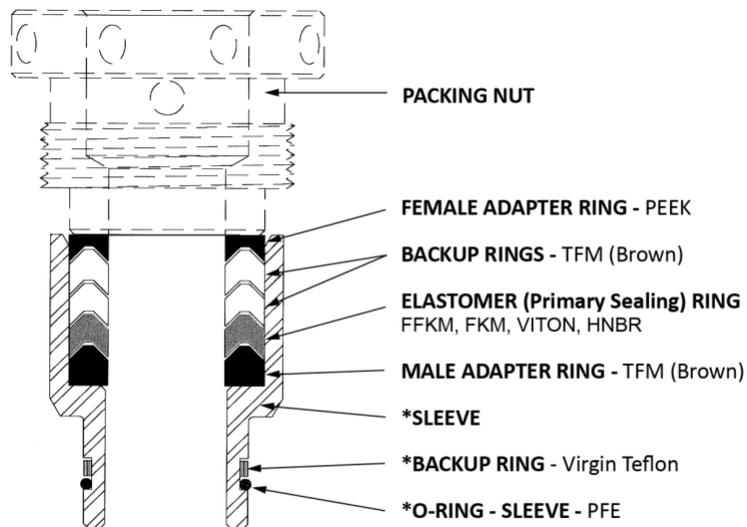
5.2.2 Close the block valves on the chemical supply and discharge.

5.2.3 Disconnect the chemical supply from the pump at the suction check valve, and disconnect the discharge line from the discharge check.

- 5.2.4 Remove the chemical head by removing the two head bolts and then separating the head component from the body of the pump.
- 5.2.5 Unscrew and remove the packing nut, using 1/4" tubing or a packing nut tool. A packing nut tool is available at no charge from CheckPoint.
- 5.2.6 Remove the suction check valve from the chemical head.
- 5.2.7 Using the suction check valve hole for access, use a punch or screwdriver to push out the packing and sleeve. (On the 1" model, no sleeve is present).
- 5.2.8 On the 1/2" and 3/4" plunger sizes, remove the packing from the sleeve, along with the O-ring and backup ring on the small outside diameter of the sleeve. Clean the sleeve and lightly grease it, then install the new O-ring and backup ring supplied with your new packing. If you cannot locate these parts, please contact CheckPoint for replacements. Your pump may leak chemical without replacing these components whenever you replace the packing.
- 5.2.9 Grease and replace the metal sleeve. Refer to the drawings at the end of this Guide for proper orientation of sleeve. (On the 1" model, no sleeve is present).
- 5.2.10 Prior to installation, examine the new set of packing closely to ensure that it is oriented properly. Your packing will be similar to that shown in the cross-sectional view shown in Figure 8 below.

**NOTE:** The grease should be a premium quality multi-purpose, lithium-base NLGI No 2 grease recommended for general industrial applications which meets or exceeds the requirements of DIN 51825: (2004-06) 2K-30. Avoid products containing Xylene.

**FIGURE 8**



\* 1/2 & 3/4 plunger models only.

NOTE: When replacing adjustable packing, always install the packing rings exactly as they are shipped. Rearranging the order of the vee-rings in an adjustable packing set will reduce the life of the elastomer ring in the packing set.

5.2.11 Grease the packing rings on their outside diameters lightly and install them, one ring at a time. It is important to adhere to the ring order and orientation as shown in Figure 8.

NOTE: On the 1/2" and 3/4" plunger models, the packing fits inside the sleeve rather than directly into the packing gland.

5.2.12 Grease the packing nut threads and replace the nut loosely by hand.

5.2.13 Grease the plunger rod protruding from the pump motor.

5.2.14 Taking care to insert the plunger into the packing without damaging or bending it, replace the chemical head onto the main body of the pump.

5.2.15 Grease the threads on the two head bolts, then insert and hand-tighten them.

5.2.16 Tighten the packing nut to the point where light pressure with one finger on the packing nut adjuster will no longer move the packing nut.

5.2.17 Fully tighten down the head bolts. Failure to adhere to this procedure can lead to a misaligned head and leaking packing.

5.2.18 Reattach all process lines to the chemical head, and open all isolation valves leading to the pump chemical supply, discharge, and air/gas supply.

5.2.19 Adjust the packing nut per the directions in *Section 5.1*.

### 5.3 Lubrication

The CheckPoint Series 1500 motor was designed to run under "stone-dry" internal conditions in the motor end. However, regular lubrication will maximize the life of the pump and thus add value to your investment. In addition to minimizing friction within the pump, lubrication flushes out foreign debris, further reducing wear and tear on the mechanism.

5.3.1 **Periodic Lubrication** To lubricate the pump periodically, block off and then disconnect the air/gas supply line by unscrewing the fitting at the pump air/gas inlet. Introduce approximately 1cc of lubricant into the air/gas inlet. Reconnect the air/gas supply line and reintroduce gas pressure. Lubricant will become evenly distributed throughout the motor end of the pump within a few cycles.

5.3.2 **Continuous Lubrication** Lubricator bottles can be placed anywhere in the gas supply line prior to the pump's air/gas inlet. Set the lubricator rate as low as possible, one to two drops per minute, unless cold conditions dictate more in order to prevent freezing of the gas supply. CheckPoint offers both a small and a large in-line lubricator; call CheckPoint or your authorized CheckPoint distributor for details.

5.3.3 **Recommended Lubrication Type** A light hydraulic oil bearing the designation ISO 3448 viscosity no. 20-32 should be used. If atmospheric or other supply air/gas conditions present exhaust freezing issues, a similar type lubricant with an antifreeze component such as glycol may be used.

## 6. TROUBLESHOOTING

### 6.1 Pump runs, but chemical does not discharge at the correct rate

6.1.1 **Suction check valve may be clogged with debris** To flush, open speed control valve fully, allow pump to stroke at this maximum rate for at least 60 seconds, then return to the original setting. If no improvement is noted after three repetitions, remove the suction check valve from body of pump, blow out with air or water pressure, or rebuild if necessary, and reinstall.

NOTE: CheckPoint FailSafe™ check valves do not need replacement when they do not check properly. A simple rebuild kit is available to replace the O-ring, spring, and snap ring, which should correct all but the most severe check problems. If corrosion of the valve body and/or poppet is apparent, a different type of check valve material is indicated.

NOTE: Always replace Teflon™ tape or other appropriate thread sealant on check valve threads during reinstallation to avoid chemical leakage and/or air getting into the chemical head.

6.1.2 **Pump may have lost prime/become "air locked"** Pump should be re-primed as described in *Section 3.1*. If the problem persists, check to ensure that there are no leaks in any process lines, particularly upstream of the pump in the chemical suction lines. If the pump is getting any air through the suction side, the head will eventually lose prime. Please carefully read section 1.1.6 and its subparagraphs for more details. A common source of air in the supply is the block valve ahead of the suction check. Check this valve to make sure the stem packing is tight and that the materials of construction are compatible with the chemical being pumped. Check also that the pump's packing nut is adjusted per *Section 5.1* on page 14. Finally, on pumps supplying chemical into gas lines, it is possible that the discharge check may be leaking, allowing gas under pressure to "back into" the chemical head.

6.1.3 **Check valves may have been re-located away from the chemical head of the pump** The checks must stay directly attached to the head in order to facilitate chemical movement.

6.1.4 **Chemical may be obstructed from entering the pump** Plumbing upstream of the chemical head may have blockage preventing chemical from getting to the suction check valve. A common example is an in-line chemical filter becoming clogged with debris. Solution is to clean out suction plumbing and clean or replace chemical filter.

6.1.5 **Calibration gauge may reading incorrectly due to clogged air vent** If the calibration gauge is not reading correctly, the user may be fooled into thinking the chemical is not getting into the process. Check for an obstruction in the gauge or in the air vent atop the gauge.

### 6.2 Pump does not stroke

6.2.1 **Pump speed control valve may not be turned on** Open the speed control valve fully (counterclockwise) until pump actuates. Then set desired stroke rate as described in *Section 3.2*.

6.2.2 **Air/Gas supply pressure may be too low to overcome the chemical discharge pressure** Open the bleed port on the side of the chemical head. If the pump starts stroking, check to ensure that the supply air/gas pressure is high enough to overcome the chemical discharge pressure. In many cases, a faulty pressure gauge or regulator is at fault. See *Section 1.3.4* on page 7 to determine the minimum supply pressure for your discharge pressure.

6.2.3 **Gas recovery pressure is too high relative to gas supply pressure (Gas Recovery pumps only)** In GR pumps, the pump not only has to overcome the chemical discharge pressure but also the gas recovery pressure. Refer to *Section 2.1.1* on page 8 to determine the appropriate recovery pressure.

6.2.4 **Pump switching valve may be clogged or "gummed-up" with paraffin or trash** Disconnect air/gas supply, then pour any type of oil or solvent into the pump air/gas inlet. Re-connect air/gas supply and open speed control valve. Repeat two to three times if necessary. When pump is running normally, reset pump stroking rate as described in Section 3.2 on page 9.

6.2.5 **Spool may be swollen** Occasionally, certain types of chemicals that are introduced into the motor through the air/gas inlet may be absorbed by the standard spool material, causing it to swell. If, after removal of the housing with the spool still inside, the spool will not move with light finger pressure inside the housing, call CheckPoint to order a replacement spool made of a different material.

6.2.6 **After a repair, alignment screw may have been incorrectly reinstalled** If care is not taken to replace the alignment screw finger tight prior to tightening by wrench, it may be that it has been screwed into the plastic spool rather than into the alignment slot in the spool. Normally this can be corrected by removal of the alignment screw and replacement after properly repositioning the clock position of the spool inside its housing.

6.2.7 **Seals may be worn in the motor** If the pump has been in service for some time, the motor seals may have worn to the point where the pump can no longer switch. If air leakage is constant during stall, worn or damaged seals are indicated. Performing an overhaul on the motor and replacing all seals is required.

### 6.3 Pump strokes erratically

6.3.1 **Supply pressure may be fluctuating** Check supply pressure with an accurate pressure gauge to ensure constant supply pressure. If fluctuations are observed, replace gas pressure regulator, or, if none exists, add a pressure regulator ahead of the air/gas inlet.

### 6.4 Chemical leakage from packing nut

6.4.1 **Packing nut may not be tight enough** Adjust packing nut per Section 5.1 on page 14.

6.4.2 **Packing may be worn** If tightening the packing does not stop leakage, worn or damaged packing is almost certainly indicated. However, prior to replacing the packing, it is important to determine if wear is premature. Common causes of prematurely worn packing are:

6.4.2.1 **Packing nut may have been overtightened** Packing will appear smashed and the elastomer ring will be nearly completely destroyed due to heating and compression.

6.4.2.2 **Chemical may be attacking packing elastomer material** The packing will appear swollen or badly damaged once removed from the packing gland if it is being attacked by the chemical. Contact CheckPoint or your authorized CheckPoint distributor. If the chemical has recently been changed or if the pump has just been placed in service, there is a good chance that new packing materials are needed to do the job.

6.4.2.3 **Chemical may be attacking plunger material** The plunger will be severely worn, pitted, or corroded when inspected. A different plunger material, such as Hastelloy, 17-4 SS or ceramic is indicated.

6.4.2.4 **Chemical may have abrasives suspended in it** The plunger will appear scored and the packing will appear severely worn if trash in the chemical is indicated. To remove such particles prior to entering the pump, CheckPoint offers the ST Series In-Line Chemical Filter available in a range of mesh sizes.

### 6.5 Other problems

If you are experiencing an operating problem not listed above, or if none of the above troubleshooting actions solves your operating problem, please contact your authorized CheckPoint distributor, or call CheckPoint directly at (800) 847-PUMP or (504) 340-0770, to determine appropriate next steps. Once CheckPoint has had the opportunity to help you troubleshoot your problem, please keep in mind the following regarding repairs:

6.5.1 **CheckPoint offers an exchange program to keep you in service** We will ship you a rebuilt pump, which you will be able to install prior to sending us your existing pump. When we do receive your pump, we will tear it down, rebuild it, and report back to you any problems we uncovered, charging you for only those repairs you required. If you bought your pump from a distributor, please contact them directly to arrange for this service.

6.5.2 **Nothing beats factory-direct repairs** Although the Series 1500 has been designed to be easy to operate and to repair, the best way to ensure continued reliable service is to have your pump repaired at the factory. This is the only way to ensure you always get the quality and reliability you invested in when you purchased the product.

6.5.3 **Remember that after you repair your CheckPoint pump, it should perform as well as it did when it was new** If it doesn't, call us to determine what can be done to restore the pump to "like-new" performance.

6.5.4 **Training sessions are available** Please call us to set one up.