BLACKMER LIQUEFIED GAS PUMPS FOR CO_2 SERVICE

INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS

MODELS: CRLR(F) 1¼, CRL(F) 1¼, CRL(F) 1½

962300
INSTRUCTION NO. 785/C

Section	700
Effective	April 1988
Replaces	April 1984

'F' Versions are Discontinued Models

INSTALLATION AND OPERATION

THESE PUMPS MUST ONLY BE INSTALLED IN SYSTEMS WHICH HAVE BEEN DESIGNED BY THOSE QUALIFIED TO ENGINEER THESE SYSTEMS. THE SYSTEM MUST BE IN ACCORDANCE WITH ALL APPLICABLE REGULATIONS AND SAFETY CODES.

LOCATION

Locate the pump as near the source of supply as possible to reduce pipe friction. A good foundation reduces vibration and noise and improves the pump performance. On permanent installations, it is recommended that the pumping units be securely bolted to a concrete foundation.

When new pump foundations are to be cast in concrete, it is suggested that anchor bolts of the type shown in Fig. 1 be set into the concrete.

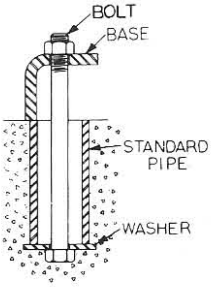


Fig. 1

CO_2 INSTALLATION SUGGESTIONS

1. Install the pump as close to the tank as possible and a minimum of two feet below the tank outlet.
2. The inlet line should be at least as big as the pump intake.
3. The line to the pump inlet port should slope down to the pump from the tank, never up to the pump.
4. A strainer should be installed in the inlet line close to the pump.
   - 4.1 The strainer should be one (1) pipe size larger than the inlet line.
   - 4.2 The strainer basket should have a maximum mesh of 40 (.0165 inches) (0.4191 mm).
   - 4.3 The strainer housing should be rated 600 WOG.
5. Use only internally vented ball valves.
6. High strength, Schedule "80," pipe should be used.
7. The inlet pipe should be insulated.
8. High pressure flexible lines, at least 18″ (0.46 meters) long, at the pump inlet and discharge ports will reduce system noise.
9. An external bypass valve must be used with each pump. The bypass valve limits the maximum pressure differential.
10. Shut off valves and couplings should be provided on both sides of the bypass and the pump for removal and servicing.
11. A pressure gauge, with a needle shut off valve and a bleed valve, installed in the pump discharge gauge hole may be required to record pressure data and to bleed vapor from the pump.

When the unit is first started, rotation should be checked with the direction arrow on the pump. The discharge pressure should be compared to the supply pressure with a closed discharge. If the differential is over 100 psi (7.0 Kg/cm²), the separate bypass valve setting should be reduced.

ALIGNMENT

Where flexible couplings are used, the coupling cover should be removed and a straight edge laid across the two hubs of the coupling as shown in Fig. 2. The maximum offset should be less than .015″ (.381 mm). With a feeler gauge or piece of flat steel, of the proper thickness, check the space between the coupling halves. Insert the gauge at a point in the coupling, and at 90° increments about the coupling. The space should not vary more than .020″ (

Fig. 2

The installation should be checked before being put into operation. Install a pressure gauge in the gauge hole nearest the discharge port provided on the pump casing before starting. Check all valves. The valves in the bypass return line must be open. After the pump is started, check the direction of the arrow on the pump head.

CAUTION

THE PUMP CONTAINS SOME RESIDUAL TEST FLUID AND RUST INHIBITOR. IF REQUIRED, FLUSH PUMP PRIOR TO USE.

CO_2 PUMP START-UP

1. Build pressure in the pump by slowly cracking the valve in the pump discharge line. When the internal pump pressure equals tank pressure, check for system leaks.
2. Open the inlet line valve to its full open position.
3. Jog the pump motor to verify correct rotation.
4. Start the motor. Priming should occur within one minute.
5. If priming does not occur within one minute, shut off the pump and close the pump discharge. Open the bleed valve on the pump discharge gauge hole until "snow" appears at the exhaust. Close the bleed valve, open the discharge line and start the pump. Repeat if necessary.
6. Set the external bypass valve at 25 psi (1.8 Kg/cm²) higher than the system operating pressure.

   NOTE: Refer to Blackmer "Sales Policy" Page One/1 for warranty, order, inspection and service policies.

TO REVERSE PUMP ROTATION

Remove bearing covers and locknuts from both heads, and the head from the shaft side. Reverse the rotor and shaft so that the shaft protrudes through the head still on the casing.

The vanes must be reversed in the slots so that the pressure relief grooves face in the direction of rotation. The rounded or wearing edge of the vanes must be outward to contact the bore of the liner. See sections DISASSEMBLY and ASSEMBLY for removal and replacement of head and rotor.

MAINTENANCE

MAINTENANCE AND TROUBLE SHOOTING MUST BE DONE BY AN INDIVIDUAL EXPERIENCED WITH PUMP MAINTENANCE AND THE TYPE OF SYSTEM INVOLVED.

LUBRICATION

Pump bearings should be lubricated every three months.

Use Standard Oil - Amolith All Weather Grease. (must be paraffinic base)

Apply grease with a hand pressure gun until it appears at the grease relief fitting.

It is normal for some grease to escape from the tell-tale holes under the bearing covers for a short period after lubrication. If this condition persists, the head must be removed and the mechanical seal replaced.

On motor-driven units using a gear reducer, the oil in the gear case should be maintained to the oil level plug hole, and changed every 6 months.

DISASSEMBLY

DO NOT ATTEMPT TO OPEN THE PUMP UNTIL YOU HAVE BLED OFF THE PRESSURE.

This model uses threaded locknuts and lockwashers against the bearings to protect the pump from end thrust. To remove the head, first remove the bearing cover. Wipe the grease off the locknut to locate the lockwasher tang staked into one of the locknut slots. Pry the staked tang up with the blade of a small screwdriver, and remove the locknut. Remove the head capscrews. The 2 pump heads are not interchangeable, identify the location of each head before removing. Each head is located by two (2) tapered pins and has a threaded jackscrew hole to facilitate head removal. Insert a bearing cover screw in the jackscrew hole to pull the locating taper pins out of the housing.

When the head is removed, the stationary seat of the seal will come off with the head. The rest of the seal can then be slid off the shaft as a complete unit.

If the seal has been leaking, it is advisable to replace the entire seal, including the stationary seat and the "O" ring. It is important to keep all parts of the seal clean. Before installing a new seal, the shaft should be thoroughly cleaned and all burrs and roughness removed with emery.

Slide the disc and head "O" ring off the rotor shaft. Inspect vanes for damage. If the outer edge of the vanes are torn or chipped, it is advisable to pull the rotor and check for liner damage. A damaged liner may be removed by tapping around its largest diameter with a wooden dowel and hammer.

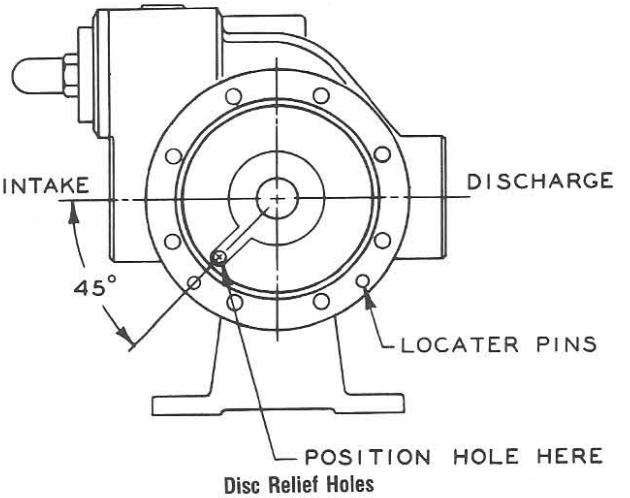
Some scoring of the rotor O.D. may occur due to weld splatter or other abrasives in the fluid. If this condition has occurred, remove any burrs from the vane slots and check the push rods for free movement in the push rod holes. Binding push rods will require replacement of the rotor and shaft assembly.

ASSEMBLY

Before assembling, clean each part thoroughly. Wash out bearing and seal recesses.

Make certain the embossed word "INTAKE," on the liner, faces the intake port of the pump casing.

With the liner "INTAKE" towards the casing intake port, start the liner into the casing. The liner keyway must be aligned with the pin that extends into the liner bore of the casing. Lightly tap, around the edge of the liner, with a plastic or lead hammer to install the liner.



Disc Relief Holes

Fig. 3

Install the disc, with the cavity side out, and the disc hole located as indicated in Fig. 3. Install the head "O" ring in the groove between the disc and the casing. Place the seal jacket assembly, in the disc cavity with the drive tang in the center hole. Install the rotating seal face and "O" ring in the seal jacket assembly and the stationary seat in the head. It is very important that all grease and oil be kept off the mating seal faces.

Use the taper pins to locate and center the head. The seal spring must be partially compressed, by holding the head against the casing, while starting the head capscrews. Pull the head down evenly before tighting the capscrews.

The direction of the pump rotation must now be selected. If the pump is to be right-hand (R.H.), the intake port must be on the right and the drive end of the rotor shaft must be pointing towards the observer. A lefthand (L.H.) pump would have the intake port on the left and the drive end of the rotor shaft pointing towards the observer.

Put a light coating of clear oil on the rotor shaft, and the threads on both sides of the rotor. Slide the two (2) push rods into the holes in the rotor vane slots. Install the four (4) vanes with the metal wear plates toward the shaft centerline and the grooves facing the direction of the rotation (see Fig. 4). Refer to pump rotation, in the preceding paragraph, and carefully insert the correct end of the rotor shaft through the seal assembly in the installed head. Care should be taken to avoid "O" ring damage. Slowly rotate the rotor shaft to engage the seal drive tang.

After the rotor and shaft has been installed use the same procedure as listed above to install the second disc, seal assembly, head, and bearing.

Install both bearing lockwashers and locknuts but do not tighten. While rotating the rotor shaft tighten one locknut until a very slight drag is noted. Tighten the second locknut until the drag disappears. Tighten or loosen each of the two (2) locknuts to align with the closest lockwasher tang. Stake the lockwasher tang into the slot in the locknut. Check the pump for free turning and install gaskets and bearing covers.

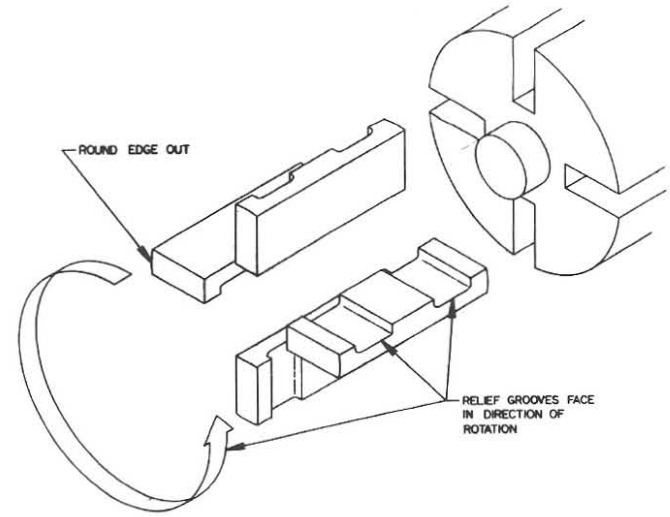


Fig. 4

PUMP TROUBLES AND THEIR CURES

LEAKAGE

Mechanical seals can be damaged and begin leaking from using the wrong grease, greasing with a high pressure gun, dirt or abrasive particles entering between the seal faces, cut or otherwise damaged "O" rings. Leakage may appear at the drain holes under the bearing housing on the pump head. If leakage occurs, the entire mechanical seal assembly should be replaced. After rebuilding a pump, if leakage appears from between pump casing and the head, remove the head and inspect the head "O" ring for cuts and nicks. Damaged "O" rings must be replaced.

VANE WEAR

Vane wear and push rod penetration are usually caused by excessive vapors entering the pump (called cavitation) or by abrasives in the liquid. Cavitation causes the vanes to "bounce" violently and sometimes is accompanied by noise and vibration. The inlet line should be at least as large as the pump intake. For longer runs the pipe diameter should be increased.

Cavitation can be caused by circulation of liquid through the built-in relief valve on the pump, or through the separate bypass valve improperly piped back into the intake pipe. It can also occur if the pump valve operates at a lower differential pressure than the separate bypass valve, even though the separate bypass valve discharges into the supply tank. Check the setting of the separate bypass valve.

Cavitation is also caused by restricted intake piping, plugged or too fine a strainer basket, and the use of globe valves instead of internally vented ball valves.

All the above conditions are aggravated if the pump is running too fast and is trying to deliver liquid faster than the piping can handle it.

One or more vanes installed backwards will cause noise and loss of capacity.

ESCAPING GREASE

Grease escaping from the tell-tale holes under the bearing housing or from the grease relief fitting on the bearing cover is normal for a short period of time after greasing the pump. If grease continues to come from these places, the grease relief fitting, the bearing grease shield and the mechanical seal should be inspected for damage. (A slow leak past the seal could be washing grease out of the bearing.) If grease escapes around the pump shaft, the seal in the bearing cover should be removed and inspected for damage.

LOSS OF CAPACITY

Probable causes:

1. Closed valve in pipe line . . . it is important to check valves in the system before starting the pump.
2. Cavitation and Vapor binding . . . may be caused by circulation of liquid through the relief valve. This might happen if the separate bypass valve is too small, or if the piping on the valve is too small. It can also be caused by the pump overheating.
3. Pump rotating backwards . . . check rotation of the pump with the arrow on the casing.
4. Suction line too long . . . locate the pump as close to supply as possible. It is easier for a pump to push liquid through a discharge pipe than pull it through suction pipe.
5. Excessively worn vanes, discs, and rotor ends . . . will increase pump slippage. One or more vanes installed backwards will reduce capacity.

DAMAGED PUMP PARTS

Worn or scored discs and rotor ends can be caused by improper adjustment of the locknuts (see ASSEMBLY). Excessive wear of vanes, discs or rotor ends increase pump slippage. Worn parts should be replaced. Corrosion of pump parts can also be caused by calcium chloride brine carried over from dehydrators. Corrosion may damage internal parts and weaken the entire system. Corrective action should be taken immediately to eliminate the cause of corrosion.

NOISE AND VIBRATION

The most frequent cause is recirculation through the pump relief valve, caused by malfunction of the separate bypass or high bypass setting.

Another cause is excessive cavitation from a restricted intake, dirty strainer, too long or too small intake pipe.

Finally, one or more vanes installed backwards may be a possible cause.

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