

BLACKMER POWER PUMPS

INSTALLATION, OPERATION, AND MAINTENANCE INSTRUCTIONS

**MODELS: HXL(S)6F-N, HXL(S)8F-N
HXL(S)6E-N, HXL(S)8E-N**

960230

INSTRUCTIONS NO. 185/E

Section	100
Effective	July 1985
Replaces	November 1982

DISCONTINUED MODELS

PARTS AVAILTILITY MAY BE LIMITED INSTALLATION

WARNING

THIS PRODUCT MUST ONLY BE INSTALLED IN SYSTEMS WHICH HAVE BEEN DESIGNED BY THOSE QUALIFIED TO ENGINEER SUCH SYSTEMS. THE SYSTEM MUST BE IN ACCORDANCE WITH ALL APPLICABLE REGULATIONS AND SAFETY CODES AND WARN OF ANY HAZARDS UNIQUE TO THE PARTICULAR SYSTEM.

RECOMMENDED USES AND LIMITATIONS

The HXL models are equipped with composition vanes and Buna-N fitted mechanical seals which are suitable for most petroleum products. For higher temperatures and/or viscosities above 10,000 SSU, extra clearance rotor and shaft and bronze faced seals are available. The HXLS models have similar features as the HXL above, but are equipped with Teflon seals. These models also offer Viton for certain applications where chemical compatibility and/or temperatures dictate.

A solid foundation reduces vibration and noise and improves pump performance. On permanent installations, it is recommended that the pumping unit be secured by anchor bolts as shown in Figure 1. This arrangement allows for slight shifting of position to accommodate alignment with the mounting holes in the base plate.

For new foundations, it is suggested that the anchor bolts be set in concrete. When pumps are to be located on existing concrete floors, holes should be drilled into the concrete to hold the anchor bolts.

When installing units built on channel or structural steel type bases, use care not to twist the base out of shape when tightening the anchor bolts. Shims should be used under the edges of the base prior to tightening the anchor bolts to prevent distortion.

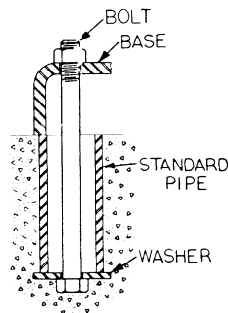


Fig. 1 — Pipe Type Anchor Bolt Box

PIPING

Before installing any piping, a complete piping diagram should be made, and pipe friction, suction lift, discharge head, vacuum and total pressure on the pump should be computed. These calculations can be made by following procedures outlined in the Blackmer Engineering supplements. Without these computations it is almost impossible to determine beforehand whether a pumping installation will work properly.

Restrictions in the pipe line should be avoided, such as elbows, sharp bends, globe valves, certain type plug valves, and undersized strainers. Suction lines in particular must be as straight and short as possible.

It is very important that there be no air in the intake line. If practical to do so, apply air pressure to the completed pipe line to check for leaks.

When pipes are subject to wide variations in temperature, provision should also be made to compensate for pipe expansion and contraction.

Piping should be well supported so as not to impart any strain to the pump body. Piping should not be suspended on loose, strap-like supports, but should be well anchored to solid supports at frequent intervals to prevent vibration.

The use of check valves or foot valves in the supply tank is generally not recommended with a self-priming, positive displacement pump and can often cause considerable trouble. If a valve in the discharge line is closed while the pump is operating it causes liquid to recirculate through the pressure relief valve, the liquid heats up and expands. A check valve in the suction line prevents the expanding liquid from returning to the supply tank, causing a build-up of pressure on the pump and in the piping system. The result can be excessive leakage at the pump or at pipe joints. If a check valve is required, locate it near the pump on the discharge side.

MANUAL BYPASS VALVE

A bypass line from the pump discharge to the pump suction with a manual shut-off valve is recommended when handling volatile liquids or viscous liquids at a high lift, or when delivering to piping too small to take the full flow from the pump.

The following sizes of manual bypass valves and recirculating lines are normally recommended.

6" pump 2" valve and piping
8" pump 3" valve and piping

When handling very viscous liquids, excessive pressure may develop when starting. To avoid possible damage to the pump, open the valve before starting. After the pressure stabilizes and the pump is running smoothly, close the valve slowly.

As viscous liquids with "light ends" are heated to a high temperature to lower the viscosity, the amount of volatile product given off is increased. The resulting cavitation may cause the pump to become very noisy and begin vibrating. By cracking the manual bypass valve open and permitting some of the liquid to recirculate, the noise and vibration can be reduced to an acceptable level.

If pump noises and vibration cannot be controlled with the manual bypass valve, look for other causes under "Noise."

STRAINER

A strainer is recommended to protect the pump from damage by foreign particles. The strainer should have a set open area of at least four times the size of the pump suction. For viscosities over 1,000 SSU, use a strainer one or two sizes larger than normal for greater area. It should be inspected and cleaned at regular intervals.

LUBRICATION

Before starting, put oil in the gear reducer. Couplings with rubber inserts do not require lubrication. Other couplings are

pre-lubricated at the factory, but require frequent lubrication to prevent excessive wear.

CHECKING ALIGNMENT

The alignment of motor, gear reducer, and pump is often disturbed in transit and must be checked before the unit is put into operation.

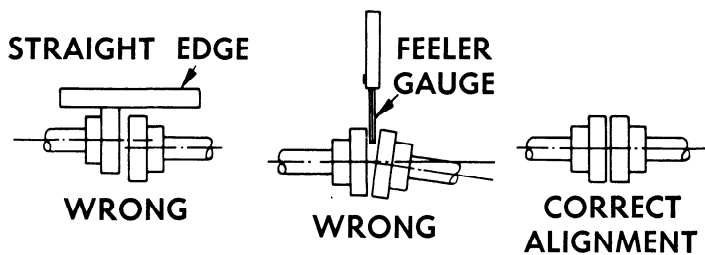


Fig. 2—Alignment Check

On those units on which 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. With a feeler

gauge, or piece of flat stock, check the angular misalignment of the coupling halves. Check in four places at 90° increments about the periphery of the coupling. Maximum variation in this spacing should not exceed .020". Misalignment is not desirable. If it does exist, it should not exceed the above limits.

Check alignment of pipes to pump to avoid strains which might later cause misalignment. Unbolt flanges or break union joints. Pipes should not spring away or drop down. After pumps have been in operation for a week or two, completely recheck alignment. See Fig. 3.

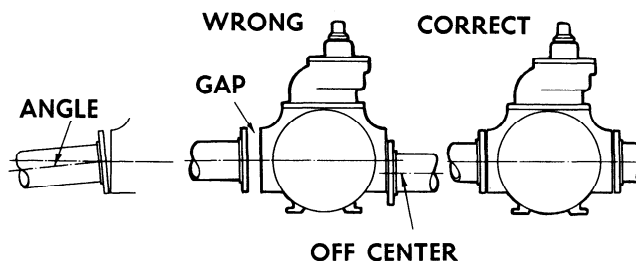


Fig. 3—Pipe to Pump Alignment

OPERATION

PUMP PERFORMANCE CHECK

It is usually desirable to make a running check of a pumping system before putting it into operation. The main points to check are general operation of the system, leakage from piping and equipment, direction of pump rotation, proper pump speed, noise level of the pump, pumping rate, and shut-off pressure.

Whenever a new pump is first started, it should be watched carefully for several hours and checked for signs of malfunction.

If the pump is abnormally noisy, follow the checking procedures outlined under "Pump Troubles and Their Cures:"

ROTATION

A right-hand pump rotates clockwise with the intake on the right side when viewed from the shaft end.

RUNNING PUMP IN REVERSE

It is sometimes desirable to reverse the pump for draining a line. The pump is satisfactory for this type of operation if a separate pressure relief valve is provided to protect the pump from excessive pressures when pumping backwards against a possible closed valve; operation in reverse may cause an increase in noise and vibration.

FLUSHING THE PUMP

Liquids which solidify when cold or which might otherwise damage the pump after prolonged contact or would contaminate other loads should be flushed out.

Drain the pump and lines by pumping air. Then pump flushing liquid to clean the pump. Close the discharge line for 3 minutes while pumping. This will flush out the relief valve.

TO REVERSE PUMP ROTATION

Important—The liner, vanes and relief valve must be reversed when changing pump rotation. Remove bearing covers from both heads and the head from the shaft end. Remove the liner and reverse.

Reason: Liners, depending on time of manufacture, have what is termed "cavitation suppression grooves." These are shallow ports in the porting area on the discharge side of the pump. If the cavitation suppression grooves are on the inlet

side, the pump will be starved and cavitation and noise will take place. Reverse the rotor and shaft so that the shaft protrudes through the head still on the casing. The vanes must be reverse 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 "Maintenance" for removal and replacement of heads and rotor. See Fig. #4 for reversing relief valve.

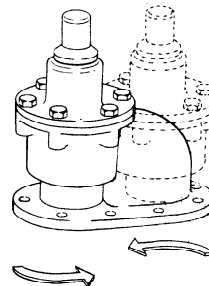


Fig. 4—Reversing Valve

CLEANING PRECAUTIONS

New tanks require careful cleaning to remove weld splatter, slag, scale and other foreign matter before filling with liquid. Suction pipes from the tank to the pump should be flushed before attaching to pump. Foreign matter entering a pump can cause extensive damage.

RELIEF VALVE

Blackmer HXL and HXLS pumps are supplied with relief valves which are bolted onto the pump body. Their purpose is to protect the pump and discharge system from excessively high pressure. Flow to be bypassed if throttled. Blackmer relief valves are designed for satisfactory operation with a partially closed discharge line on most types of installations. This allows reduction of the flow from the discharge piping without slowing down the speed of the pump; for a limited time.

When pumping highly volatile liquids under a high suction lift, when cavitation or starving of the pump exists, partial closing of the discharge valve will result in excessive noise in the relief valve. When it is necessary to operate under these conditions, a separate relief valve piped back into the storage tank is recommended.

Relief valve setting should be 20 PSI higher than the operating pressure. To increase the pressure setting, remove the cap, loosen the locknut, and turn adjusting screw inward, or clockwise. To reduce the pressure setting, turn the screw outward, or counter-clockwise. See parts list for spring ranges.

To check the pressure setting of the relief valve, install a pressure gauge at the gauge hole on the discharge side of the pump and check its reading with a valve completely closed in the discharge line.

MAINTENANCE

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

LUBRICATION

The bearings are completely protected from the pumpage. For average service, they need lubrication every three months.

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

Apply grease very slowly with pressure gun until grease begins to escape from the grease relief fitting.

NOTE: To grease the bearings the shaft should be turning to insure grease penetration into all parts of the bearing. To flush the bearing, continue greasing to force the old grease out of the grease relief fitting. Follow lubrication instructions on gear reducer.

DRAINING PUMP

If the pump is to be used with more than one type of liquid, it may be desirable to drain the pump to prevent contamination. To "blow out" the pump, run the pump with discharge pipe open and the intake valve closed, and bleed air into the pump intake through the gauge plug hole.

MECHANICAL SEALS

If the mechanical seal has been damaged, evidence of leakage will appear around the shaft. It is normal for new seals to leak very slightly until they are well worn in. If leakage becomes excessive, the mechanical seals should be replaced.

All parts of the seal must be kept clean. Before installing a new seal, remove all burrs and smooth all rough spots on the shaft. The sealing components are delicate and should be handled carefully to avoid damage to the highly polished surfaces. Place a small amount of oil on the "O" rings so that the seal will slide easily. Place the rotating half of the seal on the shaft and engage the two seal jacket prongs in the notches in the shaft or seal drive collar. Place the stationary seat of the seal in the recess in the head or in the case of the HXL, HXLS8, the bearing hub, with the polished face in view. When placing the head on the shaft avoid striking the end of the shaft against the face of the seat. Tighten the head cap-screw. See also the "Pump Assembly" instructions.

DISASSEMBLY

Most all repairs can be made by removing only one head and without removing pump from its mounting. If complete disassembly is necessary, use the following procedures:

NOTE: A forged type eyebolt may be used on the large

pumps to serve with the aid of a hoist in handling the heavier parts of the pump. The eyebolt may be used in the threaded holes provided in head, casing, discs, and the rotor.

If complete disassembly is intended on the pump, it is advantageous to place the pump on its inboard side—shaft down. Otherwise, proceed as follows with the pump on its feet.

HXL, HXLS8—First drain the pump by removing the 3/4" pipe plug located in the head. Then remove bearing covers and shaft locknuts. The locknuts can be removed by bending the lockwasher tabs out of the slot in the locknut. Remove the locknut with a hammer and punch. Remove the capscrews from the hub. The stationary seat of the seal and its "O" ring will slide off the shaft with the hub as a unit. Balance of disassembly is the same as other HXL models.

Remove two head capscrews and screw them into the tapped holes near the outer rim of the head. (Insert an eyebolt in the top of the 8" heads and use a hoist for support.) Remove remaining capscrews and tighten the two in the tapped holes until the head separates from the casing. Remove the head, being careful not to scrape or nick the shaft.

The stationary seat of the seal and its "O" ring will slide off the shaft with the head on models HXL6 and HXLJ8.

Remove the disc. If stuck in the casing, it may be forced out by running screws down in the threaded holes provided near its outside diameter.

Pin-lok vanes can be removed or replaced by sliding them out the rotor ends. This should be done with the vane seated in the bottom of its slot, which is easily accomplished by replacing each vane when rotated to a position at the top of the rotor. See Fig. #5

When the head assembly and disc have been removed from the pump, the liner can usually be withdrawn by prying with a bar. The tip of the bar is inserted into the port openings of the liner. By prying against the rotor the liner can be partly removed. Using a block under the bar against the rotor will assist in bringing the liner the rest of the way. If the liner cannot be removed with a bar, it will be necessary to remove the rotor and shaft and the other head. Then, using a block of wood or a piece of brass against the end of the liner, drive it out with a hammer. Also, if the vanes are swollen or jammed in their slots, it may be necessary to remove either the remaining head or the rotor-and-shaft in order to drive out the vanes. Removal of the push rods requires removal of the rotor-and-shaft. If the rotor-and-shaft assembly is to be removed while the pump is on its feet, a shim must be placed between the rotor and the liner to prevent the rotor from dropping onto the liner when it is pulled clear of the inboard bearing. Wood blocks will serve this purpose and also make it easier to pull the rotor-and-shaft assembly out of the casing.

ASSEMBLY

Before reassembling pump, clean each part thoroughly. Wash out the seal and bearing recess, remove any burrs from the rotor and liner with a file.

Use eyebolts with the aid of a hoist to install the liner, rotor-and-shaft, disc, and the head assembly on the 8" pump. Tapped holes have been provided in each part for this purpose.

Starting with outboard side of the pump, assemble head (and hub on models HXL(S)(D)8) and bearing. Using a gasket attach bearing cover loosely. Install stationary seat in head (use two small screws and washers to secure seat with "Loctite" on screws on HXL (S)(D)8. Install the disc in casing with smooth side of disc towards casing and position pressure hole at six o'clock. Place "O" ring in head and attach head to pump casing.

With the aid of a little grease, install the liner. The keyway, in the top of the liner, should be lined up with the pin in the top of casing. The cast word "intake" on the top of the liner for the 8" pump should go toward the intake side of the pump. The 8" liners are not symmetrical in that the discharge ports are shorter than the intake ports. The liner of the 6" is symmetrical.

If the pump is on its feet, place vanes in the three bottom slots of the rotor and insert all the push rods. Slide the rotor-and-shaft assembly into the liner chamber, taking care that the shaft does not strike and damage face of the disc or seal when locating it in the bearing hole. Do not let the three bottom vanes and push rods drop out of the rotor. Install the remaining three vanes. New vanes must be installed with the rounded edge outward from the shaft and the relief grooves faced in direction of rotation.

If the rotor is being installed with the pump on its side, install the push rods in the rotor before it is lowered into pump and position them so that the vanes may be dropped into their slots after the rotor is installed. Insert the vanes by pushing the push rods with a screwdriver until each slot is clear for a vane to drop in place. Install the remaining disc, with the pressure hole located in the six o'clock position (by pump feet).

PIN-LOK VANES

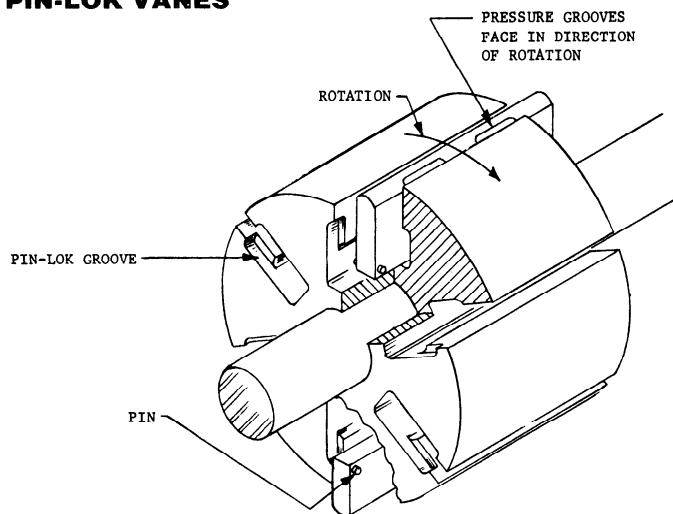


Fig. 5—Pin-Lok Vanes

During 1965, Pin-Lok vanes became standard construction. The Pin-Lok vane cannot be used in old style rotors without first driving out the pins. Old style vanes are offered in the parts list for use in old style rotors and may be used in Pin-Lok rotors if necessary.

The Pin-Lok construction prevents worn out vanes from falling out of their slots and wedging themselves within the pump.

Before putting the seal on the shaft, be sure the shaft is clean and free from burrs which might cut the rubber "O" ring or Teflon seal. Put a small quantity of oil on the shaft so the seal will slide easily. Place the rotating half of the seal on the shaft and engage the driving prongs with the key seats in the end of the rotor.

Wipe all traces of dirt or dust from the face of the seal with clean tissue paper. Check to make sure the polished face of the seal is outward. The stationary seat of the seal is placed in the recess in the head, or in the case of the HXL, HXLS8, the bearing hub, with the polished face in view. Great care should be used so that the face of the seal is not scratched or that the "O" ring is not cut or damaged.

When placing the head or hub on the shaft, avoid striking the end of the shaft against the seal face. Tighten the head stud nuts or capscrews, replace bearing and test the pump for alignment by turning the shaft with a lathe dog or coupling. If binding occurs, loosen the head fasteners and tap the rim of the head with a mallet until binding is relieved and shaft turns freely. Tighten capscrews and recheck for free turning.

HXL8 & HXLS8 LOCKNUT ADJUSTMENT

The pump must be free turning with all head capscrews tight before making an adjustment on the locknuts. The purpose of locknut adjustment is to locate and center the pump rotor between the discs with approximately .002 of an inch clearance on each end of the rotor.

It is very important that the bearing locknuts are installed properly. Overtightening locknuts will cause bearing failure. Loose locknuts will allow the rotor to wear into the discs.

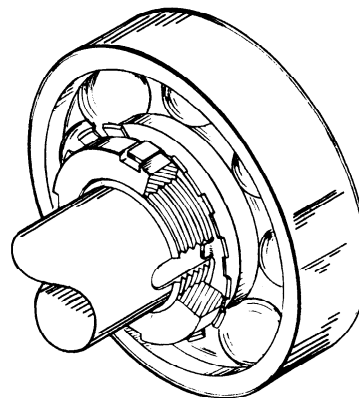


Fig. 6—Locknut

Following is the proper method for installing locknuts and lockwashers. (See Fig. 6).

- 1) Slide the lockwasher on the shaft with the tangs facing outward.
- 2) Start the locknuts on the threads with the tapered face inward.
- 3) With one locknut backed off, tighten the other until the shaft begins to bind or turn hard.
- 4) Now, back off the nut about 1/32 to 1/16 turn (about the width of a tang on the lockwasher and secure it by bending over a tang of the lockwasher into the slot of the locknut. Pump shaft must now turn freely.
- 5) Tighten the other locknut until it is snug against the bearing with the bearing seated firmly in its recess. Then tighten the nut about another 1/16 turn and lock it in place with a tang of the lockwasher.

Apply a small amount of grease to the lip of the grease seal and install with the lip outward. Attach a bearing cover gasket and bearing cover on each end.

PUMP TROUBLES AND THEIR CURES

LEAKAGE

If the mechanical seals leak, leakage will appear around the shaft. New seals may leak slightly at start-up, but should seal shortly after start-up. If leakage is excessive, the seals should be replaced. Refer to the section on "Mechanical Seals."

If leakage appears between the cylinder and head, the head should be removed. Inspect for burrs, dirt, or a defective head "O" ring.

ESCAPING GREASE

On new pumps, and older pumps after greasing, it is normal for some grease to work out of the grease-relief fitting on the bearing cover, or out of the drain holes under the bearing housing. If grease continues to come from these places, the grease-relief fitting should be removed and inspected for damage or the bearing removed and its grease shield inspected for damage.

If grease escapes around the pump shaft, the bearing cover should be removed and the grease seal examined. Reinstall the bearing cover with the grease seal centered on the shaft and properly greased.

NOISE

Noise can be caused by excessive vacuum on the pump due to starved suction, causing cavitation or vaporization of the liquid. A vacuum gage applied to the gage connection on the suction port should normally register no more than 18 inches of mercury on cold non-volatile liquids. More than 18" Hg is acceptable providing there is not excessive noise. Obviously during a stripping operation vacuum may exceed 18" Hg and some noise may be encountered for a short period of time. On hot liquids with volatile light ends, such as Bunker C and asphalt, the delivery rate may decrease when the vacuum exceeds 8-10" Hg. Usually cavitation noise and vibration is noticeable at this point. There are several possible causes of high vacuum on the pump. The piping may be too long, or too small a diameter. The strainer may be dirty, or plugged, use of plug or Globe valves or the speed too high for the viscosity of the liquid being pumped. The suction lift may be too great. The point of vacuum where noise becomes critical (accompanied by rapidly decreasing delivery) depends largely on the volatility of the liquid being handled (see section "Low Delivery Rate").

If the pump is run at speeds exceeding the recommendation maximum, the noise will be abnormal.

If the pump is run for extended periods of time with closed discharge and liquid circulating through the relief valve, the liquid will begin to vaporize and cause increasing noise.

If the vacuum is not excessive and the pump is still noisy and does not deliver the rated GPM, the vanes should be examined for possible damage. The vanes might also have been installed backwards when the pump was previously serviced.

Entrained air or vapors in the liquid entering the pump is another cause. Pipe joints should be checked for leakage of air. Sometimes when recirculating liquid in a tank, the returning liquid falling through the air carries air down into the tank which eventually gets back into the pump, causing noise and vibration.

Occasionally foreign materials will lodge in a suction line causing starvation of the pump. Sometimes valve gates will come loose from valve stems and close. Pipe lines improperly supported will magnify vibrations due to slight pump pulsations. If the vacuum is not excessive, and the pump is still abnormally noisy, the vanes, liner, and discs should be examined for possible damage or excessive wear. Pin-Lok vanes will make a clicking sound when worn out.

LOW DELIVERY RATE

Slow pumping rate may be caused by slow operating speed, a low relief valve setting, dirty strainer, restriction in the suction line, resistance in the discharge line, air leak in suction line, or by damaged or worn out parts in the pump.

DAMAGED VANES

Composition vanes can be damaged by pumping abrasive liquids, by foreign objects entering the pump, or by pumping liquids of too high viscosity. Swelling of the vanes may be caused by excessive heat (result of overspeeding), or by liquids which attack the vane materials.

Metallic vanes can also be damaged by foreign objects entering the pump or by excessive wear if used for handling non-lubricating liquids. Excessive speed can also cause damage to metallic vanes. See section on "Recommended Uses and Limitations" on Parts Page.

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