



SERIES 'R' MAGNETIC COUPLED PUMPS

OPERATION AND
SERVICE GUIDE
O-188
MAY 1993

Refer to Parts List P-4175.

DO NOT RUN DRY

This pump is NOT self-priming. The pump must be filled with liquid before starting, otherwise severe damage will occur.

SPECIFICATIONS

Maximum Viscosity	3000 SUS
Maximum Temperature	210° F
Maximum Internal pressure	150 PSI
Maximum Bending Moment on flanges	
1½ x 1 Suction	2,700 Ft-lbs
1½ x 1 Discharge	825 Ft-lbs
3 x 2 Suction	6,100 Ft-lbs
3 x 2 Discharge	1,800 Ft-lbs
4 x 3 Suction	7,400 Ft-lbs
4 x 3 Discharge	3,100 Ft-lbs

CAUTION

Read all instructions before attempting to remove pump from the shipping container, or to set-up for operation. Since this pump is used with hazardous materials, it is extremely important that the pump is installed and operated correctly to eliminate any possible mishaps that may be detrimental to property or personnel. Keep the manual handy for future reference.

DESCRIPTION

The Series R pump is a magnetically driven pump (seal-less) designed according to dimensions as specified on ANSI B73.1 with some minor exceptions. This will allow complete interchange with any competitive pump that meets ANSI B73.1 standards.

All plastic parts that come in contact with the solution being pumped are ECTFE and other carbon fiber filled fluoroplastics. Other materials that contact the solution are the bushings which may be carbon or silicon carbide. The mouth ring is constructed of carbon fiber filled TFE or silicon carbide; the shaft and mouth ring parts are silicon carbide. Be sure to check chemical resistance charts for this pump against the chemicals that you will be using.

Suction and discharge flanges are ANSI 150 pound.

Both close coupled and long coupled pumps are designed with a back pull-out for easy maintenance and are for clean liquids only with viscosities under 3000 SUS.

PRE-INSTALLATION

Your pump is shipped mounted to a wood skid and covered by a corrugated carton. Both suction and discharge flanges are covered by plastic caps for additional protection. Remove the carton and carriage bolts that hold the pump to the skid. At this time inspect the pump carefully to be sure that no damage has been incurred in shipping. If damage is noted, you must notify the shipping company of this fact as they are responsible for handling the shipment.

Turn the impeller, using a screwdriver in the motor fan for close coupled pumps or rotate the drive shaft for long coupled pumps, to check for binding that may indicate hidden damage during shipping.

SAFETY PRECAUTIONS BEFORE STARTING PUMP

1. Read operating instructions and instructions supplied with chemicals to be used.
2. Refer to Chemical Resistance Chart for compatibility of materials in pump with solution to be used.
3. Note temperature and pressure limitations.
4. Personnel operating pump should always wear suitable protective clothing; face mask or goggles, apron and gloves.
5. All piping must be supported and aligned independently of the pump.
6. Always close valves slowly to avoid hydraulic shock.
7. Ensure that all fittings and connections are properly tightened.

BEFORE CHANGING APPLICATION OR PERFORMING MAINTENANCE

1. Wear protective clothing as described in item 4 above.
2. Flush pump thoroughly with a neutralizing solution to prevent possible harm to personnel.
3. Verify compatibility of materials as stated in item 2 above.
4. Shut off power to motor at disconnect switch.
5. If the pump is to be disassembled, be sure to flush the interior and exterior with water to eliminate all acids and chemicals that may have been used in the pump. Since the pump is not equipped with a drain plug, and since more liquid than normal will remain in a magnetically driven pump; an additional flush may be required after loosening the fasteners.
6. Check the piping occasionally to be sure that all joints are secure and that no leaking has occurred anywhere in the system.

ELECTRICAL CONNECTIONS AND DRY RUNNING

The only moving parts inside the pump volute are the impeller magnet assembly and bushing which rotates on the porcelain shaft. If the pump is run dry with no liquid inside the volute, it will damage the bushing and possibly the impeller. Short runs of 15 seconds or less will not damage the pumps. This will allow you to check your electrical hook-up. The electrical wiring diagram is located inside the cover of the motor conduit box. The motor fan must rotate in a clockwise direction when viewed through the fan cover of the motor. The motor is rated for continuous duty.

ELECTRICAL

The motor must be wired by a qualified electrician according to the National Electrical Code and the local electrical code. The pump must always be grounded. Motor protection must be supplied by the user in the form of circuit breakers or fuses according to the "Full Load Amps" rating as specified on the motor.

The motors supplied are either totally enclosed fan cooled (TEFC) or (TEFC) chemical duty. Explosion proof is available for some applications.

INSTALLATION

1. The pump and motor should be installed as close to the tank or source as possible. This will keep the suction line short and direct.
2. Valves should be installed in the suction line and discharge lines to isolate the pump from the liquid source or to regulate the flow in the discharge of the pump. Do not use the suction line valve for throttling the flow.
3. Use proper gaskets between the flanges to the pump and piping system. Tighten flange bolts securely to prevent any leakage.
4. The pump and motor should be mounted on a base which, in turn, should be fastened securely to the floor. Never set the pump in its operating position without securing the pump so that it cannot move out of position.
5. Suction lines should be as large as the inlet port size or the next size larger if the piping length is long. Never reduce the suction piping size.

OPERATING TIPS

1. PIPING

Support piping near pump to minimize strain on pump casings.

To minimize head loss from friction:

increase pipe size 1 diameter

use minimal number of bends

Keep bends a minimum of 10 pipe diameters away from suction.

Poor NPSH available will cause premature bushing wear.

Position pump as close to liquid source as possible.

Maintain flooded suction whenever possible.

Ensure that piping is leak-proof.

For units in suction lift system, install appropriate piping in discharge to allow for priming of pump. Use discharge valve to regulate flow. Do not use suction valve for throttling pump.

2. Cavitation for any reason is detrimental to the pump, therefore, the use of a priming chamber to assure flooded suction is desirable. Be sure inlet is not restricted in any way, either by the use of a valve or abnormal hose size in relation to the discharge flow. Make certain air used to agitate solutions is prevented from entering the pump in sufficient quantities which would cause cavitation. Cavitation is evidenced by pulsing flow or spurts and indicated on a pressure gauge by accelerated highs and lows. Look for wear on the thrust washer and bushing in the impeller magnet. Replace

worn parts immediately, otherwise impeller magnet assembly will not remain in line and wear the liner.

CAUTION: Do not pump liquids that contain suspended iron fines which will be attracted to the strong magnetic fields of the impeller magnet, and thus damage internals. Also solutions with heavy concentrations of salts should not be allowed to stand in pump for extended time. Flush out.

Keep away from metallic particles.

Make sure drive magnets are free of metal chips.

REPAIR PARTS

It is suggested that certain repair parts be kept on hand in the event of a breakdown. This will keep the down time to a minimum. Check the parts list for the recommended spare parts.

START-UP

1. Check all piping and electrical wiring before the motor is energized. Motor direction must be checked before running the pump.
2. Open the suction line and discharge line valves. The pump must have fluid in it before attempting to start, as running the pump dry could be disastrous.
3. Jog the motor and observe the direction of rotation by looking at the motor fan through the fan cover. The proper direction is clockwise as viewed for this end. If the direction is opposite, interchange any two of the three wires coming into the conduit box (three phase current). Again jog the motor and make sure the direction is correct.
4. Start the motor and listen for any unusual noise that may indicate that something is wrong. If so, shut-off the motor and investigate.

Run the pump at the desired flow and head. Check each electrical line coming to the motor L1, L2, & L3 with an amp probe. Make sure that the current measured at that voltage is less than that specified on the motor name plate. If the current measured is above the specified name plate current, reduce the pump flow until it meets specifications. All (TEFC) motors have a 1.15 service factor capable of carrying 15% overloads for short periods of time. Most Explosion Proof motors will have a 1.0 service factor.

SHUT-DOWN

If the pump is to be shut down for any reason, follow this procedure.

1. Shut-off discharge valve slowly to prevent water hammer.
2. Shut-off motor.
3. Shut-off suction valve.

PUMP ASSEMBLY

Standard NEMA 'C' face motors from 143TC to 256TC can be close coupled to Series R pumps. However, the 143TC, 145TC, 213TC, 215TC, 254TC and the 256TC will require a special adapter plate for mounting. Motor frames 182TC through 184TC can be mounted without the use of the adapter plate. (See Figures 1-4)

1. The best way to assemble the pump is in a vertical direction. Place the motor on a table or the floor with the fan cover down and the motor shaft pointing upward. Place the fan cover on a piece of corrugated paper or similar material to prevent the fan cover from being scratched.
2. If a 182TC, 184TC or a long coupled bearing frame is used, go to item 3. However if a motor other than the above is used, an adapter should be mounted now. (See Figure 1 or 3).
Align the through holes in the adapter plate with the threaded holes in the motor C Face. Fasten the plate in place using (4) stainless steel hex bolts and lock washers.
3. If the motor frame is 213TC or greater, find the outer magnet assembly (drive magnet). Make sure the set screws, in the hub of the outer magnet assembly, are backed out from the hub internal diameter (ID) so there will be no interference with the motor shaft. For close coupled pumps, adjust the position of the drive magnet on the shaft so that the distance from the motor face to the far end of the drive magnet is $6\text{-}3/8\text{ -}0 + 1/16$ (See Figure 2). For long coupled pumps adjust the above dimension to $8\text{ -}0 + 1/16$. Tighten the two set screws using a $3/16$ " socket hex key.
4. Place the bracket on the motor face aligning the through holes on the bracket with the threaded holes on the motor C face or bearing frame. Note the relation between the bracket feet and the conduit box on the motor which is usually on the side of the motor when properly assembled. Fasten the bracket using (4) $1/2$ " hex socket head stainless steel bolts and lock washers. Tighten the bolts securely.
5. The rear casing and rear casing cover should now be assembled. Align the flats on the rear bushing with the flats in the plastic rear casing and press into place. Place the rear casing onto the rear casing support and push it into place.
6. Place the shaft key into the notch in the shaft. Then align the key in the shaft with the key way in the rear bushing and push into place. Place the 'O'-ring in the 'O'-ring groove of the rear casing.
7. Place the bushing key into the notch on the outer diameter of the bushing. Align the key with the key way on the internal diameter of the impeller assembly making certain that the tapered portion of the bushing is toward the eye of the impeller. Press the bushing into place until it seats against the impeller. Place the mouth ring into the mouth ring groove on the impeller. Align the notch in the mouth ring with the protrusions in the mouth ring groove. Push the mouth ring into place.
8. Place the assembled impeller over the shaft into the rear casing. Do not be concerned if the impeller tends to float. Now place the casing over the assembly making sure that the casing shaft support is aligned with the shaft. Align the through holes in the rear casing support with the tapped holes in the casing. Place (6) $1/2$ -13 x $1\ 1/2$ hex head stainless bolts with lock washers into the holes and tighten securely with a fastening torque of 40 ft-lbs. This part will now be referred to as the w@t

213/215TC
254/256TC

2 REQ. FOR 254/256TC

BEARING FRAME

MOTOR

ADAPTER

LONG COUPLED

FIGURE 1

FIGURE 2

FIGURE 3

FIGURE 4

end assembly.

9. In this step the wet end assembly is attached to the bracket.
10. Attach the motor risers to the motor if they are required for proper height. If your motor has no feet then a pump foot must be attached to the bracket at this time. After assembling the motor risers or the pump foot, return the pump to the horizontal position.

WARNING

11. Presence of strong magnetic forces will cause the two assemblies to be attracted. Hold the wet end securely and keep the fingers away from areas where they may be pinched.

Gently slip the wet end assembly (rear casing first) into the outer magnet. Align the through holes in the bracket with the threaded holes in the rear casing support. Fasten the two assemblies together using (6) 1/2 x 1" bolts. Be sure to use the correct washers and spacers at all of the bolt holes to remove all traces of chemicals. Since the pump has no drain plug, and since more liquids will remain in a magnetically driven pump than in conventional pumps, an additional flush will be required after loosening the fasteners.

Under normal operating conditions the pump should be inspected for bushing wear every 3000 hours of operation. If the material pumped is abrasive, or is a poor lubricant, inspection should be performed more often. It is suggested that the amount of wear on the bushings be recorded. If after the first few inspections you find that the amount of wear is small, the period between inspections can be extended.

INSPECTION DISASSEMBLY

NOTE: The following assumes that the casing and piping will be left in place (rear pull-out).

1. Isolate the pump by turning off the suction and discharge valves.
2. Loosen and remove the bolts holding the pump/motor foot.
3. Loosen the bolts holding the bracket to the rear casing support. Pull the motor and bracket assembly away from the wet end.
4. Remove the bolts holding the rear casing support to the casing and allow the pump to drain. Withdraw the rear casing support (containing the shaft and impeller assembly). The assembly should be flushed and taken to a clean well lighted area for inspection.

INSPECTION & REPLACEMENT

MOUTH RING A new mouth ring as initially installed has a thickness of 3/8". It is recommended that the mouth ring be replaced when it becomes 5/16" thick, although the pump can run without problems to a 9/32" thickness. To remove the mouth ring, pry the mouth ring out by inserting a screw driver under the ring. To replace with a new mouth ring, align the notch in the mouth ring with the

protrusion in the mouth ring groove and push into place using an arbor press or drill press.

REAR BUSHING This bushing is constructed of SiC or Ceramic and will not require periodic replacement. If the bushing needs to be replaced, align the flats on the rear bushing with the flats on the rear casing. The bushing can be pushed into place using an arbor press.

MAIN BUSHING Remove the main bushing by inserting a short section of 3/4" diameter plastic pipe into the impeller end of the impeller assembly. Using an arbor press push the bushing out. As installed the diameter of the shaft hole is 0.755" maximum. If the maximum diameter of the center hole at either end exceeds 0.800" the bushing should be replaced. Next check the wear on the rear of the main bushing (flat end) close to the center hole. The outer diameter of the flat end is used as a reference. If there is more than 0.02" wear, the bushing should be replaced. To replace the main bushing, insert the bushing key into the slot on the OD of the bushing. Align the key with the key way on the ID of the impeller assembly. Be sure that the tapered end goes in first. Press into place using an arbor press. Make a visual check (from the eye of the impeller) to be sure that the bushing is properly seated.

REASSEMBLY

The wet end should be reassembled before the drive and driven magnets are engaged. This procedure will facilitate aligning the shaft with the casing shaft support as well as reducing the possibility of damage when the driven and driver magnets engage.

WARNING! Keep fingers clear when engaging magnets.

FACTORY REPAIRS

If the impeller or magnet encapsulation becomes damaged and the magnets in the impeller are undamaged, the factory can salvage the magnets and encapsulate them

at a fraction of the cost of a new impeller assembly. Contact your area representative or the factory for instructions.

SHIPPING WEIGHTS LBS			
PUMP WEIGHT	1 1/2 x 1	3 x 2	4 x 3
Close coupled	76	86	114
Long coupled	102	114	142
Wet end only	47	59	87
MOUNTING KITS			
Long Coupled			
1 1/2 x 1			
143-145 (T/TC)	103		
182-184 (T/TC)	100		
213-215 (T/TC)	98		
3 x 2 / 4 x 3			
143-145 (T/TC)	119		
182-184 (T/TC)			
214-215(T/TC)	117		
254 (T/TC)	114		
	110		
Close Coupled Base	63		

Motor Weights (Approx.)	
2 H.P. 60	7.5 H.P. 152
3 H.P. 90	10 H.P. 178
5 H.P. 111	15 H.P. 266

Temperature Rise in an 1½ x 1 Pump @ 1800 RPM

Temperature Rise in an 1½ x 1 Pump @ 3600 RPM

Temperature Rise in an 1½ x 1 Pump with Locked Impeller