



END-SUCTION CENTRIFUGAL PUMPS

OPERATION AND
SERVICE GUIDE
O-1775
AUG. 1985

SERIES 'PC'

SAFETY PRECAUTIONS

WARNING:

1. Never use these pumps for pumping flammable liquids such as gasoline.
2. In pumping corrosive materials, extreme caution should be exercised. Provide safety guards, ventilation, and drains to protect people and property in case of a leak in the pump. Handling instructions from the manufacturer(s) of the liquids being pumped should be closely followed.
3. Before starting the pump, follow all of the instructions in this manual and any supplemental instructions supplied with the pump.
4. Any person operating this pump and its power unit should be fully aware of its' safe operation before they start using it.
5. Never operate an engine driven unit in an explosive atmosphere, near combustible materials, or where insufficient ventilation exists unless specific provisions have been made regarding the power unit so as to prevent possible injury and damage. Be certain any other power unit is safe for the area in which it is to be operated.
6. Always be sure that the unit is on a secure footing and keep the immediate pump and power unit area free of all unauthorized personnel. If the pump is sitting beside a pit, be sure it is well anchored so that it does not fall in.
7. Never operate the unit with any guards removed.
8. With engine driven pumps:
 - a. Observe all safety precautions for the handling of fuel.
 - b. Never refuel the engine while running, and care should be exercised so that no fuel is spilled on a hot engine.
9. Before working on this pump make sure that the power unit cannot inadvertently be started.
10. Be sure that the power unit, pump, wiring and piping installations are suitable for the liquid being pumped, and comply with all applicable codes and regulations.
11. Do not use torches or apply fire or flames to this pump for any reason.
12. This pump must not be subjected to more than 65 pounds per square inch internal pressure. The pump itself, normally cannot develop more than 55 pounds per square inch pressure. The pump must *not* be used under any of the following unusual conditions which can result in excessive pressures being developed:
 - A. Pump shaft speed over 3600 RPM.
 - B. Quick closing valves in discharge line or any other device which may introduce hydraulic shock into the system.
 - C. Possible sudden obstruction of discharge line such as vehicle driving over hose.
 - D. High positive suction pressures (such as with a flooded suction) which would increase the *total system* pressure to 65 PSI or above.
 - E. Do not pump liquids with specific gravities exceeding the following values:

Impeller* Number	Maximum Specific Gravity** at 3600 RPM
667	2.1
707	1.6
709	1.6
975	2.1

*The impeller number appears in the model number on the pump label. It is the seventh, eighth and ninth digits of the model number.

**The specific gravity is the ratio of the weight of the liquid to be pumped to the weight of an equal volume of water. Water has a specific gravity of 1.0. Therefore, a liquid which is heavier than water has a specific gravity greater than 1.0.

13. Do not overtighten the drain plug. Hand tighten only. Excessive force may damage the threads or the pump body. Do not use a metal plug.
14. Use at least one foot of flexible hose to make plumbing connections to the pump. Rigid piping may put stresses on the pump, causing damage. If rigid piping must be used, properly support it so as to eliminate stresses on the pump.
15. Do not tighten inlet and discharge fittings more than one turn beyond hand tight. Excessive force will damage the pump or fittings.
16. Long suction and discharge lines must be supported so that the weight of the line filled with liquid does not damage the pump or cause misalignment between the pump and motor.
17. Use replacement parts supplied by the manufacturer only.
18. Do not run the pump dry. Always fill the system with liquid to be pumped before starting the pump. The system consists of the pump and suction line. If the pump has a 'flooded suction' (the liquid to be pumped is above the pump itself) then the pump and suction line will be filled by the liquid to be pumped. If the pump is on a 'suction lift' (the liquid to be pumped is below the pump) then it will be necessary to install a foot valve at the end of the suction line so that the foot valve is completely immersed in the liquid to be pumped. In the case of a suction lift situation, it is necessary to fill the suction line and the pump (referred to as the system) before starting the pump. A non-self-priming centrifugal pump can only pump if the system is full of liquid and the pump encounters no air. It is not necessary to drain the pump after use, unless there is danger of freezing, settling of solids, or crystallization.
19. Do not subject pump to extreme conditions of acidity or basicity. Consult factory for specific recommendations concerning chemicals and temperature.
20. Do not operate pump with closed discharge valve for any lengthy period of time. Liquid in pump will overheat. If necessary to reduce pump flow without lowering the speed (rpm), a valve may be used in the discharge line to throttle the flow.
21. Do not restrict the suction line or try to throttle the pump on the suction side because cavitation may result. Cavitation is evidenced by noisy pump operation and pitting of pump parts.

PREPARING THE PUMP FOR OPERATION

Pump Preparation

1. Inspect unit for shipping damage immediately upon receipt and before signing for merchandise. If any visible damage exists, note damage on shipping bill of lading or receiving document(s) before signing. Also notify your dealer or distributor immediately of any damage to the shipment.
2. Read these instructions and the power unit instructions until you are sure you can operate it safely and correctly.
3. IMPORTANT INFORMATION ABOUT PUMP ELASTOMERS ("RUBBER PARTS").

This pump is equipped with one of the three following elastomeric materials. Please read the label on the pump for the name of the specific type of elastomer used inside the pump.

material is not suitable for use with any petroleum based liquids. Consult the factory at the address shown on the back cover of this manual for specific non-water application recommendations.

VITON ELASTOMERS

This pump is equipped with Viton elastomers ("rubber parts"). Viton material is suitable for use with water (clean or dirty), many petroleum products, and many chemical solutions. However, due to the wide range of chemical solutions, it is not possible to list them all here. Consult the factory at the address shown on the back cover of this manual for specific non-water application recommendations.

Power unit preparation-Gasoline engine driven pumps:

1. For complete operating and maintenance information consult the engine manufacturer's instructions included with the pump.
2. Before starting, fill crankcase with oil specified by the engine manufacturer. Use a high quality detergent oil classified for service SC, SD, SE, or MS. Do not add anything to the recommended oil.
3. Before starting, fill fuel tank with clean, fresh, leaded "regular" grade automotive gasoline. Do Not mix oil with gasoline. Do Not use unleaded gasoline.

CAUTION: Always remove spark plug or spark plug wire before working on unit to prevent accidental starting.

PUMP OPERATING INSTRUCTIONS

1. Fill the system with liquid before starting. Do not run the pump dry; damage to the mechanical shaft seal may result. There are no points on the pump which need lubrication. The mechanical shaft seal is self lubricating, and designed to handle clean liquids.
2. Make certain all pipe or hose connections are air tight. An air leak in the suction line under 'flooded suction' operations will reduce flow. An air leak in the suction line on a 'suction lift' installation will prevent operation.
3. Always place the pump as close to the liquid to be pumped as possible. Keep all lines as short and straight as possible. Avoid sharp bends in hoses. Keep the pump on a level foundation.
4. If flexible hose must be laid across a roadway, protect it with planking. Instantaneous shut-off pressures applied when a vehicle runs across an unprotected hose will cause "hydraulic shock". This shock can damage the pump and/or damage the hose. See Figure #1.
5. When pumping dirty liquids or other liquids which may contain solids, always use a pump strainer specified by the manufacturer on the end of the suction line. In the case of 'suction lift' conditions, the strainer will have to be a combination foot valve and strainer.
6. Drain the pump whenever there is a danger of freezing.
7. Always use rubber feet under portable pump

BUNA-N ELASTOMERS

This pump is equipped with Buna-N elastomers ("rubber parts"). Buna-N material is suitable for use with water (clean or dirty) and many petroleum based solutions such as kerosene, diesel fuel and number 2 heating oil. Consult the factory at the address shown on the back cover of this manual for additional specific non-water application recommendations.

EPDM ELASTOMERS

This pump is equipped with an EPDM shaft seal and EPDM static seals. This elastomer ("rubber part") is suitable for use with water (clean or dirty) and many agricultural chemicals. EPDM

CAUTION: The engine governor is set at the factory. Do not tamper with any part which may increase the governed engine speed.

Power unit preparation-Electric Motors:

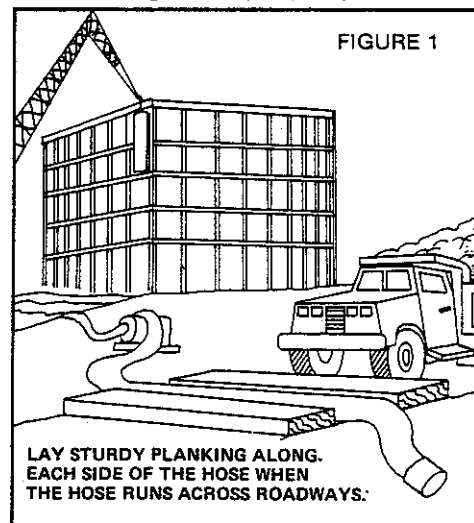
1. Make certain the input power to your electric motor is proper, single phase or three phase, and is of the proper voltage according to the motor specification plate.
2. Be sure of the proper motor rotation. Pump impeller should rotate counterclockwise, looking from the suction inlet side. For single phase motors consult the motor manufacturer's instructions for wiring for counterclockwise rotation. Three phase motor rotation may be reversed by interchanging any two of the three power leads.
3. Make certain that wiring for your electric motor complies with all existing local codes.

Power unit preparation-Hydraulic and Pneumatic Motors:

Consult the separate instruction sheet supplied with each hydraulic motor powered unit.

Power requirements:

NOTE: For liquids having specific gravities greater than 1.0, increase the rated horsepower (from catalog) by a factor equal to the specific gravity of the liquid being pumped.
(Ex. Catalog HP x Specific gravity = Actual HP required)



PROBLEM

1. Pump does not produce flow or has insufficient flow.

POSSIBLE CAUSE

- a. Pump and suction line not completely filled. See Section I, paragraph #18.
- b. Leak in suction line.
- c. Foot valve and strainer not completely immersed.
- d. Mechanical shaft seal leaking air.
- e. Impeller rotation incorrect (Impeller should rotate counterclockwise when viewing through suction end).
- f. Impeller speed (rpm) too low.
- g. Worn impeller and/or volute. See section V, paragraphs 4, 5, and 6.

Pump Disassembly and Repair

NOTE: Pump may be disassembled and repaired using simple "screwdriver maintenance". See exploded view drawing at end of manual for item numbers mentioned.

1. Remove the six ¼" volute screws and nuts (items 21 & 4) and remove the volute (item 17).
2. Remove the large o-ring (item 7) from around the bracket (item 6).
3. Unscrew the impeller screw (item 16) and remove it along with the small o-ring (item 8). Slide the impeller (item 15) and key (item 27) off the shaft. (To facilitate removal of impeller, gently force two screwdrivers 180° apart under the back of the impeller and gently pry the impeller off the shaft).

NOTE: Impeller shims (item 30) may or may not have been used on your pump. Check for these and save them for reuse.

4. One-half of the shaft seal (item 14) is in the impeller hub (item 15), and the other half (item 13) is mounted in the bracket (item 6) where the shaft protrudes. Only remove the impeller portion of the seal and the bracket portion of the seal if you intend to replace both seal elements with new parts. Always protect the sealing surfaces from nicks, scratches and dirt.
5. Remove the four bracket screws (item 9) and the four small o-rings (item 8), one on each screw. The bracket (item 6) may now be removed. The bracket (stationary) portion of the shaft seal (item 13) may now be **pressed** out from the backside of the bracket. Use a round wooden plug 1-3/16" in diameter and carefully press the seal out straight. If it is to be reused, carefully check the face for nicks or scratches. If no damage is evident, carefully store for re-installation. Save the o-ring (item 11) which surrounds the seal.

NOTE: If plugs (item 12) are installed over the bracket screw heads (item 9), remove by screwing a body screw (item 21) into the plug and carefully pulling out. **Be careful not to strip the threads which the screw forms in the plug.**

bracket shims* (item 3) must be installed between the bracket and the mounting surface of the power unit.

SUMMARY OF SHIMMING

The impeller can be shimmed **away** from the bracket face by:

- A. Adding one or more washer type shims (item 30) under the impeller hub.
- B. Removing one or more bracket shims* (item 3) from between the bracket and mounting surface of the power unit.

The impeller can be shimmed **closer** to the bracket by:

- A. Removing one or more washer type shims (item 30) from under the impeller hub.
- B. Adding one or more bracket shims* (item 3) between the bracket and mounting surface of the power unit.

*NOTE: Bracket shims are used on engine driven pumps only and may be either paper (as illustrated in the exploded view drawing at the end of manual) or washer type. See the parts description for the type to be used on your pump.

5. Check the impeller vanes for proper height. The following measurements should be found when measuring the vane height at the outside perimeter of the impeller (vane tip):

REASSEMBLY—READ THE FOLLOWING INSTRUCTIONS BEFORE REASSEMBLY.

Reassembly involves putting the pump together in the reverse order of the disassembly sequence described above.

1. When installing a new seal, always replace both elements (items 13 & 14) and install the o-ring (item 11) around the bracket half of the seal (item 13). Do not bear directly on the seal surface when installing the bracket half. Use a piece of pipe that will bear only on the metal flange of the seal case. The impeller half of the seal (item 14) may be pressed in with the thumbs. Be sure both seal halves are seated squarely with respect to the pump shaft.
2. During final assembly it is recommended that the 5 screw head o-rings (item 8) be replaced. Lubricate these with a **vegetable** type oil only. (DO NOT use petroleum based oil).
3. Use a thread locking compound such as Loc-tite #242 on the bracket screw (item 9) threads and on the impeller screw (item 16) threads.
4. The clearance between the impeller (item 15) vanes and the volute (item 17) face should be about .015" to .025" for good performance. This "front" clearance can be obtained by shimming with the washer type shims (item 30) mentioned in step 3 of the disassembly instructions. Use the same shims which you saved from step 3. Install the impeller (item 15) and firmly press on the impeller **hub only** while rotating the impeller 360°. If scraping is heard, add shim or shims until scraping noise is not heard. Install the impeller screw and o-ring (items 16 & 8). Install the volute (item 17) and the screws and nuts (items 21 & 4). Rotate the shaft while listening for scraping noise. If scraping is heard, remove the volute and impeller, and remove one washer type shim. Repeat this procedure until no scraping is heard.

NOTE: If no washer type shims are used and the impeller still scrapes the **volute**,

NOTE: If the vane thicknesses are less than noted above, shimming up to .060" with washer type shims (item 30) is acceptable. More than .060" of shimming requires replacement of the impeller.

6. Check the volute face for excessive wear. Slight scoring is acceptable.
7. The four bracket screws (item 9) and the impeller screw (item 16) should be tightened **securely by hand** using a large screwdriver.
8. Lubricate the large o-ring (item 7) with **vegetable** oil only, before replacing it in the pump. This will help to prevent pinching and, thus, leaks.
9. When assembling nipples, fittings and/or elbows into or onto the volute, wrap the male threads with teflon sealing tape, or use pipe dope. Proper tightness is hand tight plus one full turn with a pipe wrench.

CAUTION: After pump is assembled and before starting, rotate the shaft by hand and listen for possible scraping noises. A scraping noise indicates improper clearances, requiring disassembly and re-shimming as described in step 4 of reassembly instructions.

*IMPELLER NO.	VANE HEIGHT AT TIP OF VANE
667-30	.535"
698-30	.250"
704-30	.535"
706-30	.535"
707-30	.560"
708-30	.560"
709-30	.560"
974-30	.600"
975-30	.975"

*See parts list for further description. The impeller part number is the 7th, 8th & 9th digits of the model number on the pump label.

SPECIAL INFORMATION

A. FLEXIBLE COUPLED PUMPS: COUPLING ALIGNMENT

Measure the diameter of the pump shaft and power unit shaft. Choose the appropriate coupling for your pump and power unit. (See flexible couplings chart number VI-A). Proper shaft and coupling alignment reduces vibration and prevents premature coupling failure. The following 8 steps help in obtaining proper shaft alignment:

1. Make sure you use a rigid base plate large enough for the assembly of the pump and the drive-unit. We offer kits, kit 028 and kit 016, for this purpose. (See baseplate kits listed after couplings chart VI-A)**

place a straight edge along the side of both coupling halves in two different locations, 90° apart. The coupling is aligned when the straight edge rests squarely on the sides of both coupling halves.

8. To avoid angular misalignment, insert a measuring device (taper gauge or feeler gauge) between the coupling faces at four locations 90° apart (See arrows in Figure 6) and measure the gap at each of the four locations. For proper alignment all four measurements should be equal. Reshimming may be required to achieve this alignment.

COUPLING PART NUMBER	POWER UNIT SHAFT* DIAMETER	ELECTRIC MOTOR FRAME SIZES
785	.625"	56
786	.875"	143T-145T 182-184
787	1.125"	182T-184T 213-215
788	1.375"	213T, 215T
875	1"	—
876	.75"	—

FLEXIBLE-COUPPLINGS CHART VI-A

*One-half of each coupling has a .750" diameter bore to fit the pedestal pump shaft.

**BASEPLATE KITS

These kits contain a baseplate, coupling guard, shims and hardware for mounting a pedestal pump to the power units listed. All necessary mounting holes are provided in the baseplate.

KIT004-Light duty baseplate for these electric motor frame sizes: 56, 143T, 145T, also can be used to mount a 3 or 5 H.P. Briggs and Stratton engine.

KIT016-Heavy duty baseplate for these electric motor frame sizes: 184, 182T, 184T, 213T, 215T.

2. Place the pump and drive-unit on the base plate.
3. Measure the distance between the center-line of the pump shaft and the base plate surface.
4. Measure the distance between the center-line of the drive-unit shaft and base plate.
5. Compare measurements obtained from steps 3 and 4 and use spacer blocks for height adjustment to insure alignment of both shafts.
6. Place the coupling halves over each shaft, put the "spider" between the two halves and couple the two halves together.
7. To assure parallel alignment (Figure 5)

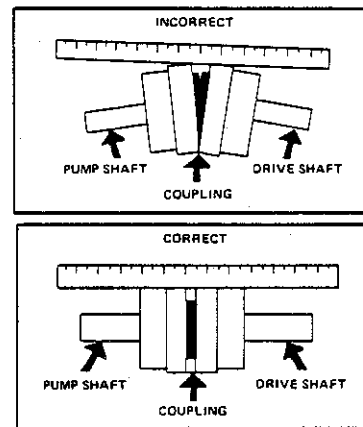


FIGURE 5

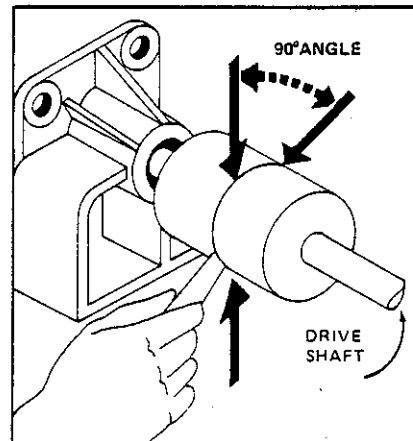
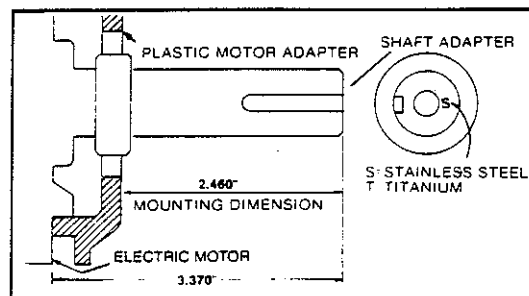
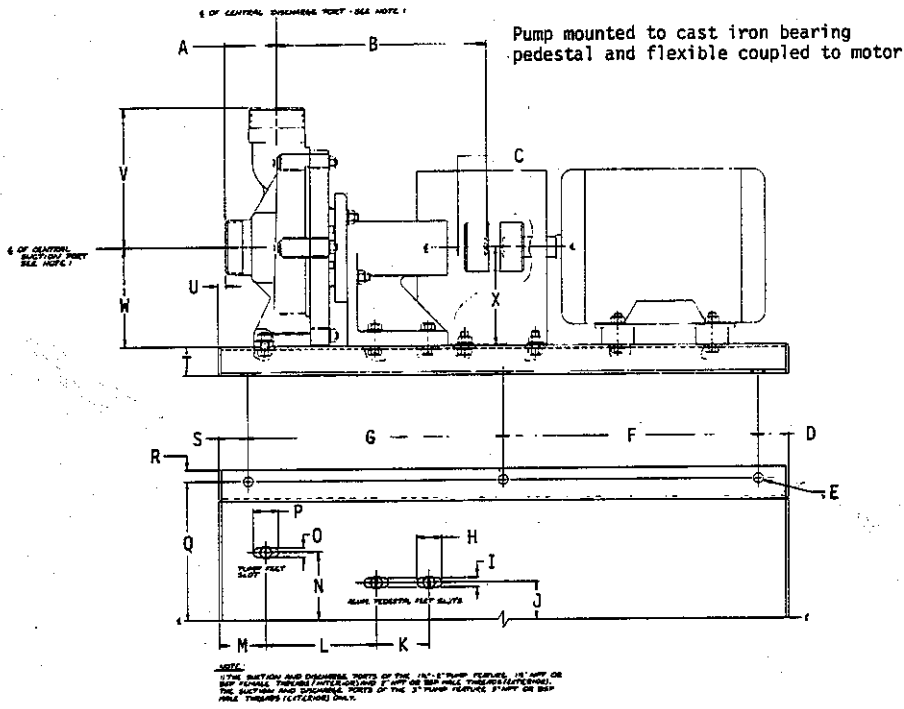


FIGURE 6

B. CLOSE-COUPLED ELECTRIC AND PNEUMATIC MOTOR DRIVEN PUMPS

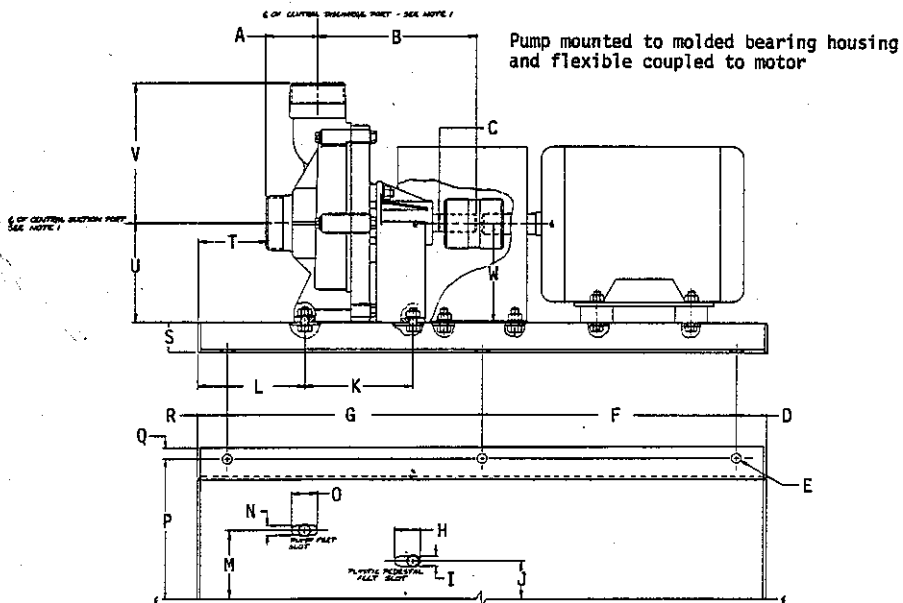
If the motor shaft adapter is replaced, use the mounting dimensions shown when installing the new part.





Pump Size	A	B	C	D	E	F	G	H	I		
1 1/2"	2.20	6.80	.750 Dia.	1.275	.406 Dia.	10.85	10.85	1.056	.406		
3"	2.17	7.14	.750 Dia.	1.275	.406 Dia.	10.85	10.85	1.056	.406		
Pump Size	J	K	L	M	N	O	P	Q	R	S	T
1 1/2"	1.61	2.25	4.72	2.24	2.95	.406	1.056	6.0	.50	1.275	1.25
3"	1.61	2.25	5.05	2.24	2.95	.406	1.056	6.0	.50	1.275	1.25
Pump Size	U	V	W	X							
1 1/2"	.630	5.98	4.17	4.17							
3"	.590	6.50	4.17	4.17							

Dimensions are in inches



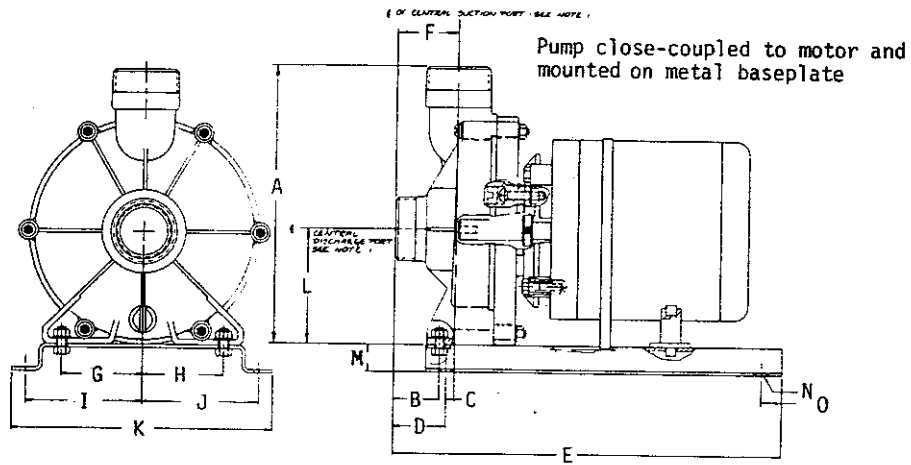
NOTE:
THE SUCTION AND DISCHARGE PORTS OF THE 1 1/2" PUMP FEATURE 1" NPT OR BSP MALE THREADS (EXTERNAL) AND 2" NPT OR BSP MALE THREADS (INTERNAL). THE SUCTION AND DISCHARGE PORTS OF THE 3" PUMP FEATURE 2" NPT OR BSP MALE THREADS (EXTERNAL) ONLY.

Pump Size	A	B	C	D	E	F	G	H	I	J
1 1/2"	2.20	6.80	.750 Dia.	1.275	.406 Dia.	10.85	10.85	1.056	.406	1.61
3"	2.17	7.14	.750 Dia.	1.275	.406 Dia.	10.85	10.85	1.056	.406	1.61

Pump Size	K	L	M	N	O	P	Q	R	S	T	U	V
1 1/2"	4.65	4.55	2.95	.406	1.056	6.0	.50	1.275	1.25	2.94	4.17	5.98
3"	4.99	4.55	2.95	.406	1.056	6.0	.50	1.275	1.25	2.90	4.17	6.50

Pump Size	W
1 1/2"	4.17
3"	4.17

Dimensions are in inches



NOTE:
THE SUCTION AND DISCHARGE PORTS OF THE 1 1/2" PUMP FEATURE 1" NPT OR BSP MALE THREADS (EXTERNAL) AND 2" NPT OR BSP MALE THREADS (INTERNAL). THE SUCTION AND DISCHARGE PORTS OF THE 3" PUMP FEATURE 2" NPT OR BSP MALE THREADS (EXTERNAL) ONLY.

Pump Size	A	B	C	D	E	F	G	H	I	J	K	L
1 1/2"	10.16	1.69	.265	1.94	14.19	2.20	2.95	2.95	4.25	4.25	9.50	4.17
3"	10.67	1.65	.265	1.90	14.15	2.17	2.95	2.95	4.25	4.25	9.50	4.17

Pump Size	M	N	O
1 1/2"	1.00	.37 Dia.	.75
3"	1.00	.37 Dia.	.75

Dimensions are in inches



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