

DEMING®

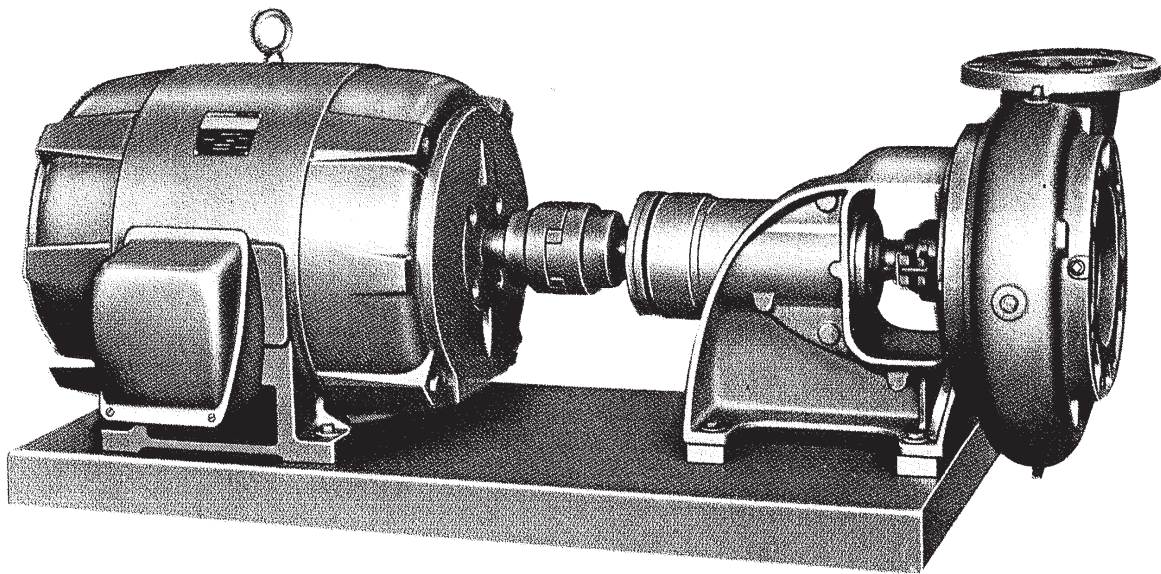
INSTALLATION, OPERATION & MAINTENANCE MANUAL End Suction Centrifugal Pumps

Series: 4060

Semi-Open Impeller

Series: 4160

Enclosed Impeller



IMPORTANT!

***Read all instructions in this manual before operating pump.
As a result of Crane Pumps & Systems, Inc., constant product improvement program,
product changes may occur. As such Crane Pumps & Systems reserves the right to
change product without prior written notification.***

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Form No. 120002-Rev. D

CONTENTS

SAFETY FIRST	3
A. GENERAL INFORMATION.....	4
Receiving, Storage, Service Centers	
B. INSTALLATION	4 - 6
Foundation, Mounting, Field Alignment, Grouting, Piping	
Wiring, Rotation, Cooling, Lubrication	
C. OPERATION.....	7
Priming, Starting, Adjustment	
D. MAINTENANCE	7 - 10
Inspection, Lubrication, Impeller Adjustment, Packing Box Care,	
Disassembly, Reassembly	
E. LOCATING TROUBLE	11
CROSS-SECTIONS & PARTS LIST.....	12 - 13
WARRANTY & RETURNED GOODS	15

SAFETY FIRST!

Please Read This Before Installing Or Operating Pump. This information is provided for **SAFETY** and to **PREVENT EQUIPMENT PROBLEMS**. To help recognize this information, observe the following symbols:



IMPORTANT! Warns about hazards that can result in personal injury or indicates factors concerned with assembly, installation, operation, or maintenance which could result in damage to the machine or equipment if ignored.

CAUTION! Warns about hazards that **can or will cause minor** personal injury or property damage if ignored. Used with symbols below.

WARNING! Warns about hazards that can or will cause serious personal injury, death, or major property damage if ignored. Used with symbols below.



Hazardous fluids can cause fire or explosions, burns or death could result.



Extremely hot - Severe burns can occur on contact.



Biohazard can cause serious personal injury.



Hazardous fluids can Hazardous pressure, eruptions or explosions could cause personal injury or property damage.

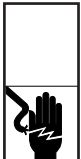


Rotating machinery Amputation or severe laceration can result.



Hazardous voltage can shock, burn or cause death.

Only qualified personnel should install, operate and repair pump. Any wiring of pumps should be performed by a qualified electrician.



WARNING! To reduce risk of electrical shock, pumps and control panels must be properly grounded in accordance with the National Electric Code (NEC) or the Canadian Electrical Code (CEC) and all applicable state, province, local codes and ordinances. Improper grounding voids warranty.



WARNING! To reduce risk of electrical shock, always disconnect the pump from the power source before handling or servicing. Lock out power and tag.



WARNING! Operation against a closed discharge valve will cause premature bearing and seal failure on any pump, and on end suction and self priming pump the heat build may cause the generation of steam with resulting dangerous pressures. It is recommended that a high case temperature switch or pressure relief valve be installed on the pump body.



CAUTION! Pumps build up heat and pressure during operation-allow time for pumps to cool before handling or servicing.



WARNING! Do not pump hazardous materials (flammable, caustic, etc.) unless the pump is specifically designed and designated to handle them.



WARNING! Do not wear loose clothing that may become entangled in moving parts.



WARNING! Keep clear of suction and discharge openings. **DO NOT** insert fingers in pump with power connected.

Always wear eye protection when working on pumps.

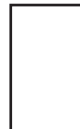


Make sure lifting handles are securely fastened each time before lifting. **DO NOT** operate pump without safety devices in place. Always replace safety devices that have been removed during service or repair. Secure the pump in its operating position so it can not tip over, fall or slide.

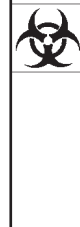
DO NOT exceed manufacturers recommendation for maximum performance, as this could cause the motor to overheat.



WARNING! To reduce risk of electrical shock, all wiring and junction connections should be made per the NEC or CEC and applicable state or province and local codes. Requirements may vary depending on usage and location.



WARNING! Products returned must be cleaned, sanitized, or decontaminated as necessary prior to shipment, to insure that employees will not be exposed to health hazards in handling said material. All Applicable Laws And Regulations Shall Apply.



Bronze/brass and bronze/brass fitted pumps may contain lead levels higher than considered safe for potable water systems. Lead is known to cause cancer and birth defects or other reproductive harm. Various government agencies have determined that leaded copper alloys should not be used in potable water applications. For non-leaded copper alloy materials of construction, please contact factory.



Crane Pumps & Systems, Inc. is not responsible for losses, injury, or death resulting from a failure to observe these safety precautions, misuse or abuse of pumps or equipment.

A - GENERAL INFORMATION

TO THE PURCHASER:

Congratulations! You are the owner of one of the finest pumps on the market today. These pumps are products engineered and manufactured of high quality components. With years of pump building experience along with a continuing quality assurance program combine to produce a pump which will stand up to the toughest applications.

Check local codes and requirements before installation. Servicing should be performed by knowledgeable pump service contractors or authorized service stations.

RECEIVING:

Upon receiving the pump, it should be inspected for damage or shortages. If damage has occurred, file a claim immediately with the company that delivered the pump. If the manual is removed from the crating, do not lose or misplace.

STORAGE:

Short Term - Pumps are manufactured for efficient performance following long inoperative periods in storage. For best results, pumps can be retained in storage, as factory assembled, in a dry atmosphere with constant temperatures for up to six (6) months.

Long Term - Any length of time exceeding six (6) months, but not more than twenty four (24) months. The units should be stored in a temperature controlled area, a roofed over walled enclosure that provides protection from the elements (rain, snow, wind blown dust, etc.), and whose temperature can be maintained between +40 deg. F and +120 deg. F. Pump should be stored in its original shipping container and before initial start up, rotate impeller by hand to assure seal and impeller rotate freely.

SERVICE CENTERS:

For the location of the nearest Deming Service Center, check your Deming representative or Crane Pumps & Systems Service Department in Piqua, Ohio, telephone (937) 778-8947 or Crane Pumps & Systems Canada, Inc., Bramton, Ontario, (905) 457-6223.

B - INSTALLATION

1. FOUNDATION

The pump foundation should be sufficiently substantial to form a level, rigid support for the combined weight of the pump and driver and maintain alignment of the installed unit. Foundation bolts, of the proper size, should be imbedded in the concrete. A pipe sleeve, about 2½" diameters larger than the bolt, should be used to allow for final positioning of the bolts. See Figure 1.

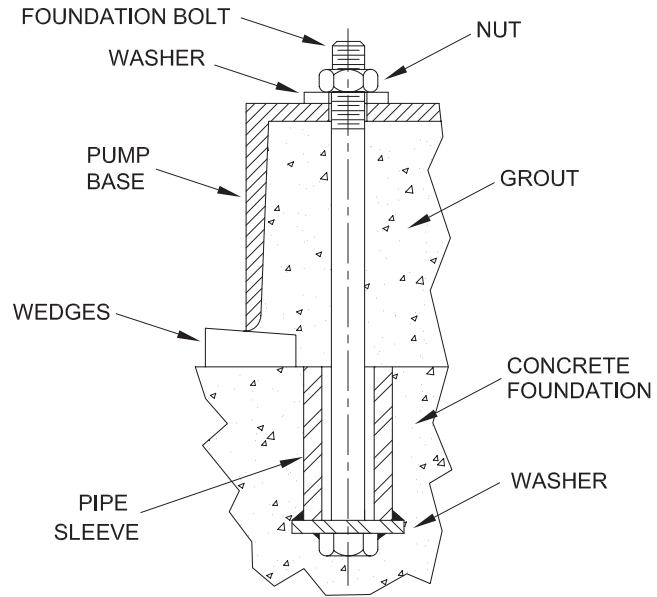


Figure 1. Foundation Bolt Location and Anchorage

2. MOUNTING:

Pumps and drivers that are received from the factory with both machines mounted on a common base plate, were accurately aligned before shipment. All baseplates are flexible to some extent and, therefore, must not be relied upon to maintain the factory alignment. Preliminary alignment is necessary after the complete unit has been leveled on the foundation, and again, after the unit is piped, and rechecked periodically as outlined in the following paragraphs.

Position unit on foundation and level the base plate, using rectangular metal blocks and shims, or wedges having a small taper as shown in Figure 2. A gap of 3/4" to 1½" should be allowed between the base plate and foundation for grouting.

Adjust the metal supports or wedges until the shafts of the pump and driver are level. Check the coupling faces, as well as the suction and discharge flanges of the pump for horizontal or vertical position by means of a level. Correct the positions, if necessary, by adjusting the supports or wedges under the base plate, as required.

NOTE: A flexible coupling should not be used to compensate for misalignment of the pump and driver shafts. The purpose of the flexible coupling is to compensate for temperature changes and to permit end movement of the shafts without interference with each other, while transmitting power from the driver to the pump.



CAUTION! - Remove and lock out power to driver.

3. FIELD ALIGNMENT

The faces of the coupling halves should be spaced far enough apart so that they cannot strike each other when the driver rotor is moved toward the pump. The necessary tools for checking the alignment of a flexible coupling are a straight edge and a taper gauge or a set of feeler gauges.

NOTE: In most cases where extreme accuracy is necessary, a dial indicator may be used to align coupling. Angular alignment check is made by inserting a taper gauge or feelers between the coupling faces at 90-degree intervals around the coupling. The unit will be in angular alignment when the coupling faces are exactly the same distance apart at all points. (See Figure 3).

Parallel alignment check is made by placing a straight edge across both coupling rims at the top, bottom and at both sides. The unit will be in parallel alignment when the straight edge rests evenly on the coupling rim at all positions. Allowance may be necessary for temperature changes and for coupling halves that are not of the same outside diameter. Care must be taken to have the straight edge parallel to the axis of the shafts. Correction for Angular and Parallel Misalignment is made by adjusting the shims under the driver. After each change, it is necessary to recheck the alignment of the coupling halves, as adjustment in one direction may disturb adjustments already made in another direction.

The permissible amount of coupling misalignment will vary with the type of pump and driver, but should be limited to approximately .002 inches per inch of shaft diameter when final adjustment is made. When the units are lined up cold, it is necessary to make allowance for the vertical rise of the driver caused by heating when in operation. When the preliminary alignment has been completed the foundation, bolts should be tightened evenly, but not too firmly.



WARNING - Coupling guards must be used to avoid serious injury to operating personnel.

4. GROUTING

Grouting compensates for unevenness in the foundation and prevents vibration and shifting after mounting is complete. Build a form around the base plate to contain the grout, and sprinkle area with water to obtain a good bond. The base should be completely filled with a good quality, non-shrinking grout. The usual mixture for grouting is one part Portland cement and two parts sand with sufficient water to flow freely. It is also desirable to grout the leveling pieces, shims or wedges in place. Foundation bolts should be fully tightened when grout has hardened, usually about 48 hours after pouring.

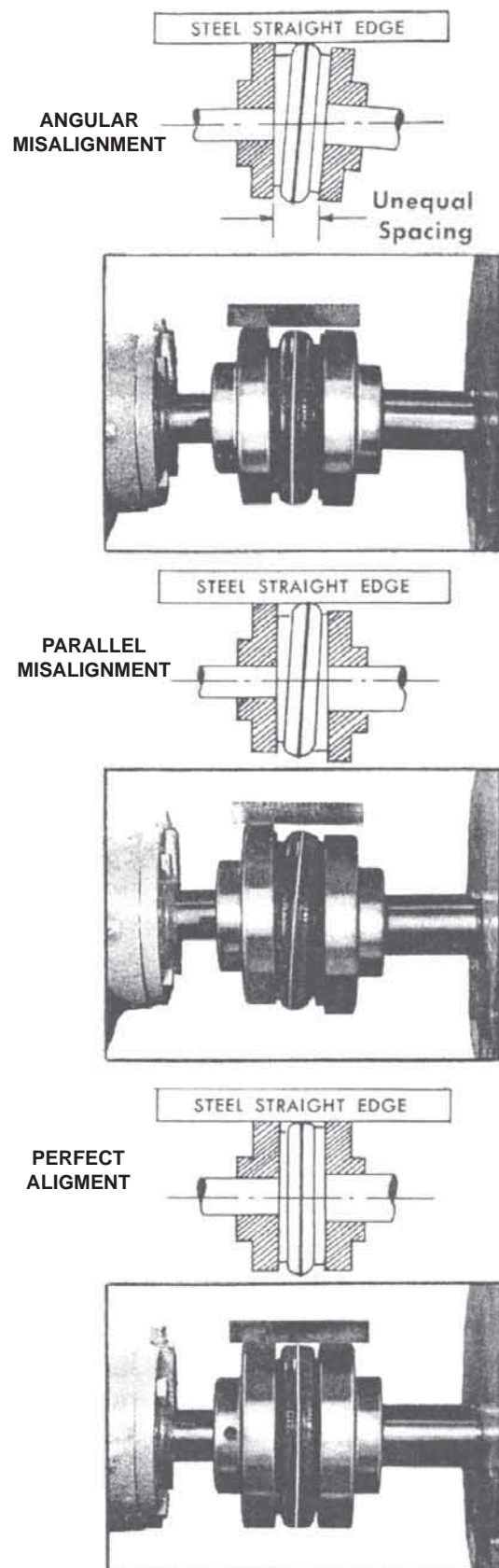


Figure 3

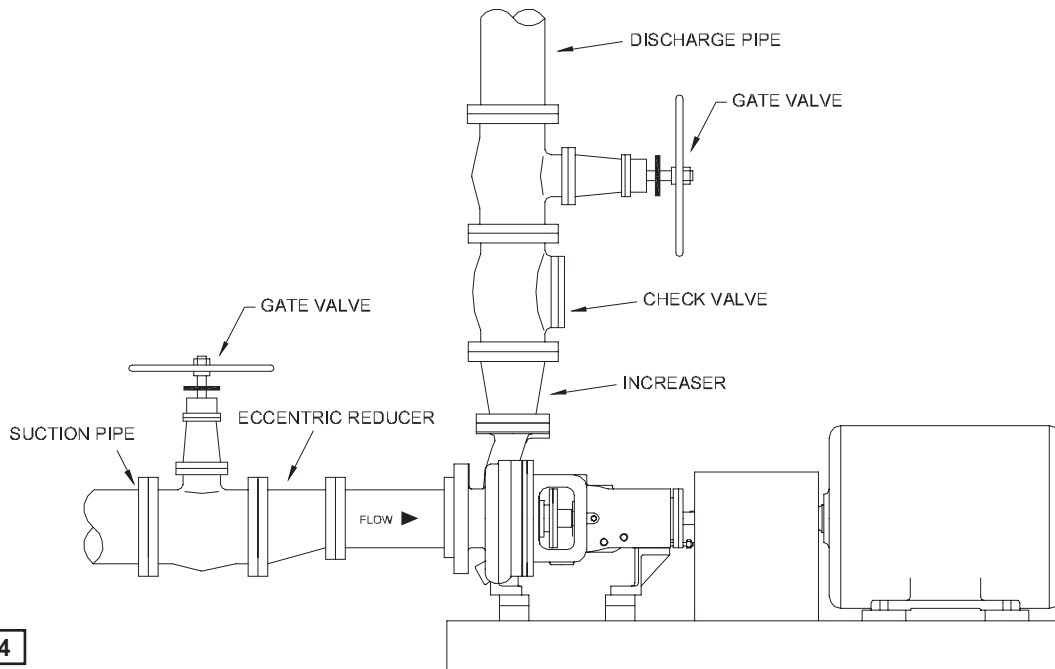


Figure 4

5. PIPING

The pump suction and discharge connections are not intended to indicate the required suction and discharge pipe sizes. The pipe diameter must be selected according to the requirements of the pumping system and recommended friction losses for the liquid being pumped.

Usually, it is advisable to increase the size of both the suction and discharge pipes at the pump nozzles to have minimum acceptable friction loss, suction pipe should never be smaller in diameter than the pump suction nozzle. When suction pipe is of larger diameter than the pump suction nozzle, an eccentric reducer is required to eliminate possible air or vapor pockets at the pump suction inlet.

Both suction and discharge pipes must be supported independently near the pump, so that when piping is connected to the pump, no strain will be transmitted to the pump. Piping should be arranged with as few bends as possible, and, preferably, with long radius elbow whenever possible.

SUCTION PIPING

A horizontal suction line must have a gradual rise to the pump. Any high point in the suction pipe can become filled with air and prevent proper operation of the pump and may cause loss of prime. The pipe and fittings must be free of all air leaks.

Any valves or fittings should be located at a distance equal to 5 to 10 times the diameter of the suction pipe from the pump suction nozzle. If an elbow must be installed at the pump suction, it should be installed in a vertical position to reduce unequal flow into the pump, which may cause cavitation in the pump.

NOTE: A gate valve in the suction piping should not be used as a throttling device, as this may cause the liquid to overheat during operation.

FOOT VALVE

When it is advisable to install a foot valve to facilitate priming, a spring loaded type check valve must be installed next to the pump in the discharge line to prevent pump rupture from water hammer shock. The foot valve should have a clear passage for water not less than the same area as that of the suction pipe. Care must be taken to prevent foreign substances from being drawn into the pump or choking the foot valve. For this purpose an effective strainer should be provided. When there is any refuse such as sticks, twigs, leaves, etc., in the water, a large outside screen should be placed around the suction inlet to prevent choking of the strainer. This screen should have sufficient openings so that the flow velocity does not exceed two feet per second or a free area of four to five times the suction pipe area.

6. WIRING

For electric motor drives, connect power supply to conform with national and local codes. Line voltage and wire capacity must match the ratings stamped on the motor nameplate.

7. ROTATION

Before starting the pump, check the required direction of rotation of the pump. The proper direction is indicated by a direction arrow on the pump casing. Separate the coupling halves, then start motor to see that it rotates in the direction required by the pump. If it does not, reverse any two main leads of the 3-phase wiring to the motor. The coupling halves can be reconnected and the pump primed for starting.

C - OPERATION

The following important items should be checked as pump is started and placed in operation.

- a. Pump and driver securely bolted
- b. Coupling properly aligned
- c. Piping complete
- d. Correct pump rotation
- e. Pump shaft turns freely
- f. Discharge valve closed
- g. Suction valve open (if used)
- h. Coupling Guard installed
- i. Pump fully primed
- j. Pump and driver properly lubricated
- k. Seal water valve open (if used)
- l. Liquid drips slowly from packing gland

Only after these items have been checked should the pump be started.

1. PRIMING

CAUTION: Before starting the pump, the casing and suction line must be filled with liquid, and air-vented through the vent pipe plugs. The pump must not be run until it is completely filled with liquid, because of danger of injuring some of the parts of the pump which depend upon liquid for lubrication.

Be sure the stuffing box packing or mechanical seal and power frame are supplied with the proper lubrication. See LUBRICATION.

Pump priming may be accomplished by one of the following methods. The discharge gate valve should be closed during priming.

PRIMING BY SUCTION PRESSURE

When operating with suction pressure (flooded suction), remove the pipe plug at the top of the casing and when pump is filled with liquid, replace plug.

PRIMING WITH FOOT VALVE AND STRAINER

A foot valve and strainer may be installed on the lower end of the suction pipe to keep pump filled with liquid. Incorporate filler pipe in discharge pipe between pump and check valve. Remove pipe plug at top of casing, then fill suction pipe and pump with liquid. When pump is full of liquid, replace plug and close filler pipe.

CAUTION: When a foot valve and strainer are installed on the suction pipe, a spring loaded type check valve **MUST** be installed next to the pump in the discharge piping to prevent pump rupture from water hammer shock.

Priming by means of primer pump or ejector, attached to the pump, will also remove air from suction pipe and pump casing. When pump is filled with liquid, start motor and slowly open discharge gate valve.

2. STARTING THE PUMP

On initial start up, the gate valve in the discharge piping should be closed and slowly opened after pump is up to speed and pressure developed. **DO NOT** operate pump for any appreciable length of time against a closed discharge valve, as this may heat trapped liquid excessively and damage the pump or seal.

3. PUMP ADJUSTMENT

Open discharge valve as soon as operating speed has been reached. After the pump has been started the packing box glands should be tightened to eliminate excessive liquid loss. (Applies only to pumps having packed stuffing boxes.) Packing should not be pressed too tight, as this may result in burning the packing and scoring the shaft or shaft sleeve. The best adjustment will allow the liquid to drip slowly from the packing box gland. This will permit proper lubrication of the shaft and dissipate generated heat.

As soon as the pump and driver have reached the normal operating temperature, the unit should be shut down for final coupling alignment. This should be done by following the instructions found in Section B, Part 3. If correction is necessary, it may be accomplished by the addition or removal of shims from under the motor mounting feet.

D. MAINTENANCE

1. INSPECTION

Periodic inspection should be made of the following components:

- a. Bearing lubrication. Make sure the proper grade and amount of lubrication is present. Section B and Section D.
- b. Packing should be lubricated with the proper amount and type of acid-resistant lubricant.
- c. A double seal should be lubricated with light oil, clean water, or other compatible lubricating liquid.
- d. All piping connections, gasketed joints and drains should be checked for leaks.
- e. Check bearings for excessive wear or failure. Worn bearings may result in shaft run-out requiring frequent replacement of packing or seal
- f. Coupling alignment and lubrication must be maintained for smooth operation and long coupling life.

2. LUBRICATION

All pump and component parts have been lubricated at the factory except pumps with oil lubricated bearings which must be lubricated by filling oil reservoir through automatic oiler.

Subsequent lubrication depends on operating conditions. Periodic inspection of bearing lubrication is necessary and additional grease or oil should be added as required.



CAUTION: DO NOT over grease bearings or add excess oil

The following lubricants are recommended at the operating temperature indicated:

Oil lubricated Bearings - S.A.E. #10 Wt. Non-detergent oil

Grease Lubricated Bearings - Shell Alvania #2 or equal.

Packing boxes - Lithium base grease

Double Seal - Pressurized water or light oil circulated thru seal chamber. If pressurized liquid is not available, Shell Alvania EPRO #71030 grease may be used with pressurized grease cup.

Driver and Coupling - See manufacture's recommendations.

SINGLE SEAL

Pumps with single seals are normally furnished with an internal by-pass open (See cross section). A small portion of the liquid being pumped is recirculated from the casing through the seal chamber to act as a lubricant and coolant. For hot water service at temperatures above 180°F the by-pass should be plugged and seal chamber cooled with water through a heat exchanger or from an outside source.

DOUBLE SEAL

On double seal applications, clear liquid under pressure must be circulated thru the seal chamber at approximately 20 pounds above the maximum pressure that may occur on the inner seal. This may be accomplished with clear liquid from outside source, liquid from pump discharge thru a filter or thru exchanger if liquid is over 180°F.

3. IMPELLER ADJUSTMENT - Fig. 4060 Series

An outstanding feature of this pump is the axial adjustment of the impeller to compensate for eventual wear or corrosion. Correct impeller adjustments will insure optimum operating performance and efficiencies.

To adjust impeller clearance:

- a. Disconnect power supply to the driver and disengage shaft coupling.
- b. Loosen the three lock nuts and jack screws (204) and (286) then tighten the three cap screws (213) evenly, by alternating cap screws, until the impeller vanes just rub against the casing (1) when the shaft is rotated by hand. It may be necessary to bump the shaft on the coupling end to make sure that the impeller is against the casing.
- c. Tighten the jack screws (286), finger tight against the power frame (19), then loosen cap screws (213).
- d. Tighten the jack screws an additional 1/3 turn (2 hex) to obtain .016" to .020" impeller clearance. The clearance may be measured with feeler gauge thru suction inlet of the casing (1).
- e. Carefully tighten cap screws (213) and lock nuts (204) then rotate shaft by hand to make certain that impeller does not rub against casing.

- f. Reassemble shaft coupling. Place pump in operation and check power required to be certain impeller does not rub casing.

NOTE: The Fig. 4160 Series with enclosed impeller normally does not require adjustment of the impeller.

4. PACKING BOX CARE

Pumps are normally furnished with grease fittings (243) for packing lubrication and with the internal water seal passage blocked. If operating with suction lift and clean liquid the socket type pipe plug (263) may be removed and the liquid being pumped will then form a water seal at the lantern ring.

When installing new rings of packing, clean packing box (11) and inspect parts for any damage. If the shaft sleeve (14) is worn or grooved, it should be replaced. New packing will not do an adequate sealing job on a worn shaft sleeve.

Insert two new rings of packing in front of lantern ring. Stagger joints to minimize leakage. Tamp each ring in place. Replace lantern ring. Add two rings of packing behind lantern ring. Replace gland (17) and bolts (209), rotate shaft and tighten gland securely. Loosen the gland and add the final ring of packing. Be sure lantern ring is positioned to receive lubrication through item (243) orifice. Tighten nuts securely to seat packing and rotate shaft. After rotating several turns, loosen nuts (210) to finger tight for starting.

IMPORTANT! - Liquid being pumped should drip slowly but constantly through the packing and gland. This will prevent overheating, high power consumption, and shaft sleeve damage.

Lubricate through grease fitting (243) or by removal of fitting and substituting tubing and on outside source of water or oil.

5. DISASSEMBLY

The disassembly instructions apply to the series of pumps in general and may vary slightly on special units. If complete disassembly is not necessary, use only those steps which apply.

Close gate valve in discharge and suction piping. Inspect all parts removed to determine whether suitable reuse. It is recommended that all packing, gaskets and o-rings be replaced with new ones during reassembly.

NOTE: Special precautions must be observed when handling mechanical seals so as not to damage the lapped faces of the seal.

Unless casing (1) is damaged or it is necessary to replace wearing ring (7), it may not be necessary to remove the suction and discharge piping from the casing to service the power end.

- a. Disconnect power supply to the motor and remove motor from baseplate or remove coupling spacer if spacer type coupling is installed.
- b. Remove all cooling or lubricating lines.
- c. Remove drain plug (216).
- d. Remove cap screws (212) and separate power end from casing. Fig. 4160 Series - Remove wearing ring (7) from casing (1) if worn.
- e. Remove impeller screw (26), impeller washer (270), impeller washer gasket (30) and o-ring (272) and pull impeller (2) from shaft with an impeller or wheel puller. Remove impeller key (32) from shaft.
- f. Loosen gland nuts (210) and remove gland bolts (209), gland (17) and gland clips (206). The packing box cover (11) may now be removed from the frame (19).
- g. Remove packing (13) and lantern ring (29) from packing box cover and clean bore of the cover.
- h. If pump is fitted with single mechanical shaft seal, mark the position of the seal retainer (230) on the shaft sleeve (14) to assist in reassembly. Remove seal rotating assembly (89B) from the shaft sleeve and stationary seal seat (89A) from the gland (251).

If pump is fitted with double shaft seal, push inboard stationary seal seat (89A) from packing box cover (11) and the outboard seal seat (89A) from the seal gland (251). Remove rotating seal assembly (89B) from the shaft sleeve (14).

- i. Remove shaft sleeve (14) from pump shaft (6). Loosen set screws (211) in deflector and remove deflector (40).
- j. Remove pump half of flexible coupling and key (46) from pump shaft (6). Remove cap screws (213), cap screws (332) and jack screws (286) and pull bearing cover (37) from bearing housing (33).
- k. Open tangs of lock washer (69) and unscrew and remove bearing lock nut (22) and bearing lock washer (69).
- l. Insert small pry bar under flange at bearing housing (33) and carefully force shaft with bearings (18) and (16), bearing housing (33) and grease retainer (51) from coupling end of frame (19).
- m. Mark location of grease retainer (51) on the shaft then press grease retainer and bearing (16) from impeller end of shaft.
- n. With bearing puller, remove bearing housing (33) and bearing (18) from coupling end of shaft. Press bearing from bearing housing.
- o. Wash bearings and bearing cover to remove old grease. Oil lubricated pumps include o-ring (232) on bearing housing. Check and replace if nicked or damaged.

6. REASSEMBLY

Clean and inspect all parts, replacing any worn or damaged parts, also replace all gaskets and o-rings. Replace mechanical shaft seal showing worn faces, hardened elastomer or loss of spring tension.

- a. Inspect bearings and replace if worn.
- b. Press grease retainer (51) onto shaft to position marked. Press bearing (16) onto shaft until inner race of bearing is against shaft shoulder.
NOTE: Press only on inner race of bearing. Apply fresh grease to bearing if grease lubricated.
- c. Carefully press bearing (18) into bearing housing (33) until properly seated in bottom of bearing housing. Press bearing housing assembly onto shaft (6) until inner race of bearing is against shaft shoulder. Apply fresh grease to bearing and bearing cover if grease lubricated.
- d. Insert shaft assembly into frame (19), from the coupling end, until there is approximately 5/16" between flange of bearing adapter (33) and end of frame.

If oil lubricated bearings, apply light oil to exterior of bearing housing (33) and o-ring (232) and carefully guide bearing housing into frame to prevent damage to o-ring.

- e. Place bearing lock washer (69) on the shaft and thread bearing lock nut (22) tight against bearing lock washer. Bend tangs of washer into bearing lock nut.
- f. Place bearing cover (37) on bearing housing (33) and replace and tighten cap screws (332). Also replace cap screws (213) and jack screw with lock nut (286) and (204) but do not tighten. Replace shaft key (46) and pump half of flexible coupling on shaft.

ALL PUMPS WITH PACKING

- g. Place packing box cover on bench and insert shaft sleeve in bore with keyway down. Insert packing as described in Section D item 3.
- h. Position deflector (40) on shaft. Apply Permatex or Silastic sealing material to end of sleeve which will seat against shaft shoulder and slide entire packing box cover assembly (11) onto the shaft and align keyways.
- i. Assemble split gland onto shaft and replace gland clips (206), bolts (209) and nuts (210).

ALL PUMPS WITH SEALS

Before installing any new seal or replacing old seals, inspect and clean all parts. Remove all burrs, nicks, etc., from shaft and sleeve.

- j. Place deflector (40) on shaft and secure. Apply Permatex or Silastic sealing materials to end of sleeve that seats on shaft shoulder and slide onto shaft, lining up keyways.

SINGLE SEAL

CAUTION: Protect the lapped faces of the stationary seal seat and rotating seal washer during installation.

- k. Apply light oil to the outer surface at the stationary seal seat and o-ring (89A) and press seal seat into the seal gland (251).

- l. Apply light oil to the inside of the seal bellows and to the shaft sleeve (14) then slide seal gland (251), gland gasket (259) and rotating seal assembly (89B) onto the shaft sleeve. See Figure 5.
- m. Place seal retainer (230) on the shaft sleeve to the premarked position and tighten set screw.
- n. Place packing box cover (11) against frame (19), in proper position, and attach seal gland (251) to packing box cover with bolts and nuts (209) and (210), tighten securely.

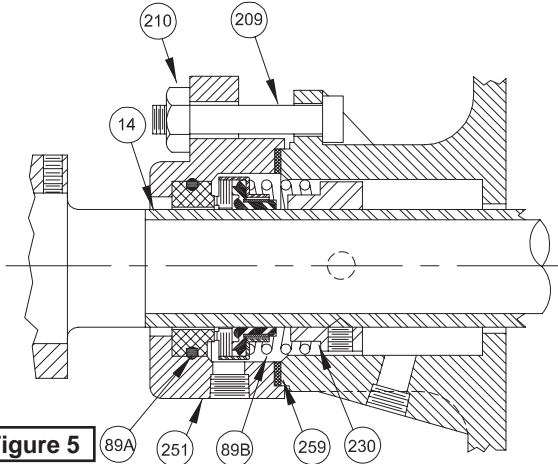


Figure 5

DOUBLE SEAL

- o. Apply light oil to the outer surface of the stationary seal seats and o-rings (89A) and press one seal seat into seal gland (251) and the other seal seat into the packing box cover (11). Slide seal gland and gland gasket (259) onto the shaft.
- p. Apply light oil to the inside of the seal bellows and shaft sleeve (14) and slide the rotating seat assembly (89B) onto shaft sleeve.
- q. Place packing box cover (11) against frame (19), in proper position, and attach seal gland (251) to packing box cover with bolts and nuts (209) and (210). Tighten securely. Seal may be tested for leakage by applying 20 pounds of water pressure to the seal cavity of packing box cover.

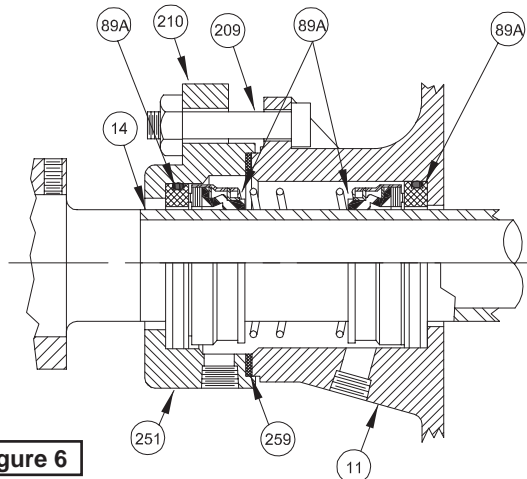


Figure 6

ITEM No	DESCRIPTION
11	Packing Box Cover
14	Shaft Sleeve
89A	Shaft Seal - Stationary Seat
89B	Shaft Seal - Rotating Assembly
209	Machine Bolt
210	Hex Nut
230	Seal Retainer
251	Seal Gland
259	Gland Gasket

ALL PUMPS WITH PACKING OR MECHANICAL SEAL

- r. Place shaft gasket (38) against shaft sleeve (14) and replace impeller key (32) in pump shaft keyway.
- s. Spread a drop of Loctite #601 on the shaft and mount impeller (2) on the shaft. Block the coupling end of the shaft then lay a block of wood over the impeller vanes and tap lightly on the block until impeller is seated on the shaft.
- t. Assemble the impeller screw o-ring (272), impeller washer (270) and impeller washer gasket (30) onto the impeller screw (26). Apply a drop of Loctite #601 to the impeller screw and mount the assembly on the end of pump shaft. Tighten securely.
- u. Fig. 4160 Series - Clean wearing ring of casing (1) of any rust or deposits then press new wearing ring (7) into casing.

Fig. 4060 and 4160 Series - Place casing gasket (73) on packing box cover (11) and mount casing (1). Insert and tighten cap screws (212).

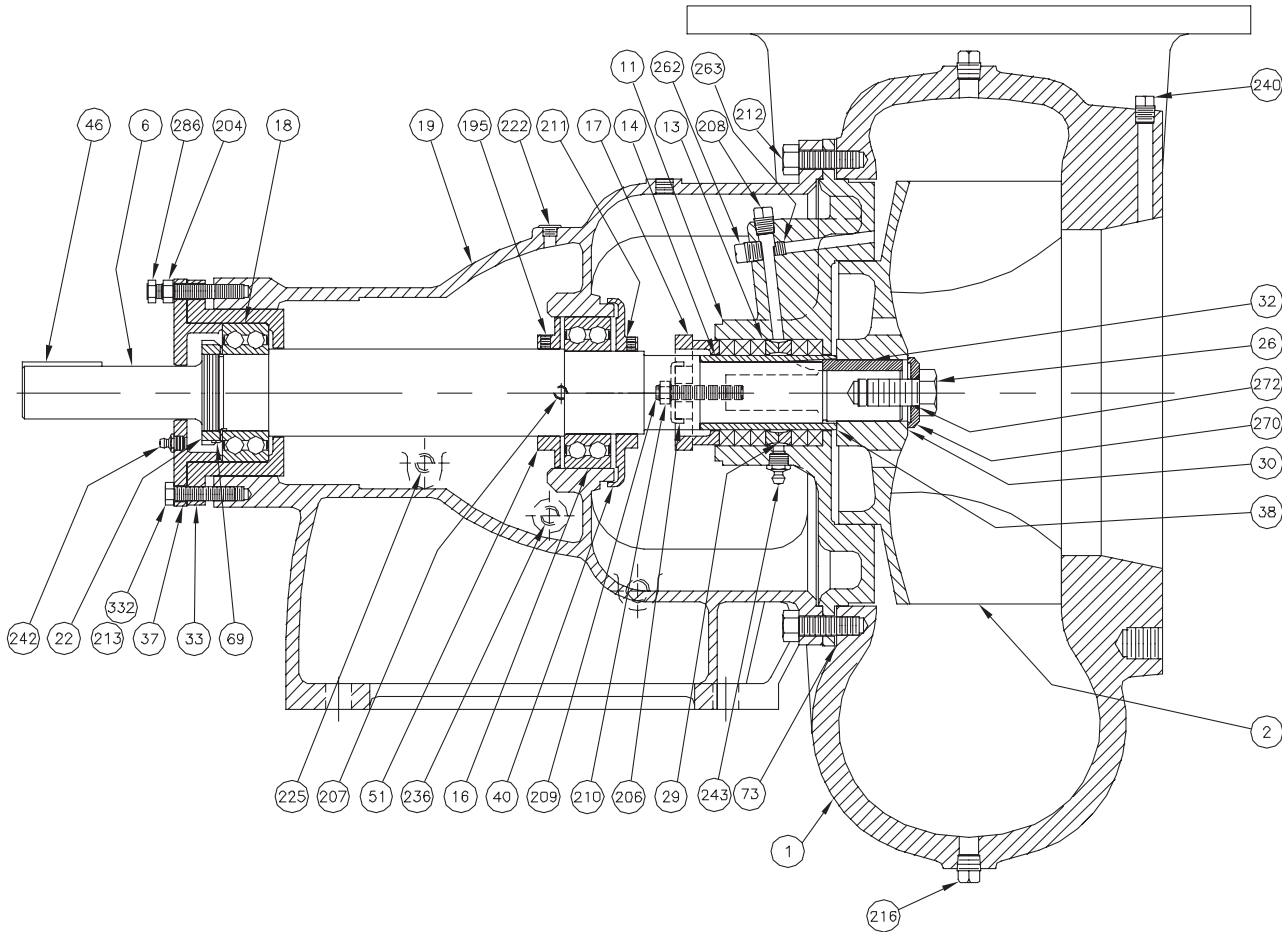
NOTE: Casing (1), packing box cover (11) and power frame must be correctly aligned when reassembled. Be sure rabbeted flange of packing box cover is fully seated in power frame and that casing is aligned and fully seated on packing box cover BEFORE tightening cap screws (212).

- v. Adjust impeller clearance according to Section D item 2.
- w. Adjust gland pressure and lubrication packing according to Section D.
- x. Check all lubrication points listed in Section D item 3.
- y. Replace any tubing or outside piping to packing box cover.
- z. Mount pump on baseplate. Reassemble flexible shaft coupling and check for pump and motor alignment according to Section B. Verify proper rotation before placing pump in service.

E - LOCATING TROUBLE

1. No Liquid Delivered
 - a. Pump not primed - See Priming
 - b. Speed too low - Check motor speed and nameplate
 - c. Discharge head too high
 - d. Impeller completely plugged
 - e. Wrong direction of rotation - Check wiring
 - f. Suction head too high - over 15 feet, check with vacuum gauge.
 - g. Suction or discharge valves closed
2. Not Enough Liquid Delivered
 - a. Air leaks in suction piping
 - b. Speed too low - Check motor speed
 - c. Discharge head higher than anticipated.
Check discharge valve/system requirements
 - d. Suction lift too high - over 15 feet, check with vacuum gauge.
 - e. Impeller partially plugged
 - f. Wrong direction of rotation
 - g. Not enough suction head for hot liquid
 - h. Mechanical defects
 1. Impeller worn or damaged
 2. Casing worn
 - i. Foot valve too small
 - j. Foot valve not immersed deep enough
3. Not Enough Pressure
 - a. Speed too low - Check motor speed
 - b. Air in liquid
 - c. Incorrect impeller diameter - Check system requirements
 - d. Obstruction in pump or piping
 - e. Air leaks in suction piping
 - f. Mechanical defects
4. Pump Works For A While Then Quits
 - a. Air leaks in suction piping
 - b. Obstruction in pump or piping
 - c. Suction lift too high - over 15 feet, check with vacuum gauge.
 - d. Air or gas in liquid
 - e. Incomplete priming - See Priming
5. Pump Takes Too Much Power
 - a. Speed too high - Compare Pump and motor nameplates
 - b. Head lower than rating - pumps too much liquid.
Check system requirements
 - c. Liquid specific gravity or viscosity greater than expected. Requires large motor.
 - d. Pump and driver misalignment - Check casing for pipe strain. Support piping and realign unit
 - e. Wrong direction of rotation
 - f. Electrical defects - Check power supply and motor
 - g. Mechanical defects
 1. Bent pump shaft.
 2. Impeller binds in casing - Check impeller adjustment
 3. Stuffing box packing too tight. See Packing
6. Excessive Pump Vibration
 - a. Cavitation at pump suction due to insufficient NPSHA. Alter installation to reduce NPSHR
 - b. Impeller out of balance - Check mechanical (static) balance
 - c. Pump and motor misalignment
 - d. Obstruction in pump impeller
 - e. Pump shaft bent
 - f. Worn pump bearings
 - g. Impeller imbalance due to wear or corrosion
 - h. Motor imbalance
 - i. Base plate loose on foundation or insufficient strength to support the load
7. Pump and/or Motor Noise
 - a. Pump and motor misalignment
 - b. Pump cavitation
 - c. Base plate loose or not grouted
 - d. Pump bearings worn
 - e. Motor bearings worn or fan rubs housing
 - f. Foreign matter in pump
 - g. Broken shaft
 - h. Liquid velocity in pump or valves due to greater liquid flow than anticipated.
 - i. Pump impeller imbalance due to wear.

FIG. 4060 SERIES END SUCTION
Semi-Open Impeller, Packed Stuffing Box, Grease Lubricated Bearings



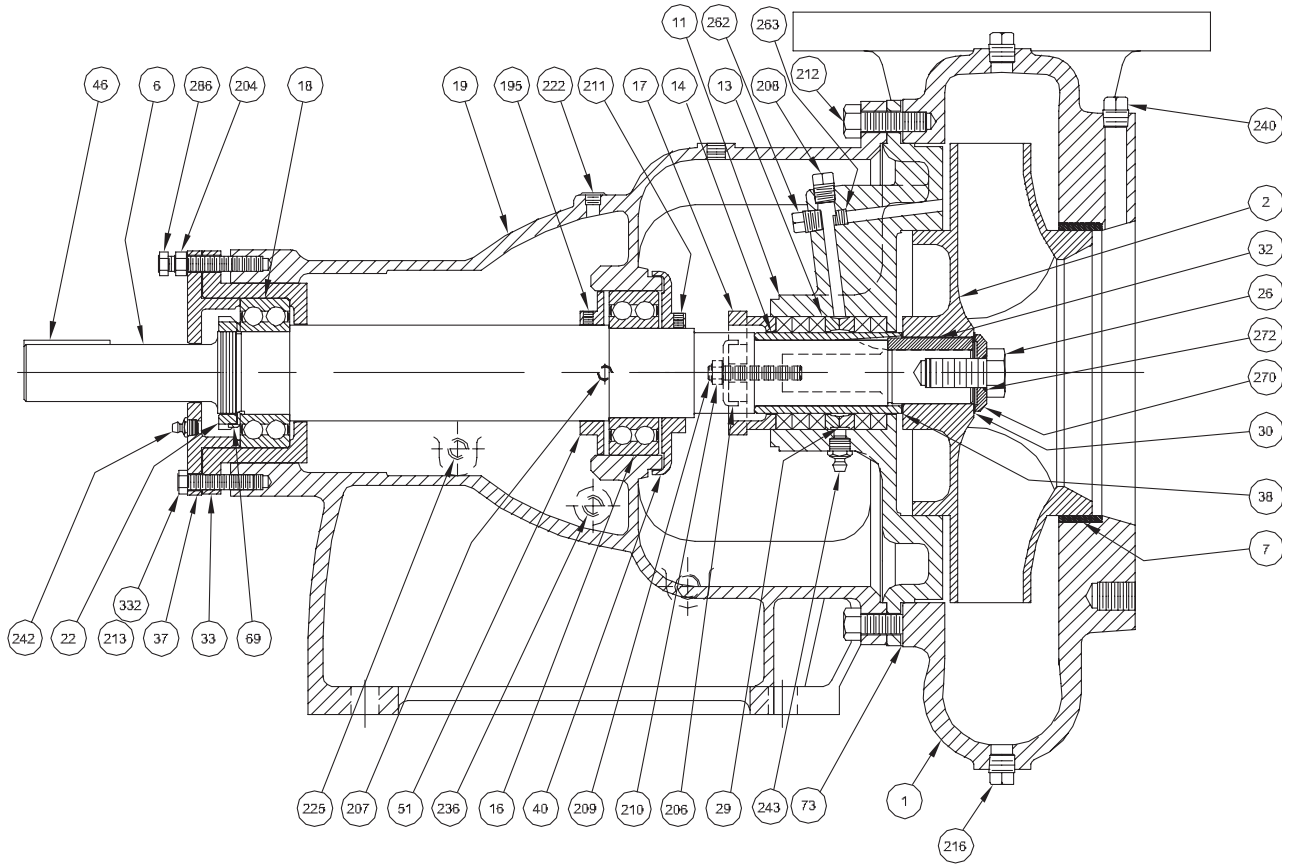
ITEM No.	DESCRIPTION
1	Casing
2	Impeller
6	Shaft
11	Packing Box Cover
*13	Packing
*14	Shaft Sleeve
*16	Bearing (inboard)
17	Gland, Split
*18	Bearing (outboard)
19	Frame
22	Nut, Bearing Lock
*26	Impeller Screw
*29	Lantern Ring
*30	Impeller Washer Gasket
32	Impeller Key
33	Bearing Housing - Outboard
37	Bearing Cover - Outboard
*38	Shaft Sleeve Gasket
40	Deflector
46	Coupling Key

ITEM No.	DESCRIPTION
51	Grease Retainer
69	Lockwasher
*73	Casing Gasket
204	Adjusting Locknut
206	Split Gland Clip
207	Grease Fitting
208	Pipe Plug
210	Nut
211	Set Screw
212	Cap screw
213	Cap Screw
216	Pipe Plug
222	Drive Cap
225	Drive Cap
236	Pipe Plug
240	Pipe Plug
242	Grease Fitting
243	Grease Fitting
262	Pipe Plug
263	Pipe Plug

ITEM No.	DESCRIPTION
*270	Impeller Washer
*272	Impeller Screw O-ring
286	Jack Screw

(*) Recommended Spare Parts

FIG. 4160 SERIES END SUCTION
Enclosed Impeller, Packed Stuffing Box, Grease Lubricated Bearings



ITEM No.	DESCRIPTION
1	Casing
2	Impeller
6	Shaft
*7	Wear Ring
11	Packing Box Cover
*13	Packing
*14	Shaft Sleeve
*16	Bearing (inboard)
17	Gland, Split
*18	Bearing (outboard)
19	Frame
22	Nut, Bearing Lock
*26	Impeller Screw
*29	Lantern Ring
*30	Impeller Washer Gasket
32	Impeller Key
33	Bearing Housing - Outboard
37	Bearing Cover - Outboard
*38	Shaft Sleeve Gasket
40	Deflector
46	Coupling Key

ITEM No.	DESCRIPTION
51	Grease Retainer
69	Lockwasher
*73	Casing Gasket
195	Set Screw
204	Adjusting Locknut
206	Split Gland Clip
207	Grease Fitting
208	Pipe Plug
209	Machine Bolt
210	Nut
211	Set Screw
212	Cap screw
213	Cap Screw
216	Pipe Plug
222	Drive Cap
225	Drive Cap
236	Pipe Plug
239	Cap Screw
240	Pipe Plug
242	Grease Fitting
243	Grease Fitting

ITEM No.	DESCRIPTION
262	Pipe Plug
263	Pipe Plug
*270	Impeller Washer
*272	Impeller Screw O-ring
286	Jack Screw

(*) Recommended Spare Parts

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Limited 24 Month Warranty

Crane Pumps & Systems warrants that products of our manufacture will be free of defects in material and workmanship under normal use and service for twenty-four (24) months after manufacture date, when installed and maintained in accordance with our instructions. This warranty gives you specific legal rights, and there may also be other rights which vary from state to state. In the event the product is covered by the Federal Consumer Product Warranties Law (1) the duration of any implied warranties associated with the product by virtue of said law is limited to the same duration as stated herein, (2) this warranty is a LIMITED WARRANTY, and (3) no claims of any nature whatsoever shall be made against us, until the ultimate consumer, his successor, or assigns, notifies us in writing of the defect, and delivers the product and/or defective part(s) freight prepaid to our factory or nearest authorized service station. Some states do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply. **THE SOLE AND EXCLUSIVE REMEDY FOR BREACH OF ANY AND ALL WARRANTIES WITH RESPECT TO ANY PRODUCT SHALL BE TO REPLACE OR REPAIR AT OUR ELECTION, F.O.B. POINT OF MANUFACTURE OR AUTHORIZED REPAIR STATION, SUCH PRODUCTS AND/OR PARTS AS PROVEN DEFECTIVE. THERE SHALL BE NO FURTHER LIABILITY, WHETHER BASED ON WARRANTY, NEGLIGENCE OR OTHERWISE.** Unless expressly stated otherwise, guarantees in the nature of performance specifications furnished in addition to the foregoing material and workmanship warranties on a product manufactured by us, if any, are subject to laboratory tests corrected for field performance. Any additional guarantees, in the nature of performance specifications must be in writing and such writing must be signed by our authorized representative. Due to inaccuracies in field testing if a conflict arises between the results of field testing conducted by or for user, and laboratory tests corrected for field performance, the latter shall control. **RECOMMENDATIONS FOR SPECIAL APPLICATIONS OR THOSE RESULTING FROM SYSTEMS ANALYSES AND EVALUATIONS WE CONDUCT WILL BE BASED ON OUR BEST AVAILABLE EXPERIENCE AND PUBLISHED INDUSTRY INFORMATION. SUCH RECOMMENDATIONS DO NOT CONSTITUTE A WARRANTY OF SATISFACTORY PERFORMANCE AND NO SUCH WARRANTY IS GIVEN.**

This warranty shall not apply when damage is caused by (a) improper installation, (b) improper voltage (c) lightning (d) excessive sand or other abrasive material (e) scale or corrosion build-up due to excessive chemical content. Any modification of the original equipment will also void the warranty. We will not be responsible for loss, damage or labor cost due to interruption of service caused by defective parts. Neither will we accept charges incurred by others without our prior written approval.

This warranty is void if our inspection reveals the product was used in a manner inconsistent with normal industry practice and/or our specific recommendations. The purchaser is responsible for communication of all necessary information regarding the application and use of the product. **UNDER NO CIRCUMSTANCES WILL WE BE RESPONSIBLE FOR ANY OTHER DIRECT OR CONSEQUENTIAL DAMAGES, INCLUDING BUT NOT LIMITED TO TRAVEL EXPENSES, RENTED EQUIPMENT, OUTSIDE CONTRACTOR FEES, UNAUTHORIZED REPAIR SHOP EXPENSES, LOST PROFITS, LOST INCOME, LABOR CHARGES, DELAYS IN PRODUCTION, IDLE PRODUCTION, WHICH DAMAGES ARE CAUSED BY ANY DEFECTS IN MATERIAL AND/OR WORKMANSHIP AND/OR DAMAGE OR DELAYS IN SHIPMENT. THIS WARRANTY IS EXPRESSLY IN LIEU OF ANY OTHER EXPRESS OR IMPLIED WARRANTY, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.**

No rights extended under this warranty shall be assigned to any other person, whether by operation of law or otherwise, without our prior written approval.

CRANE[®]

PUMPS & SYSTEMS

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Fax: (937) 773-7157
www.cranepumps.com

83 West Drive, Brampton
Ontario, Canada L6T 2J6
Phone: (905) 457-6223
Fax: (905) 457-2650

**IMPORTANT!
WARRANTY REGISTRATION**

Your product is covered by the enclosed Warranty.
To complete the Warranty Registration Form go to:

<http://www.cranepumps.com/ProductRegistration/>

If you have a claim under the provision of the warranty, contact your local
Crane Pumps & Systems, Inc. Distributor.

RETURNED GOODS

**RETURN OF MERCHANDISE REQUIRES A "RETURNED GOODS AUTHORIZATION".
CONTACT YOUR LOCAL CRANE PUMPS & SYSTEMS, INC. DISTRIBUTOR.**



**Products Returned Must Be Cleaned, Sanitized,
Or Decontaminated As Necessary Prior To Shipment,
To Insure That Employees Will Not Be Exposed To Health
Hazards In Handling Said Material. All Applicable Laws
And Regulations Shall Apply.**



A Crane Co. Company

PUMPS & SYSTEMS

START-UP REPORT

General Information

Pump Owner's Name: _____
 Address: _____
 Location of Installation: _____
 Contact Person: _____ Phone: _____
 Purchased From: _____

Nameplate Data

Pump Model #: _____ Serial #: _____
 Part #: _____ Impeller Diameter: _____
 Voltage: _____ Phase: _____ Ø Hertz: _____ Horsepower: _____
 Full Load Amps: _____ Service Factor Amps: _____
 Motor Manufacturer: _____

Controls

Control panel manufacturer: _____
 Model/Part number: _____
 Number of pumps operated by control panel: _____
 Short circuit protection? YES___ NO___ Type: _____
 Number and size of short circuit device(s): _____ Amp rating: _____
 Overload Type: _____ Size: _____ Amp rating: _____
 Do protection devices comply with pump and motor Amp rating? YES___ NO___
 Are all electrical and panel entry connections tight? YES___ NO___
 Is the interior of the panel dry? YES___ NO___
 Liquid level Control Brand and Model: _____

Pre-Startup

All Pumps

Type of equipment: NEW___ REBUILT___ USED___
 Condition of equipment at Start-Up: DRY___ WET___ MUDDY___
 Was Equipment Stored? YES___ NO___ Length of Storage: _____
 Liquid being pumped: _____ Liquid Temperature: _____
 Supply Voltage/Phase/Frequency matches nameplate? YES___ NO___
 Shaft turns freely? YES___ NO___
 Direction of rotation verified for 3Ø motors? YES___ NO___
 Debris in piping or wet well? YES___ NO___
 Debris removed in your presence? YES___ NO___
 Pump case/wet well filled with liquid before startup? YES___ NO___
 Is piping properly supported? YES___ NO___

Non-Submersible Pumps

Is base plate properly installed / grouted? YES___ NO___ N/A___
 Coupling Alignment Verified per I&O Manual? YES___ NO___ N/A___
 Grease Cup/Oil Reservoir Level checked? YES___ NO___ N/A___

Submersible Pumps

Resistance of cable and pump motor (measured at pump control):

Red-Black: _____ Ohms(Ω) Red-White: _____ Ohms(Ω) White-Black: _____ Ohms(Ω)

Resistance of Ground Circuit between Control Panel and outside of pump: _____ Ohms(Ω)

MEG Ohms check of insulation:

Red to Ground: _____ White to Ground: _____ Black to Ground: _____

Operational Checks

Is there noise or vibration present? YES___ NO___ Source of noise/vibration: _____

Does check valve operate properly? YES___ NO___ N/A___

Is system free of leaks? YES___ NO___ Leaks at: _____

Does system appear to operate at design flow rate? YES___ NO___

Nominal Voltage: _____ Phase: 1Ø 3Ø (select one)

Voltage Reading at panel connection, Pump OFF: L1, L2 _____ L2, L3 _____ L1, L3 _____

Voltage Reading at panel connection, Pump ON: L1, L2 _____ L2, L3 _____ L1, L3 _____

Amperage Draw, Pump ON: L1 _____ L2 _____ L3 _____

Submersible Pumps

Are BAF and guide rails level / plumb? YES___ NO___

Is pump seated on discharge properly? YES___ NO___

Are level controls installed away from turbulence? YES___ NO___

Is level control operating properly? YES___ NO___

Is pump fully submerged during operation? YES___ NO___

Follow up/Corrective Action Required

YES___ NO___

Additional Comments:

Startup performed by: _____ Date: _____

Present at Start-Up

() Engineer: _____ () Operator: _____

() Contactor: _____ () Other: _____

All parties should retain a copy of this report for future trouble shooting/reference



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