



# **OPERATING AND INSTALLATION INSTRUCTIONS FOR ROPER 7X412, 7X419, AND 7X428 PUMPS**

## **WARNINGS**

**WARNING! DANGER! READ BELOW BEFORE STARTING PUMP! FAILURE TO HEED THESE WARNINGS MAY RESULT IN AN ACCIDENT CAUSING PHYSICAL DAMAGE, SERIOUS PERSONAL INJURY OR DEATH!**

1. Read and understand tags and installation and operating instructions.
2. Know operating conditions.
3. Open all lines before starting pump.
4. Install and properly set relief valve in discharge line. Pump not provided with a relief valve.
5. Install proper guard(s). Never operate pump without guard(s) in place.
6. Always use caution near rotating parts.
7. Do not operate this equipment in excess of its rated capacity, pressure, speed and temperature or other than in accordance with instructions contained in the installation and operating instructions.
8. Do not run pump dry. Do not start pump until its filled with liquid to be pumped.
9. See safety precautions.

### **PRE-START UP CHECKS**

1. Make sure the pump and the driver are in proper alignment. For a detailed discussion on the causes of misalignment study the following sections in the inside flap.
  - A. Preparation of foundation for base mounted pumps.
  - B. Aligning driver and pump.
  - C. Installation of pipes.
2. Make sure that the driver will rotate the pump in the direction of the arrow shown on the pump.
3. Fill the pump with the liquid to be pumped. Rotate the drive shaft of the pump four or five rotations
4. Make sure the inlet and discharge lines are open.
5. Start the unit.
6. Check to see if the pump is delivering liquid. If it is not, refer to the section on checking pump performance.
7. Check for any vibration, excessive heat generation or excessive packing leakage.

IF THERE IS ANY QUESTION CONCERNING THE RATINGS OR INSTRUCTIONS, PLEASE CONSULT A DISTRIBUTOR, DISTRICT REPRESENTATIVE, OR THE HOME OFFICE OF THE:

**ROPER PUMP COMPANY**  
COMMERCE, GEORGIA 30529

## **PREPARATION OF FOUNDATION FOR BASE MOUNTED PUMPS**

A concrete foundation is best for base mounted units. It supports the units rigidly and absorbs any strain or shock created during operation. The base mounted units must be leveled with shims or integral jacks and securely bolted in that position. Bolting a unit that has not been properly leveled may result in misalignment between pump and driver. This in turn may impose excessive stresses on the pump and accelerate the wear of pump parts.

### **ALIGNING DRIVER AND PUMP**

All base mounted units built at Roper Pump Co. are properly aligned before shipment. However, it is necessary to check the alignment after the unit is mounted on its foundation.

On direct driven units with a coupling between the driver and the pump, check the alignment of coupling halves with a straight edge. Alignment should be checked at least at four points at 90° around the O.D. of the coupling. Do not depend on the flexible coupling to compensate for misalignment.

On belt driven units, make sure, with the help of a straight edge, that the driven and the driver pulleys are in the same plane. Check the belts for proper tension.

### **INSTALLATION OF PIPES**

Piping to the pump should be generally equal in size to the pump inlet and discharge port openings. (When pumping viscous, volatile or high temperature materials the size may change). Gaskets should be used between all flange connections. Be sure that flanges fit without having to be forced.

Use expansion joints to allow for expansion and contraction in the piping. Use pipe supports to prevent the weight of the piping system from causing strain on the pump. Any strain on the pump may cause misalignment resulting in acceleration of wear on pump parts.

### **GENERAL RECOMMENDATIONS**

1. It is good practice to install pressure and/or vacuum gages at both inlet and outlet of the pump to make sure that it conforms to operating specifications.
2. It is recommended that a relief valve be used in the discharge line to protect the system.
3. If there is no relief valve in the system never close the outlet line. High pressure will occur, resulting in possible damage or breakage to the pump or system parts and possible injury to personnel. Even with a relief valve in the system do not operate the pump for more than a few minutes with the outlet line blocked. Rapid heating and possible damage will occur.

## **SAFETY PRECAUTIONS**

Safe installation, operation and maintenance must be performed by qualified personnel. Do not work on or adjust a pump while it is running except for minor necessary adjustments such as packing. Be careful when working on or near a running pump. Contacting or being caught in rotating parts could cause serious or fatal injury. Guards should be provided for all exposed rotating parts to prevent possible personal injury.

Where the liquid being handled is hazardous or volatile, full precautions should be taken at all times, including the run-in period and during assembly and disassembly of the pump.

## **INSTRUCTIONS FOR REPLACEMENT OF:**

### **1. STATOR:**

- A. Follow steps 1 thru 7 in pump disassembly.
- B. Follow steps 1, 9, and 26 thru 30 in pump assembly.

### **2. ROTOR:**

- A. Follow steps 1 thru 9 in pump disassembly.
- B. Follow steps 4 thru 9 and 26 thru 30 in pump assembly.

### **3. DRIVE SHAFT AND/OR BEARINGS:**

- A. Follow steps 1, 3, 4, and 12 thru 16 in pump disassembly.
- B. Follow steps 18 thru 24 and 26 thru 30 in pump assembly.

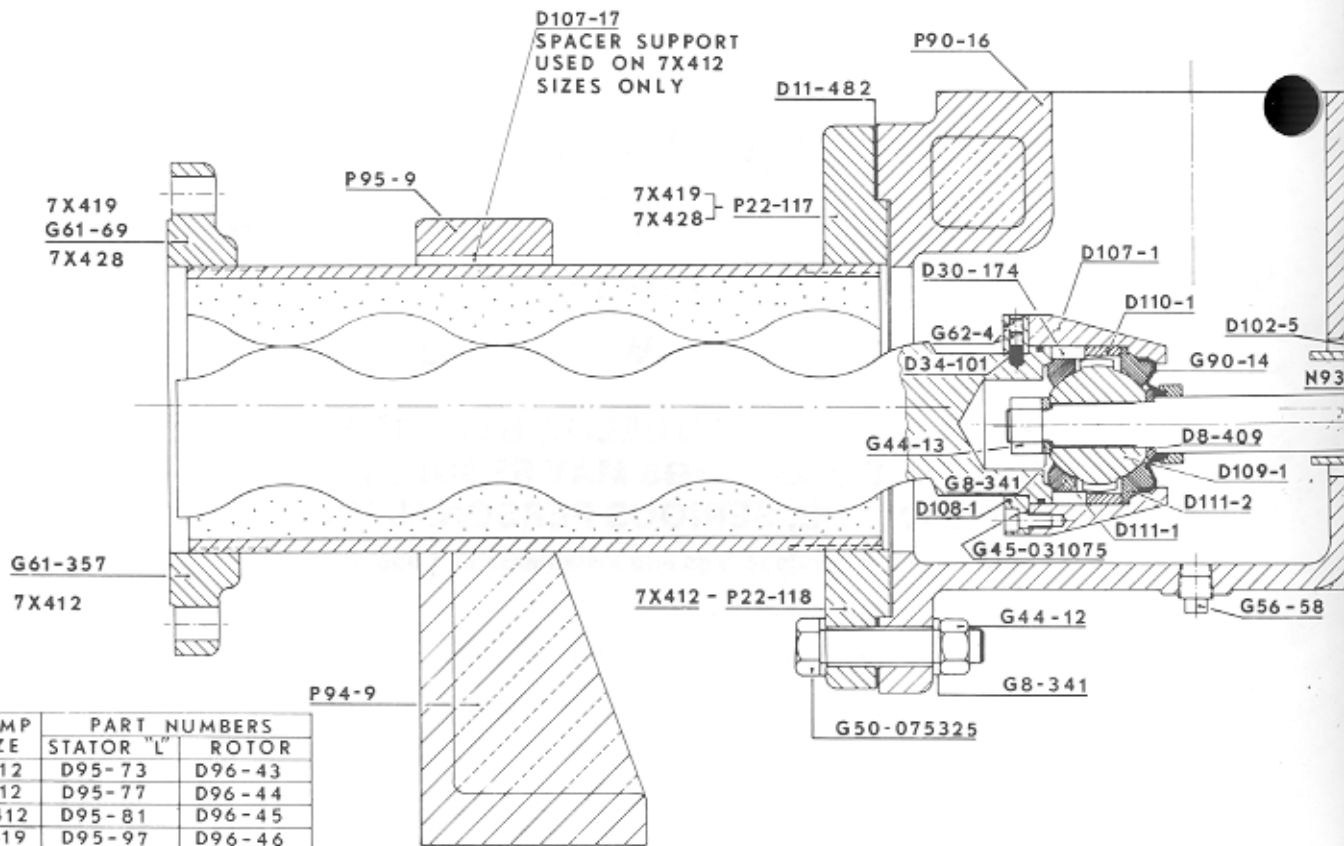
### **4. PACKING:** (Follow steps in item 3 above plus following steps)

- A. Follow steps 17, 19, and 21 in pump disassembly.
- B. Follow steps 10, 16, and 23 in pump assembly.

### **5. GEAR JOINTS AND CONNECTING ROD:**

- A. Follow steps 1 thru 6, 8, 10 and 11 in pump disassembly.
- B. Follow steps 2, 3, 6, 7, 8, and 26 thru 30 in pump assembly.

**WHILE REPLACING PARTS ALWAYS INSPECT DISASSEMBLED PARTS AND ADJACENT PARTS, TO SEE IF FURTHER DISASSEMBLY IS NEEDED. REPLACE WORN OR DAMAGED PARTS AS REQUIRED.**



## INSTRUCTIONS FOR PUMP DISASSEMBLY

1. Before disassembly, drain inlet and discharge lines. Disconnect lines from inlet body and discharge flange.
2. Remove pipe plug G56-58 from bottom of inlet body P90-16 and drain pump.

### SUB GROUP A (STUB SHAFT)

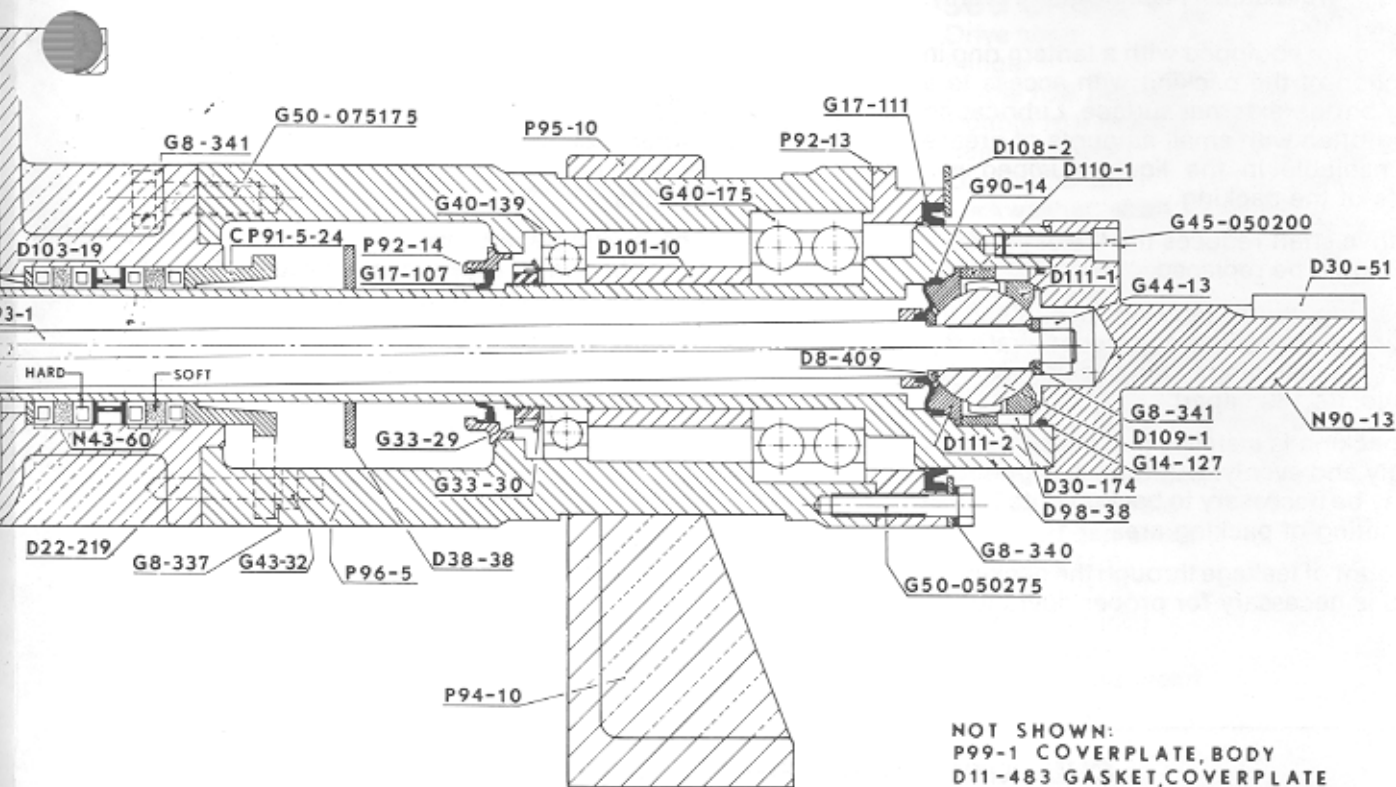
3. Remove (4) socket head cap screws securing stub shaft N90-13 to drive shaft D98-38. Pull stub shaft (with O-ring G14-127) out of drive shaft.
4. Remove nut G44-13, Lockwasher G8-341, front thrust plate D111-1, (2) keys D30-174, ring gear D110-1, hub gear D109-1, rear thrust plate D111-2, connecting rod washer D8-409, and connecting rod seal G90-14 from end of connecting rod N93-1.

### SUB GROUP C (STATOR)

5. Remove hex head cap screws securing stator support cap P95-9 to stator support P94-9. Remove stator support cap. Place temporary support under inlet body P90-16 and remove stator support.
6. Remove (6) hex head cap screws, lockwashers, and nuts securing adapter flange P22-117 or P22-118 to inlet body P90-16. Remove discharge flange, stator, adapter flange, rotor and all attached parts from inlet body.
7. Press rotor and attached parts out of stator. Remove discharge flange G61-69 or G61-357 and adapter flange P22-117 or P22-118 from ends of stator.

### SUB GROUP D (ROTOR)

8. Remove (8) socket head cap screws securing retaining plate D108-1 to coupling housing D107-1. Remove connecting rod and attached parts from rotor head. Remove O-ring G14-127.
9. Remove (2) set screws G62-4 and plug D34-101 from retaining plate D108-1. Slide retaining plate off over profile of rotor.



NOT SHOWN:  
 P99-1 COVERPLATE, BODY  
 D11-483 GASKET, COVERPLATE  
 G50-062150 HEX HD. CAP SCREW  
 G56-45 PIPE PLUG, BODY  
 G63-2 LUB FITTING, BODY  
 G63-5 LUB FITTING, ANGLE

### SUB GROUP E (GEAR JOINTS AND CONNECTING ROD)

10. Remove coupling housing D107-1 from connecting rod N93-1 and attached parts.
11. Follow directions in step 4 for removal of gear joint parts from connecting rod N93-1.

### SUB GROUP F (DRIVE SHAFT)

12. Remove (5) hex head cap screws securing seal retainer D108-2 and coverplate P92-13 (with lip seal G17-111) to bearing housing P96-5. Remove seal retainer and coverplate.
13. Loosen (2) nuts G43-32 securing packing gland CP91-5-24 in place.
14. Pull drive shaft D98-38 and attached parts out of packing in inlet body P90-16 and through the bearing housing P96-5. Flinger D38-38 will slide off end of drive shaft.
15. Remove locknut G33-29 and lockwasher G33-30 from drive shaft D98-38.
16. Remove single row bearing G40-139, bearing spacer D101-10 and double row bearing G40-175 from drive shaft D98-38. *Be careful not to damage bearings or threads on drive shaft.*

### SUB GROUP G (INLET BODY AND BEARING HOUSING)

17. Remove (2) nuts G43-32, flat washers G8-337 and packing gland CP91-5-24 from studs D22-219.
18. Remove (8) hex head cap screws securing (2) coverplates P99-1 and coverplate gaskets D11-483 to sides of inlet body P90-16 and remove parts.
19. Remove (4) hex head cap screws and lockwashers securing inlet body P90-16 and bearing housing P96-5 together. Slide inlet body out of bearing housing.
20. Remove seal retainer P92-14 (with lip seal G17-107) from bearing housing P96-5.
21. Remove packing rings N43-60, lantern ring D103-19 and packing gland insert D102-5. (Packing hooks are commercially available to assist in removing packing).
22. Remove hex head cap screws securing body support cap P95-10 to body support P94-10 and remove body support cap. Remove bearing housing P96-5 from body support.
23. Visually inspect all parts. Replace all worn or damaged parts before reassembling pump.

## INSTRUCTIONS FOR PUMP ASSEMBLY

### SUB GROUP C (STATOR)

1. Install discharge flange G61-69 or G61-357 on one end of stator and adapter flange P22-117 or P22-118 on opposite end. Place adapter flange gasket D11-482 on flange. Apply pipe sealant on all threads.

### SUB GROUP E (GEAR JOINTS AND CONNECTING ROD)

2. On connecting rod N93-1, slide connecting rod seal G90-14, connecting rod washer D8-409, rear thrust plate D111-2, and ring gear D110-1. Lubricate hub gear D109-1 generously on the teeth and spherical surfaces with molykote paste, slide into place. Slide front thrust plate D111-1 on and line-up keyway slots in ring gear and front thrust plate. Install (2) keys D30-174, lockwasher G8-341 and locknut G44-13 and tighten.
3. Slide coupling housing D107-1 over opposite end of connecting rod N93-1 into position.

### SUB GROUP D (ROTOR)

4. Slide retaining plate D108-1 over profile of rotor. Line-up the hole in rotor head and retaining plate, drop in plug D34-101 and set screw G62-4. Do not tighten.
5. Install O-Ring G14-127 in groove on rotor head.

### GROUP X (ASSEMBLY OF SUB GROUPS C, D, AND E)

6. Line-up keyway slots on rotor with keys in gear joint and slide parts together.
7. Secure retaining plate D108-1 and coupling housing D107-1 together with (8) socket head cap screws.
8. Tighten set screw G62-4 against plug D34-101. Add second set screw and lock against first.
9. Lubricate inside of stator in sub group C and profile of rotor in sub group D with soapy water. Slide rotor into stator from adapter flange end.

### SUB GROUP G (INLET BODY AND BEARING HOUSING)

10. Drop packing gland insert D102-5 into inlet body P90-16. Remove middle soft ring of packing from N43-60 and insert in its place lantern ring D103-19 between two hard rings and install packing as shown. Stagger joints 180° apart.
11. Install (2) studs D22-219 in inlet body P90-16.
12. Install pipe plug G56-58 in bottom, pipe plug G56-45 and lube fitting G63-2 in sides at packing area on inlet body P90-16. Grease packing chamber.
13. Place coverplate gaskets D11-483 on coverplates P99-1 and secure parts to sides of inlet body P90-16 with (8) hex head cap screws.
14. Install lip seal G17-107 in seal retainer P92-14 and press into bearing housing P96-5.
15. Install angle lube fitting G63-5 in bearing housing P96-5.
16. Assemble inlet body and bearing housing with (4) hex head cap screws and lockwashers.
17. Slide packing gland CP91-5-24 over studs D22-219. Install (2) flat washers G8-337 and nuts G43-32 on studs. Hand tighten nuts only.

### SUB GROUP F (DRIVE SHAFT)

18. Assemble double row bearing G40-175, bearing spacer D101-10 and single row bearing G40-139 on drive shaft D98-38. *Be careful not to damage threads on drive shaft.*
19. Install lockwasher G33-30 and locknut G33-29 on drive shaft D98-38 and tighten in conventional manner.

### GROUP Y (ASSEMBLY OF SUB GROUPS F AND G)

20. Lubricate I.D. of packing in inlet body P90-16.
21. Slide drive shaft D98-38 into bearing housing P96-5, through seal retainer P92-14 with lip seal G17-107.
22. Install flinger D38-38 on end of drive shaft D98-38.
23. Slide drive shaft until double row bearing seats in bearing housing.
24. Tighten (2) nuts G43-32 pulling packing gland CP91-5-24 down snugly in place.
25. Install lip seal G17-111 in coverplate P92-13. Slide coverplate and retaining plate D108-2 over drive shaft D98-38. Secure with (5) hex head cap screws.

### GROUP Z (ASSEMBLY OF GROUPS X AND Y AND SUB GROUPS A AND B)

26. Lift group X, slide connecting rod N93-1 through drive shaft of group Y and secure in place with (6) hex head cap screws, lockwashers, and nuts.
27. Follow directions in step 2 (gear joints) for assembling parts on connecting rod N93-1.
28. Install O-ring G14-127 in groove on stub shaft N90-13.
29. **SUB GROUP A** Line-up keyway slots on stub shaft N90-13 with keys in gear joint. Slide parts together and secure in place with (4) socket head cap screws.
30. **SUB GROUP B** Set pump on body support P94-10 and stator support P94-9. Place body support cap P95-10 and stator support cap P95-9 in position and secure in place on support bases. Stator support spacer D101-17 will be used with 7x412 size pumps only.

## PARTS LIST FOR 7X412, 7X419, 7X428

DESCRIPTION	QTY	PART NO.	DESCRIPTION	QTY	PART NO.
<b>SUB GROUP A (STUB SHAFT)</b>			<b>SUB GROUP F (DRIVE SHAFT)</b>		
Stub shaft	1	N90-13	Drive shaft	1	D98-38
Key	1	D30-51	Flinger	1	D38-38
O-ring	1	G14-127	Single row bearing	1	G40-139
Socket head cap screw	4	G45-050200	Double row bearing	1	G40-175
<b>SUB GROUP B (BODY AND STATOR SUPPORT)</b>			Bearing spacer	1	D101-10
Body support	1	P94-10	Locknut, shaft	1	G33-29
Body support cap	1	P95-10	Lockwasher, shaft	1	G33-30
Hex head cap screw	4	G50-050350	Coverplate	1	P92-13
Stator support (7x412)	1	P94-9	Lip seal, coverplate	1	G17-111
(7x419 & 7x428)	2	P94-9	Seal retainer	1	D108-2
Stator support cap			Lockwasher	5	G8-340
(7x412)	1	P95-9	Hex head cap screw	5	G50-050275
(7x419 & 7x428)	2	P95-9	<b>SUB GROUP G (INLET BODY &amp; BEARING HOUSING)</b>		
Hex head cap screw			Inlet Body	1	P90-16
(7x412)	4	G50-050350	Coverplate, inlet body	2	P99-1
(7x419 & 7x428)	8	G50-050350	Gasket, coverplate	2	D11-483
<b>SUB GROUP E (CONNECTING ROD &amp; GEAR JOINTS)</b>			Hex head cap screw	8	G50-062150
Connecting rod	1	N93-1	Pipe plug (1/8)	1	G56-45
Connecting rod seal	2	G90-14	Pipe plug (1/2)	1	G56-58
Connecting rod washer	2	D8-409	Lube fitting (str)	1	G63-2
Hub gear	2	D109-1	Packing gland	1	CP91-5-24
Ring gear	2	D110-1	Packing gland insert	1	D102-5
Front thrust plate	2	D111-1	Lantern ring	1	D103-19
Rear thrust plate	2	D111-2	Packing	1	N43-60
Key, gear joint	4	D30-174	Stud	2	D22-219
Lockwasher	2	G8-341	Flat washer	2	G8-337
Nut	2	G44-13	Locknut	2	G43-32
Coupling housing	1	D107-1	Bearing housing	1	P96-5
**On 7x412 size only use spacer support, stator			Seal retainer	1	P92-14
(71412)	2	D101-17	Lip seal	1	G17-107
(72412 & 73412)	4	D101-17	Lube fitting (angle)	1	G63-5
			Lockwasher	4	G8-341
			Hex head cap screw	4	G50-050175

DESCRIPTION	QTY	7X412	7X419	7X428
<b>COMMON PARTS FOR STATOR SUB GROUP C (CHOOSE PROPER STATOR)</b>				
Discharge flange	1	G61-357	G61-69	G61-69
Adapter flange	1	P22-118	P22-117	P22-117
Gasket, adapter flange	1	D11-482	D11-482	D11-482
Lockwasher	6	G8-341	G8-341	G8-341
Nut	6	G44-12	G44-12	G44-12
Hex head cap screw	6	G50-075325	G50-075325	G50-075325
<b>COMMON PARTS FOR ROTOR SUB GROUP D (CHOOSE PROPER ROTOR)</b>				
Retaining plate	1	D108-1	D108-1	D108-1
Plug	1	D34-101	D34-101	D34-101
Set screw	2	G62-4	G62-4	G62-4
Socket head cap screw	8	G45-031075	G45-031075	G45-031075
O-ring	1	G14-127	G14-127	G14-127
		<b>71412</b>	<b>71419</b>	<b>71428</b>
Stator	1	D95-73	D95-97	D95-121
Rotor	1	D96-43	D96-46	D96-41
		<b>72412</b>	<b>72419</b>	<b>72428</b>
Stator	1	D95-77	D95-101	D95-125
Rotor	1	D96-44	D96-47	D96-49
		<b>73412</b>	<b>73419</b>	
Stator	1	D95-81	D95-105	
Rotor	1	D96-45	D96-48	

## PROPER CARE OF PACKING

1. The packing gland should be pulled down snugly so as to prevent excessive leakage through the packing; but not so tight that it would cause overheating. Always adjust packing gland evenly. Do not cock gland.
2. Roper pumps are equipped with a lantern ring in the midsection of the packing with access to a lube fitting on the external surface. Lubricating the packing often with small amounts of grease which is insoluble in the liquid pumped will increase life of the packing.
3. A scored drive shaft reduces the life of packing. The shaft should be replaced.
4. When replacing worn packing use standard formed packing (do not use one piece spiral wrap packing). While installing, tamp packing in place staggering joints 180° apart.
5. After new packing is installed pull packing gland down snugly and evenly. During run-in period of pump it may be necessary to backoff nuts to prevent overheating of packing area.
6. A small amount of leakage through the packing is normal and is necessary for proper operation.

## LUBRICATION OF PUMPS

Pump bearings are ball bearings and are grease lubricated.

1. Do not lubricate bearings very often because more bearings are ruined due to over attention than lack of attention.
2. Do not lubricate with any grease except approved bearing grease such as Gulflex 'A' multi-purpose grease.
3. Under normal operating conditions bearings should not need lubrication for the first 12 months.
4. The bearing-shaft assembly should be removed from the pump approximately every 12 months and washed clean with benzene.
5. Remove any old grease left in bearing housing and refill bearings with new grease.
6. Add a few drops of oil to bearing seals before reassembling.
7. While replacing pins, connecting rod, drive shaft or rotor lubricate the drive area generously with a grease that is resistant to the liquid being pumped.

In a new pump or relubricated pump the bearings may run hot for a few days before temperature levels off.

## CHECKING PUMP PERFORMANCE

A SUMMARY OF THE CAUSES OF COMMON MALFUNCTIONS OF PROGRESSING CAVITY PUMPS.

### NO LIQUID DELIVERED

1. Pump rotating in wrong direction.
2. Inlet lift too high. Check this with gauge at pump inlet.
3. Clogged inlet line.
4. Air pockets or vapor lock.
5. Air leaks in inlet line.
6. Faulty relief valve in system.

### PUMP TAKES TOO MUCH POWER

1. Speed too high.
2. Liquid more viscous than previously anticipated.
3. Operating pressure higher than specified. Check this with gauge at the pump outlet.
4. Outlet line obstructed.
5. Mechanical defect, such as bent shaft, tight packing gland, or misalignment of piping.
6. Relief valve in system not operating properly.

### INSUFFICIENT LIQUID DELIVERED

1. Air leaks in inlet line.
2. Air leaks through packing.
3. Speed too low.
4. Excessive lift at inlet. Check this with gauge at the pump inlet.
5. Viscosity of liquid too high for size and length of inlet pipe.
6. Foot valve or end of inlet pipe not immersed deeply enough in liquid.
7. Foot valve, if used, too small, stuck, or not working properly.
8. Partial air pockets or vapor lock.
9. Pump damaged by misalignment.
10. Excessive clearance in pump caused by wear or corrosion.
11. Faulty relief valve in system.

### EXCESSIVE NOISE

1. Starved pump.
2. Air leaks in inlet line.
3. Air or gases in liquid.
4. Pump speed too high.
5. Improper mounting. Check alignment thoroughly.



*Dependable pumps for over 120 years!*