O-1175
AUG. 1981

INSTRUCTIONS

for

INSTALLATION – OPERATION

and

MAINTENANCE

of

SERIES VGRP

VERTICAL FIBERGLASS
SUMP PUMPS

NOTE: IT IS IMPORTANT THAT THE ENTIRE CONTENTS OF THIS BOOKLET BE STUDIED BEFORE INSTALLATION.

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THE VGRP PUMP

The VGRP Pump has all parts below the mounting plate (except the pump shaft) constructed of corrosion-resistant non-metallic materials. The major parts are made from a fiberglass-resin composite, which is a result of the latest technology in this field. These parts have been carefully designed to safely handle all operating loads anticipated. They should still be treated with care, however, to avoid damage to the pump. All piping must be independently supported (see the "Piping" section under "Installation Instructions"), and all temporary external loads on the pump must be avoided. Also very important is the danger of over-tightening of the fasteners used on the pump. Please pay strict attention to the maximum torque values listed in this manual for the various fasteners.

CAUTION

DISCHARGE FLANGE:

USE FLAT FACE MATING FLANGES ONLY
MINIMUM FULL FACE GASKET THICKNESS = 1/8"
MAXIMUM GASKET HARDNESS = 70 DUROMETER
MAXIMUM BOLTING TORQUE = 20 FT. LB.

AUXILIARY CONNECTIONS: (BEARING LUBRICATION LINES)

DO NOT INSTALL METAL PIPE FITTINGS DIRECTLY ONTO PIPE CONNECTIONS ON NON-METALLIC PARTS.

PUMP BOLTING:

ALL PUMP BOLTING BELOW MOUNTING PLATE NOT TO EXCEED 10 FOOT-POUNDS TORQUE.

READ ENTIRE CONTENTS OF THIS INSTRUCTION BOOK BEFORE INSTALLATION.

APPLICATION

The VGRP Pump has been designed to operate safely and reliably under known normal service conditions. It is extremely important that the pump be used within the limits specified in the tables below, and also within the limits specified in the following sections of this instruction book:

The corrosion-resistant non-metallic "wet-ends" of the VGRP Pump were designed to handle a wide variety of liquids; however, do not use this pump on any other service than for which it was intended without first checking with your Ingersoll-Rand representative for comments /approval.

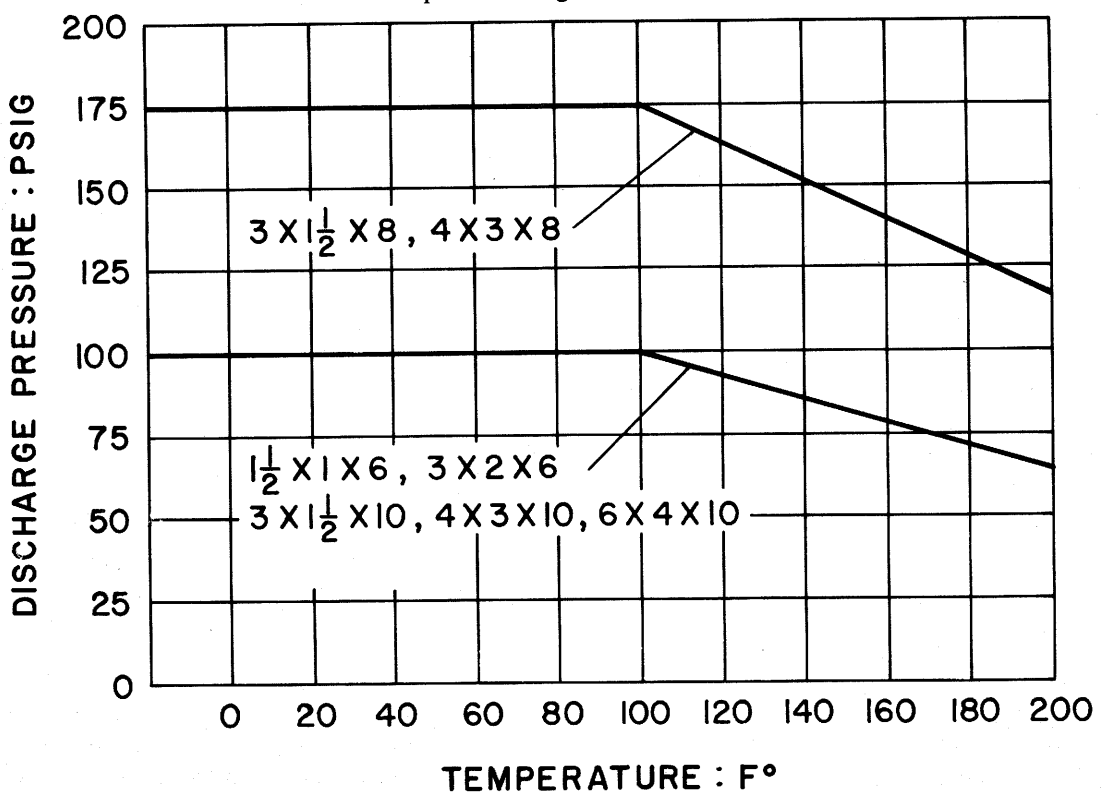
VGRP VERTICAL IMMERSION PUMPS PRESSURE AND TEMPERATURE RATINGS

Group	Type	Design Working Pressure[1]	Design Hydro Test Pressure	Max. Operating Temperature[2]
I	1½x1x6	100	150	200° F
	3x2x6	100	150	
II	3x1½x8	175	250	200° F
	4x3x8	175	250	
	3x1½x10	100	150	
	4x3x10	100	150	
	6x4x10	100	150	

1. Refer to Corrosion-Resistance Guide for temperature limits of specific chemicals, and chart below.
2. Minimum temperature = 0° F.

VGRP PRESSURE-TEMPERATURE RATINGS

General guide only. There are temperature limits for certain specific chemicals and concentrations which may be less than chart rating. Consult Ingersoll-Rand representative for specific ratings.



When installing auxiliary equipment on the pump (such as float controls) or while lowering the pump into the pit, check all bolts and nuts for tightness. Check to see that the discharge pipe and/or lube lines are not causing any distortions to the pump or column which could cause shaft binding.

FIELD ASSEMBLY

Pumps are shipped completely assembled except for driver, strainer, and float controls (if furnished). Some optional equipment, when specified, would be shipped loose.

Assemble float control equipment (if furnished) following the illustration on page 19 or instructions packed with equipment. The stops should be set in accordance with maximum and minimum liquid levels desired and required. Float rods are furnished in kits of a standard length. The rod might have to be cut off to fit the particular installation.

The driver will be mounted after the pump is installed. See "Driver Mounting".

PUMP MOUNTING

The pump may be mounted directly on the pit using the pump mounting plate or in conjunction with a pit cover.

Carefully lower the assembled pump (less driver) into the pit, taking care not to damage lube lines or float control equipment.

Make sure that any equipment used to lift the pump or any of its components is capable of supporting the weights encountered. Make sure that all parts are properly rigged before attempting to lift.

Pump mounting plate and/or pit cover must be reasonably level, and supported evenly at all points before being bolted down.

The foundation for the mounting plate or pit cover must be sufficiently rigid to prevent vibration. Supporting members must be sufficiently strong to prevent spring action and/or lateral movement.

DRIVER MOUNTING

Install key, motor half coupling, and split ring on driver shaft as shown in Figure 1 (see "Setting Impeller Clearance"). Lift driver into place on pump support, and bolt down (with conduit box in desired location). DO NOT CONNECT DRIVER HALF COUPLING TO PUMP HALF COUPLING AT THIS TIME.

Connect the motor terminals to the leads from the starter panel. Make sure the motor shaft and/or coupling is not touching any part of the pump shaft, adjusting nut, or pump half coupling, and that the motor-half coupling is in place so that the split ring cannot fly out. Rotate the motor shaft by hand to make sure it is free to rotate when energized. Start the motor, immediately hit the stop button, and check for proper rotation which should be clockwise when looking down on top of the motor. If rotation is wrong, interchange any two motor connections on three-phase motors. On single-phase motors, follow the motor manufacturers instructions. After changing the connections, again check the rotation.

CAUTION

NEVER CHECK DRIVER ROTATION UNLESS PUMP AND DRIVER COUPLINGS ARE DISCONNECTED AND PHYSICALLY SEPARATED.

Failure to follow this instruction can result in serious damage to pump and driver if rotation is wrong. The coupling halves can now be joined together at this time if desired. Be sure to follow instructions under "Adjust Impeller Running Clearance" for proper method of coupling connection.

PIPING

Use discharge piping one size larger than the pump discharge.

Discharge piping should be connected to the pump such that no strain or weight of the piping is carried by the pump. Check pump shaft for freedom of rotation by hand to make sure discharge piping strain is not causing binding.

The increaser should be placed next to the pump discharge before the check valve and gate valve are installed.

The check valve is required to prevent back-flow through the pump on shut-down. (Ingersoll-Rand will not be responsible for damages resulting from failure to install a check valve.)

NOTE

If quick-closing valves are installed in the discharge piping system, protection MUST be provided to ensure that no surge or water-hammer is transmitted to the pump.

PRE-STARTING CHECKS

DRIVER PREPARATION AND LUBRICATION

Prepare the driver for operation as instructed by the driver manufacturer. Re-check all connections to the motor and control with the wiring diagram. Make sure voltage and frequency on the motor and control nameplates correspond with the line voltage.

If the driver has not been checked for rotation, it must be done now, WITH THE COUPLING DISCONNECTED AND PHYSICALLY SEPARATED. The pump must not be connected to the driver when the driver is checked for rotation. Failure to follow this instruction can result in serious damage to pump and driver if rotation is wrong.

Ball Bearing Motor With Grease Fittings . . . All ball bearing motors that have grease fittings and plugs near the bearings are to be lubricated in accordance with your maintenance schedule. Refer to instructions of motor manufacturer for lubrication instructions.

(a) Remove retaining ring and gib key from adjusting sleeve. Turn adjusting sleeve in counterclockwise direction while holding shaft to prevent it from rotating. Shaft will move in downward direction (toward casing).

(b) After rotor "bottoms out" (impeller will touch casing), turn adjusting sleeve in clockwise direction (while preventing shaft from turning) "X" number of degrees per Table 2 below.

(c) If a slot in the sleeve does not line up with the keyway in the shaft, turn adjusting sleeve clockwise (while preventing shaft from turning) until the nearest slot in the sleeve lines up with the keyway in the shaft. This will increase impeller running clearance slightly, but will not noticeably affect pump performance.

(d) Install gib key and retaining ring.

(e) Check coupling alignment, which should be within .010″ angular alignment (face of coupling hub to face of other coupling hub), and .010″ parallel alignment (concentricity). By design, the coupling alignment should fall within these limits. Coupling parallel alignment (concentricity) can be set to a finer tolerance by loosening the motor and/or motor support bolts, and tapping motor and/or motor support sideways until desired alignment is achieved.

Table 2.
SLEEVE MOVEMENT "X"

	"X"
GROUP 1	90° (1/4 turn)
GROUP 2	90° (1/4 turn)

NOTE: Above adjustment can be made by marking the shaft immediately above one of the slots in the sleeve then turning sleeve until the next slot after that lines up with the mark. There are four slots in the sleeve, so each slot represents 1/4 turn.

OPERATION

STARTING THE PUMP

After all pre-starting checks have been performed, the pump is ready to start. Observe the following procedure to put the pump into operation:

1. Rotate the pump shaft by hand thru at least one complete revolution to see that there is no rub or bind.
2. Close, or leave open very slightly, the control valve in the discharge line.
3. If water-lubricated bearings are used, turn on water supply to the bearings.
4. Start the driver. If other than motor drive, bring the pump up to speed quickly.
5. As soon as the pump is up to rated speed, open the discharge valve slowly, to desired capacity or pressure.

OPERATING CHECKS

Costly shut-downs will be avoided by making routine checks on pump operation.

1. Check to see if liquid is being discharged. A discharge pressure gauge is an easy way to check whether or not the liquid is being pumped. If, at any time, the gauge should drop to zero, or register an abnormally high pressure, shut down the pump immediately.
2. Observe pump for any abnormal noise or vibration. Especially check to observe any CHANGE in pump noise or vibration.
3. Bearing lubricating water should be checked frequently.

STOPPING THE PUMP

The pump should be shut down rapidly, especially on pumps equipped with product-lubricated bearings. Pumps driven by electric motors do not require any special shut-down procedure. If turbine drive is used, the operator must manually trip the overspeed trip to obtain rapid shut-down.

Close the gate valve in the discharge line if maintenance work is to be done on pump.

CAUTION

WHEN OPERATING FOR SOME TIME AT REDUCED CAPACITY, MUCH OF THE PUMP HORSEPOWER WILL GO INTO THE LIQUID IN THE FORM OF HEAT. A BY-PASS MUST BE PROVIDED UNDER THESE CONDITIONS TO PREVENT THE LIQUID IN THE PUMP FROM BECOMING HOT ENOUGH TO VAPORIZE. DAMAGE TO PUMP MAY RESULT FROM PROLONGED OPERATIONS AT REDUCED CAPACITIES. SEE "MINIMUM FLOW", PAGE 10.

WARNING

IN THE INTEREST OF OPERATOR SAFETY THE UNIT MUST NOT BE OPERATED ABOVE THE NAMEPLATE CONDITIONS. SUCH OPERATION COULD RESULT IN UNIT FAILURE CAUSING INJURY TO OPERATING PERSONNEL. CONSULT INSTRUCTION BOOK FOR PROPER OPERATION AND MAINTENANCE OF THE PUMP AND ITS SUPPORTING COMPONENTS.

MAINTENANCE

WARNING

DO NOT ATTEMPT ANY MAINTENANCE, INSPECTION, REPAIR OR CLEANING IN THE VICINITY OF ROTATING EQUIPMENT. SUCH ACTION COULD RESULT IN PERSONAL INJURY TO OPERATING PERSONNEL.

BEFORE ATTEMPTING ANY INSPECTION OR REPAIR ON THE PUMP THE DRIVER CONTROLS MUST BE IN THE "OFF" POSITION, LOCKED AND TAGGED TO PREVENT INJURY TO PERSONNEL PERFORMING SERVICE ON THE PUMP.

PREVENTIVE MAINTENANCE

Ingersoll-Rand pumps are ruggedly constructed, and with proper care will give years of satisfactory service. It is recommended that operating personnel become familiar with "Operating Checks" described previously in this book, and that these checks be made as a matter of routine.

Periodically, depending upon your service schedule, the unit should be dismantled, and all internal parts and passages cleaned and inspected for wear. Any foreign matter found in the pump should be removed, and all excessively worn parts replaced.

Ingersoll-Rand assumes no responsibility or liability for damages caused by the use and failure of the pump which has been fitted with spare or repair parts not of Ingersoll-Rand manufacture. Only genuine parts from Ingersoll-Rand or an authorized distributor should be used.

The following is a list of normal maintenance procedures that might be performed between major overhauls:

BEARING LUBRICATION-GREASE

Pumps furnished with external upper thrust bearing design should have the thrust bearing greased every 1000 to 2000 hours, depending upon the operating conditions of the pump and its environment. A moisture-resistant, lithium-base grease of Number 2 consistency should be used.

Follow driver manufacturer's recommendations as to lubricant and frequency of lubrication of the motor bearings.

BEARING LUBRICATION-WATER

Check frequently to see that water is flowing to pump bearings. Some bearings can run without lubrication, but water lubrication is needed to dissipate heat and abrasives.

BEARING LUBRICATION-PRODUCT

Pumps furnished with pumped-product bearing lubrication need no maintenance checks other than observing pump for change in noise or vibration level.

WARNING

OPERATION OF THE UNIT WITHOUT PROPER LUBRICATION CAN RESULT IN OVERHEATING OF THE BEARINGS, BEARING FAILURES, PUMP SEIZURES AND ACTUAL BREAKUP OF THE EQUIPMENT EXPOSING OPERATING PERSONNEL TO PERSONAL INJURY.

OVERHAUL INSTRUCTIONS

Use extreme care in removing and dismantling pump. Refer to pump assembly drawing for part nomenclature.

1. Close control valve in discharge line.
2. Lock out power supply to driver.
3. Disconnect all electrical connections.
4. Disconnect any external auxiliary piping connections.
5. Disconnect discharge piping from pump.
6. Unbolt and disconnect coupling halves. The pump-half coupling is provided with two jackscrew holes. Two of the bolts holding the coupling halves together may be used in the jackscrew holes to "break" the coupling joint.
7. Disconnect driver and remove.
8. Unbolt pump support plate and lift pump from pit (let casing drain thoroughly before removing pump completely).
9. Remove liquid level controls (if any).
10. Lay pump horizontally on supports.

DISASSEMBLY

1. Unbolt the discharge pipe from the pump casing. The discharge pipe can be left in place or, if desired, the locking collar at the pump mounting plate may be unloosened or removed, and the discharge pipe may be shoved up towards the mounting plate.
2. Remove bearing lubrication lines.
3. Un-bolt and remove pump casing. Strainer need not be removed from casing unless it is to be cleaned or replaced.
4. Remove (by unscrewing) the impeller cap nut. Unscrew the impeller stud (Group 1 pumps) or the impeller locknut and washer (Group 2 pumps).
5. Rotate the casing cover to mis-match the bolt-holes so that the casing cover and impeller can be driven off. Install two wooden dowels or other suitable blunt-ended instruments thru the column lower flange (from the upper side). Tap on the dowels to drive off the cover and impeller. NOTE: The impeller is not keyed or threaded onto the shaft. The impeller is affixed to the shaft by means of a tapered polygon drive. Driving the cover off will cause the impeller to come off the shaft. Hold shaft to keep it from moving. NOTE: Do not use the non-metallic bolts/studs as tools to dis-assemble pump.
6. Remove lower bearing cartridge by pulling it towards the impeller end of the shaft.
7. On pumps furnished with external thrust bearing design—these parts can be removed by un-fastening and lifting them off from the pump shaft drive end.
8. Remove pump shaft by pulling it through column from upper (driver) end.
9. Un-bolt the column assembly from the mounting plate and rotate column 90°. This will allow room for

TECHNICAL DATA

NET POSITIVE SUCTION HEAD (NPSH)

Any liquid, hot or cold must be pushed into the impeller of the pump by some absolute pressure, such as the atmosphere or the vessel pressure from which the pump takes its suction.

The head in feet of liquid necessary to maintain the required flow into the pump is called the Net Positive Suction Head. This value, more commonly called NPSH, is measured above the vapor pressure of the liquid at the pumping temperature.

NPSH is commonly expressed in two ways: the NPSH required by the pump, and shown on the pump curve, is the head needed to cover the losses in the pump suction; the NPSH available is that inherent in the system, taking into account friction loss in suction piping, valves, fittings, etc. In all cases, the NPSH available, measured above vapor pressure, must exceed the NPSH required in order to push the liquid into the pump.

CHANGING PUMP SPEED

Changing the speed of a centrifugal pump affects the capacity, total head, NPSH required and the brake horsepower. In general the capacity will vary in a direct ratio with the speed, whereas the total head and NPSH required will vary as the ratio of the speed squared. The brake horsepower will vary as the ratio of the speed cubed.

EFFECTS OF SPECIFIC GRAVITY

The capacity and total head in feet of liquid developed by a centrifugal pump are fixed for every point on the curve and are always the same for the same speed. Neither capacity nor total head will be affected by a change in the specific gravity of the liquid pumped. However, since the discharge pressure in psi (pounds per square inch) and the brake horsepower required to drive the pump are functions of the specific gravity of the liquid, both will be affected in direct proportion by any change in specific gravity. Therefore, an increase in specific gravity will raise the discharge pressure and is dangerous, as it might overload the pump's driver.

EFFECTS OF VISCOSITY

The pump is designed to deliver rated capacity at rated head for a liquid with a particular viscosity. When pump is handling heavy viscous liquid, the viscosity of the liquid must allow it to be pumped easily. Liquid may have to be heated prior to starting of pump.

When contemplating operation at some viscosity other than that for which the pump was originally designed, the changed conditions should be referred to the nearest Ingersoll-Rand Branch Office for their recommendations.

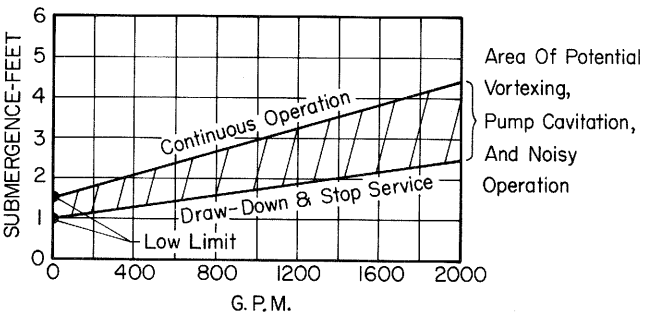


Figure 4: Submergence Chart

BEARINGS AND LUBRICATION

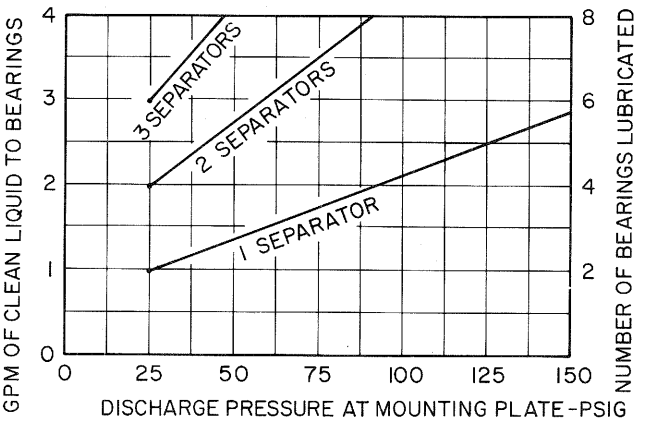
The VGRP vertical pump has been designed to permit its use over a broad range of applications. The longevity of any vertical sump pump depends mainly on bearing material and lubrication.

The VGRP pump is furnished with bearings made of fiberglass & moly-disulphide filled Teflon, which has low cold flow, high tensile and elongation characteristics. Four lubrication holes provide ample lubricant supply to working surface of bearing.

The most desirable bearing lubricant is a clean liquid (less than 5 microns particle size) that has good lubricating qualities. Alternate methods of lubrication should not be considered whenever this method is available.

Each bearing requires ½ GPM of cool (120° F or less), clean liquid at 25 PSIG.

When external lubrication is impossible, bearings can be lubricated by pumped product provided it meets the criteria mentioned above. Cyclone separators can be used effectively, provided there is 25 PSIG discharge pressure (minimum) at the pump mounting plate. Refer to chart below to select required number of separators when considering discharge pressure versus number of bearings to be lubricated. Add 2 GPM per separator to total flow requirements of pump to allow for flow taken by separators.



ENGINEERING INFORMATION (DIMENSIONS SHOWN IN INCHES)

		1½x1x6	3x2x6	3x1½x8	4x3x8	3x1½x10	4x3x10	6x4x10
	GROUP	1	1	2A	2B	2B	2B	2B
PUMP DATA	Suction Size	1½	3	3	4	3	4	6
	Discharge (Casing)	1	2	1½	3	1½	3	4
	Discharge (Mtg. Plate)	2	2	2	3	2	3	4
	Max. Imp. Dia.	6¼	5⅞	8½	8½	10¼	10½	10¾
	Max. Speed (RPM)	3600	3600	3600	1800	1800	1800	1800
	Imp. Eye Area (Sq. In.)	2.76	7.47	6.44	9.72	7.30	12.63	20.92
	Max. Sphere Size[1]	.28	.65	.35	.72	.41	.59	1.22
SHAFT DATA	WR^2 # $Ft.^2$ (wet)	0.10	0.11	0.38	0.52	1.10	1.30	1.80
	Imp. Running Clr.	.015	.015	.015	.015	.015	.015	.015
	Dia. @ Imp. (Polygon)	¾	¾	1⅛	1⅛	1⅛	1¼	1¼
	Dia. @ Bearings	1⅛	1⅛	1½	1½	1½	1½	1½
	HP/100	Refer to BHP Limits Below						
	1st Critical Speed	6000	6000	5555	5555	5555	5555	5555
COLUMN DATA	Column Size	6	6	8	8	8	8	8
	Column Thickness	5/16	5/16	7/16	7/16	7/16	7/16	7/16
	Bearing Span	30	30	36	36	36	36	36
	Brg. Length (Lower)	4¼	4¼	5	5	5	5	5
	Brg. Length (Inter.)	2⅛	2⅛	2½	2½	2½	2½	2½

1. Maximum suction strainer opening = ¼"

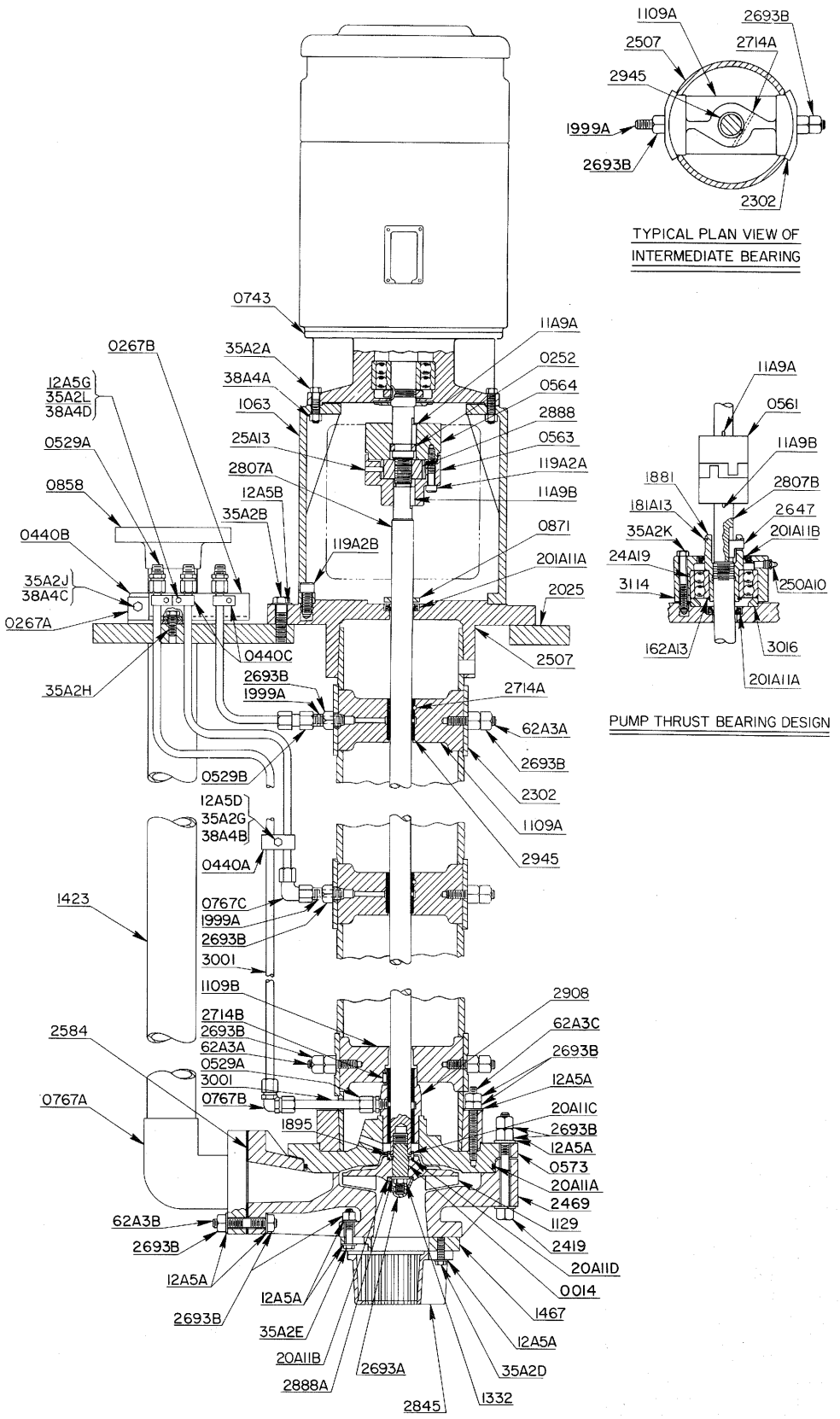
BHP LIMITS
RPM

	3550	2950	1750	1450	1180
GROUP 1	20	16	10	8	—
GROUP 2A	66	55	33	27	22
GROUP 2B	—	—	44	36	29

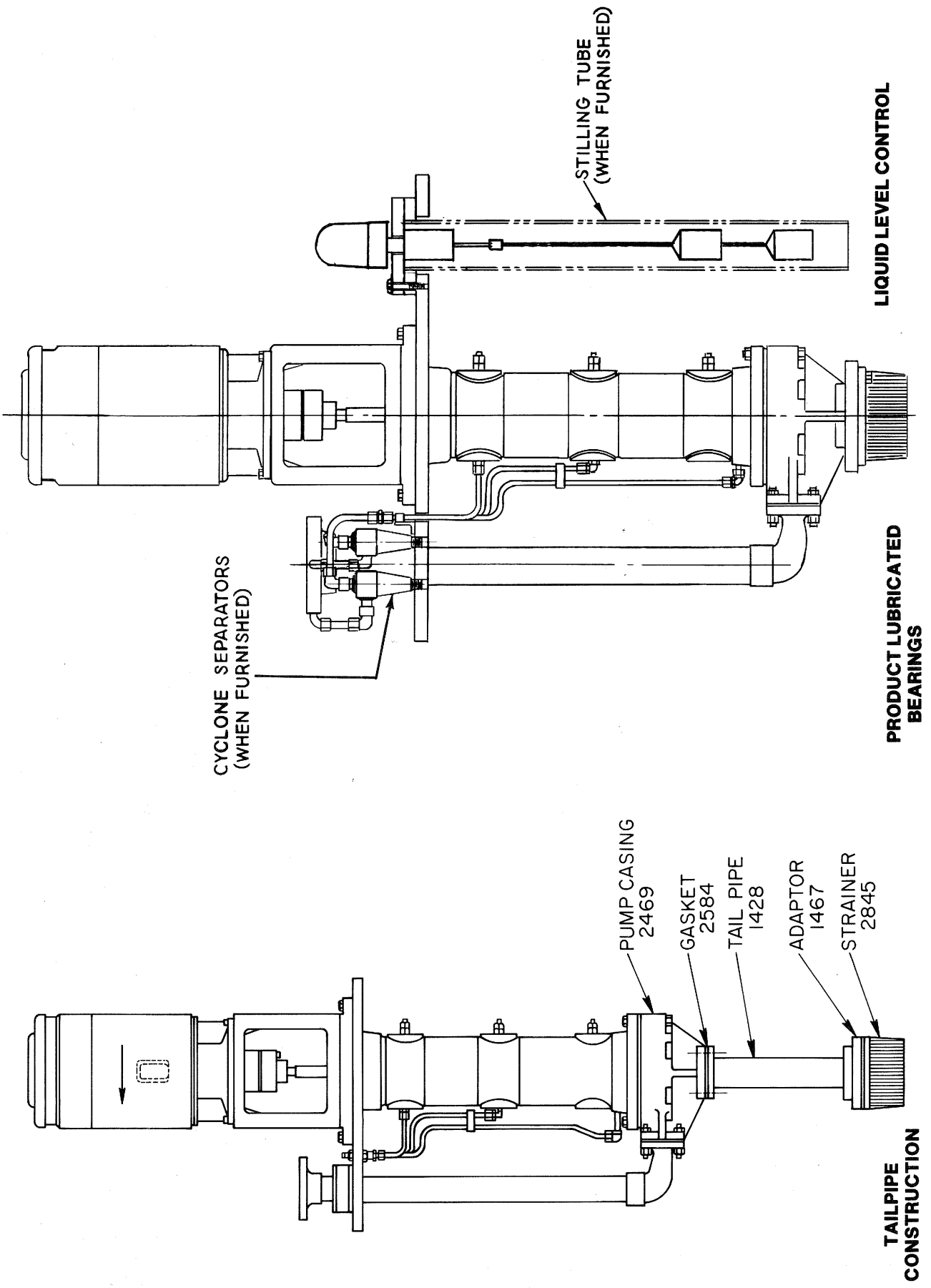
Cross Section and Parts List

GROUP 2—3x1½x8
—4x3x8

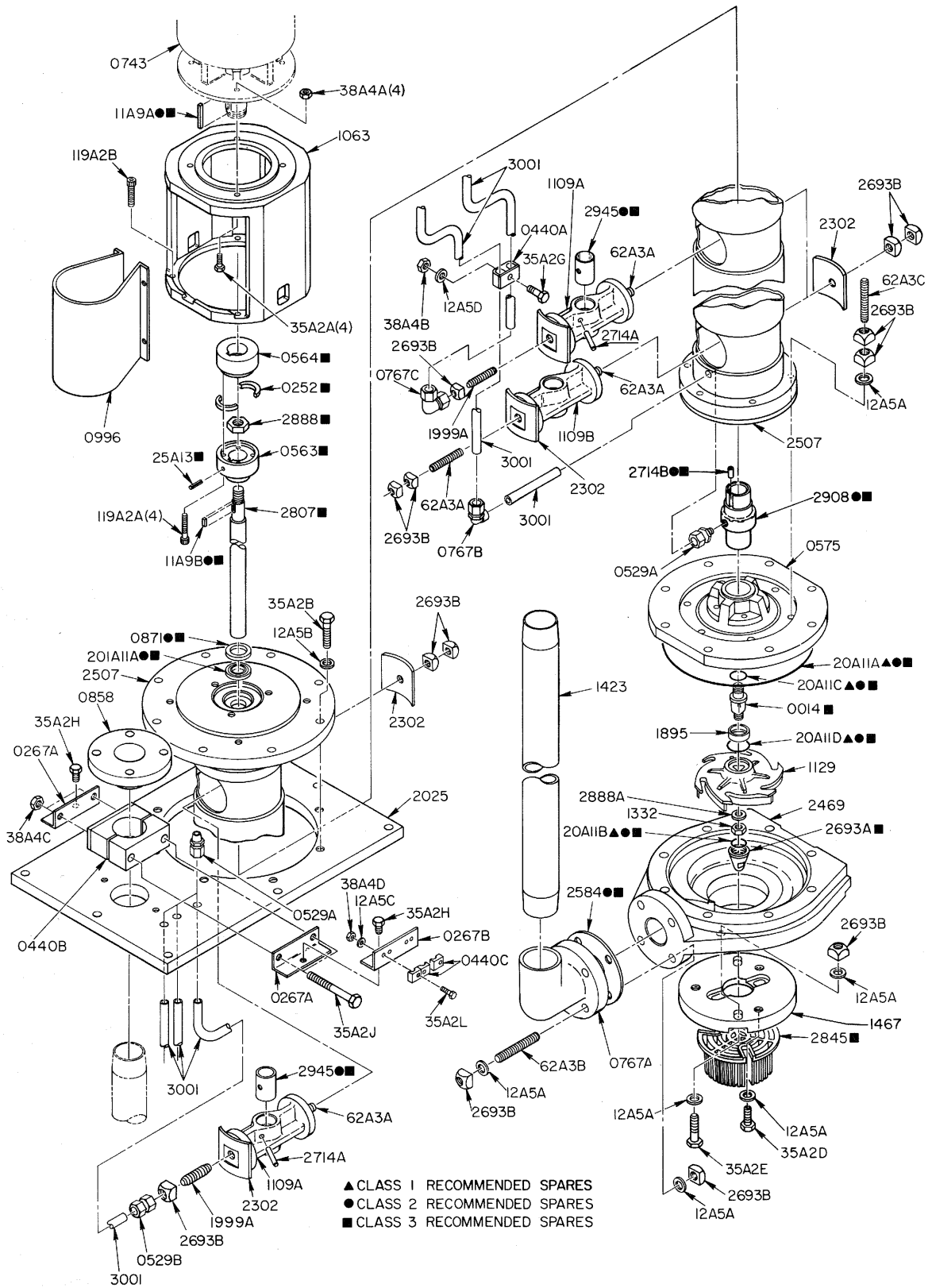
PART NO.	DESCRIPTION
0014	IMPELLER ADAPTER
0252	SPLIT RING
0267A	PIPE CLAMP BRACKET
0267B	TUBING PIPE CLAMP
0440A	TUBING CLAMP
0440B	PIPE CLAMP
0440C	TUBING CLAMP
0529A/B	CONNECTOR
0561	FLEXIBLE COUPLING
0563	PUMP HALF COUPLING
0564	MOTOR HALF COUPLING
0575	CASING COVER
0743	MOTOR
0767A	DISCHARGE ELBOW
0767B	LUBE LINE ELBOW
0767C	LUBE LINE ELBOW
0858	DISCHARGE FLANGE
0871	FLINGER
1063	SUPPORT HEAD
1109A	BEARING HOLDER INTER.
1109B	BEARING HOLDER LOWER
1129	IMPELLER
1332	IMPELLER LOCK NUT
1423	DISCHARGE PIPE
1467	ADAPTOR-STRAINER
1881	ADJUSTING SLEEVE
1895	SLEEVE
2025	MOUNT PLATE
2302	SADDLE WASHER
2469	CASING
2507	COLUMN
2584	DISCHARGE FLANGE GASKET
2647	GIB KEY
2693A	IMPELLER NUT
2693B	FRP SQUARE NUT
2714A	PIN
2714B	PIN
2807A	SHAFT (STD DESIGN)
2807B	SHAFT (THRUST BEARING DESIGN)
2845	STRAINER
2888	ADJUSTING WASHER
2888A	IMPELLER WASHER
2908	BEARING CARTRIDGE
2945	SLEEVE BEARING
3001	TUBING
3016	BEARING SUPPORT RING
3114	BEARING BODY
1999A	LUBE/LOCK STUD
2419	BOLT
11A9A	KEY (MOTOR SHAFT)
11A9B	KEY (PUMP SHAFT)
12A5A	FLAT WASHER (FRP)
12A5B	FLAT WASHER (TUBING COLUMN)
12A5C	FLAT WASHER (TUBING CLAMP)
12A5D	FLAT WASHER (TUBING CLAMP)
20A11A	CASING O-RING
20A11B	IMPELLER O-RING (NUT)
20A11C	IMPELLER O-RING (SHAFT)
20A11D	O-RING (SLEEVE)
24A19	THRUST BEARING
25A13	ROLL PIN
35A2A	CAPSCREW (MOTOR)
35A2B	CAPSCREW (COLUMN)
35A2D	CAPSCREW (STRAINER)
35A2E	CAPSCREW (ADAPTOR-STRAINER)
35A2G	CAPSCREW (TUBING CLAMP)
35A2H	CAPSCREW (DISCHARGE PIPE CLAMP)
35A2J	CAPSCREW (DISCHARGE PIPE CLAMP)
35A2K	CAPSCREW (BEARING BODY)
35A2L	CAPSCREW (TUBING CLAMP)
38A4A	NUT (MOTOR)
38A4B	NUT (TUBING CLAMP)
38A4C	NUT (DISCHARGE PIPE CLAMP)
38A4D	NUT (TUBING CLAMP)
62A3A	STUD (BEARING HOLDING)
62A3B	STUD (DISCHARGE)
62A3C	STUD (CASING)
119A2A	CAPSCREW (COUPLING)
119A2B	CAPSCREW (SUPPORT HEAD)
162A13	RETAINING RING
181A13	RETAINING RING
201A11A	KLOZURE
201A11B	KLOZURE
250A10	GREASE FITTING



OPTIONAL FEATURES



Exploded Parts Drawing



GROUP 2
3x1½x8
4x3x8

Recommended Spare Parts List

Part Number	Description	Class 1 Min.	Class 2 Av.	Class 3 Max.
	Pump End			
2469	:Casing			
1467	::Strainer Adaptor (when furnished)			
2845	::Strainer			
2419	::Bolts/Studs-Casing to Column			
12A5A	::Washers†			
2693B	::Nuts†			
0575	::Casing Cover			
20A11A	::O-Ring	1	1	1
1129	:Impeller			1
20A11B	::O-Ring—Impeller Nut	1	1	1
20A11C	::O-Ring—Shaft	1	1	1
20A11D	::O-Ring—Sleeve	1	1	1
2846	::Impeller Stud—Group 1 Pumps			1
1332	::Impeller Locknut—Group 2 Pumps			1
	Column Assembly			
2507	:Column			
2908	::Lower Bearing Cartridge		1	1
2714B	:::Pin (furnished with cartridge)			
1109A	::Intermediate Bearing Holder			
2945	:::Intermediate Bearing††		1	1
2714A	:::Pin (furnished with bearings)††		1	1
1109B	::Lower Bearing Holder			
1999A	Lube/Lock Stud			
2807	:Shaft		1	1
0014	::Impeller Adapter		1	1
201A11A	::Lip Seal	1	1	1
0871	::Flinger		1	1
11A9B	::Key		1	1
	Discharge Pipe Assembly			
1423	:Discharge Pipe			
0767A	::Discharge Elbow			
0858	::Discharge Flange			
2584	::Discharge Gasket	1	1	1
62A3B	::Studs†			
12A5A	::Washers†			
2693B	::Nuts†			
0440B	::Pipe Clamp			
	External Thrust Bearing (Optional)			
24A19	:Thrust Bearing		1	1
1881	::Adjusting Sleeve			1
201A11A	::Lip Seal	1	1	1
201A11B	::Lip Seal	1	1	1
3114	::Bearing Housing			
2647	::Gib Key			1
181A13	::Retaining Ring			1
	Coupling Assembly (Standard Design)			
0563	:Pump—Half Coupling			1
25A13	::Pin			1
2888	:Adjusting Washer			1
0252	::Split Ring			1
0564	:Driver—Half Coupling			1
11A9A	::Key Driver		1	1
0743	Driver			
1063	Support Head			
	Lube Piping			
3001	:Lube Piping			
0767B	::Elbow			
0767C	::Elbow			
0440A	::Clamp			
0529A	::Connector			
0529B	::Connector			
2025	Mounting Plate			

†Note: Not furnished less than one complete set.

††Note: Per intermediate bearing furnished—Quantity varies by pump length.