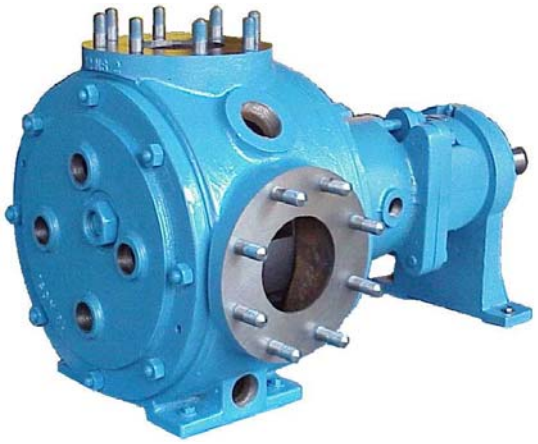
VIKING PUMP CANADA

TECHNICAL SERVICE MANUAL

HEAVY-DUTY PUMPS
SERIES 260
MODELS Q, M, N

SECTION 3
BULLETIN TSM 260-V
ISSUE C. 4/2009

CONTENTS



N-260 Left Hand with jacketed head and rotor bearing sleeve.

INTRODUCTION

The illustrations used in this manual are for identification purposes only and cannot be used for ordering parts. Obtain a parts list from the factory or a Viking representative. Always give complete name of part, part number and material with model number and serial number of pump when ordering repair parts. The pump model number and serial number are on the nameplate.

In the Viking model number system, basic size letters are combined with series number.

UNMOUNTED PUMP	UNITS
Q-260	Units are designated by the unmounted pump model numbers followed by "Arrangement" indicating drive style.
M-260	
N-260	
	13-Direct Connected
	53-V-Belt Drive
	70-Commercial Speed Reducer
	90-Commercial Gear Motor

This manual deals only with Series 260 Heavy Duty Bracket Mounted Pumps.

Caution

Parts on the pumps in this manual are heavy. Use appropriate lifting equipment, and wear safety shoes.

DANGER

BEFORE OPENING ANY PUMP LIQUID CHAMBER (PUMPING CHAMBER, RESERVOIR, RELIEF VALVE ADJUSTING CAP FITTING ETC.) BE SURE:

1. THAT ANY PRESSURE IN CHAMBER HAS BEEN COMPLETELY VENTED THROUGH SUCTION OR DISCHARGE LINES OR OTHER APPROPRIATE OPENINGS OR CONNECTIONS.
2. THAT THE DRIVING MEANS (MOTOR, TURBINE, ENGINE, ETC.) HAS BEEN "LOCKED OUT" OR MADE NON-OPERATIONAL SO THAT IT CANNOT BE STARTED WHILE WORK IS BEING DONE ON PUMP.
3. THAT YOU KNOW WHAT LIQUID THE PUMP HAS BEEN HANDLING AND THE PRECAUTIONS NECESSARY TO SAFELY HANDLE THE LIQUID. OBTAIN A MATERIAL SAFETY DATA SHEET (MSDS) FOR THE LIQUID TO BE SURE THESE PRECAUTIONS ARE UNDERSTOOD.

FAILURE TO FOLLOW ABOVE LISTED PRECAUTIONARY MEASURES MAY RESULT IN SERIOUS INJURY OR DEATH.

ROTATION: Rotary gear pumps operate equally well in a clockwise or counterclockwise rotation. The shaft rotation determines which port is suction and which is discharge. The port area where pumping elements (gear teeth) come out of mesh is suction port.

PRESSURE RELIEF VALVES:

1. Viking pumps are positive displacement pumps and must be provided with some sort of pressure protection. This may be a relief valve mounted directly on the pump, an inline pressure relief valve, a torque-limiting device or a rupture disk.
2. There are relief valve options available on all pump models. Options may include a return to tank relief valve and a jacketed relief valve. Pumps equipped with a jacketed head are not available with a relief valve.
3. If pump rotation is reversed during operation, pressure protection must be provided on *both* sides of pump.
4. Relief valve bonnet (see page 12) must *always* point towards suction side of pump. If pump rotation is reversed, remove pressure relief valve and turn end for end. Figure 2 shows the standard orientation, with side suction and top discharge.
5. Pressure relief valves cannot be used to control pump flow or regulate discharge pressure.

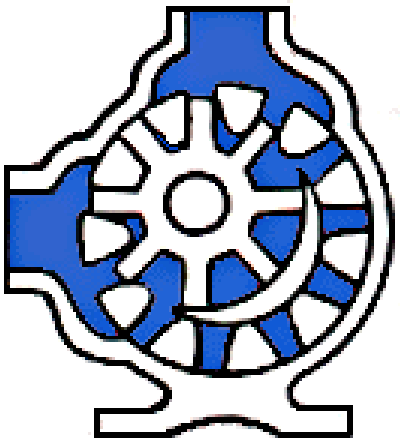


Figure 1, Idler pin location

SPECIAL INFORMATION

SPECIAL MECHANICAL SEALS can be installed either next to rotor hub or behind the bracket bushing.

Extra care must be taken in repair of pumps with mechanical seals. Read and follow all special information supplied with pump.

Figure 2, Standard head and relief valve orientation.

MAINTENANCE

Series 332 and 260 pumps are designed for long, trouble-free service life under a wide variety of application conditions with a minimum of maintenance. The points listed below will help provide long service life.

LUBRICATION: All pumps are greased at the factory. External lubrication must be applied slowly with a grease gun to all lubrication fittings every 500 hours of operation with multi-purpose grease. Do not over-grease. Applications involving very high or low temperatures will require other types of lubrication. Consult factory with specific lubrication questions.

PACKING ADJUSTMENT: New packed pumps require initial packing adjustment to control leakage as packing "runs in". The adjustment should be made while the pump is operating with normal operating pressure on the discharge of the pump. Make adjustments carefully and do not over-tighten packing gland. Evenly tighten the gland fasteners until the leak is reduced to a very slow drip. If over tightened the packing will over heat, score the shaft and reduce life. After initial adjustment, inspect periodically for increased leakage and re-adjust. Once the gland has been tightened to the stuffing box face, loosen the packing gland and add one ring to the stuffing box, then adjust again. Figure 1, page 2. Refer to instructions under Disassembly, page 5, and Assembly, page 6, regarding re-packing pump.

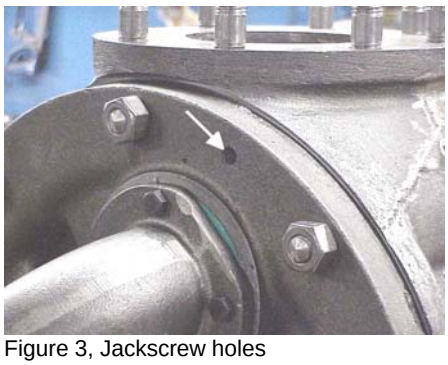


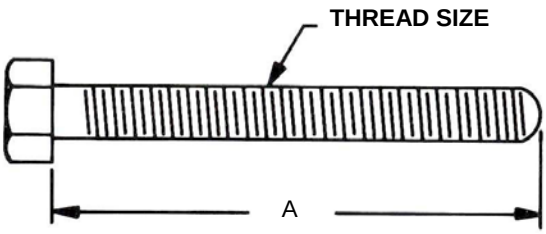
Figure 3, Jackscrew holes

CLEANING PUMP: Keep pump as clean as possible. This will facilitate inspection, adjustment and repair work and help prevent overlooking a dirt covered grease fitting.

STORAGE: If pump is to be stored, or not used for six months or more, pump must be drained and a light coat of lubricant and rust preventative suitable to the application must be applied to all internal pump parts. Lubricate fittings and apply grease to pump shaft extension. Rotate the pump shaft by hand, one complete revolution every 30 days to circulate the oil.

SUGGESTED REPAIR TOOLS: The following tools must be available to properly repair Series 260 pumps. These tools are in addition to standard mechanics' tools such as open-end wrenches, pliers, screwdrivers, etc. Most of the items can be obtained from an industrial supply house.

1. Soft Headed hammer
2. Allen wrenches (some mechanical seals and set collars)
3. Packing hooks, flexible (packed pumps)
   Large for 0.38 inch and up cross-section packing
4. Mechanical seal installation sleeve
5. Bearing lock nut wrench
7. Brass bar
8. Arbor press

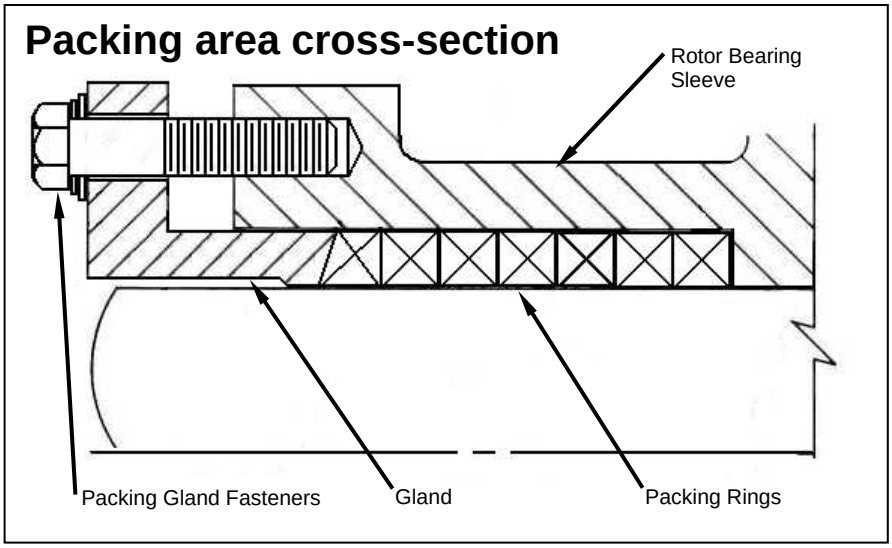


PUMP SIZE	A	THREAD SIZE (INCH)
Q	3.00	0.50" - 13 NC
M	3.50	0.50" - 13 NC
N	3.50	0.50" - 13 NC

Figure 4, Minimum length of jackscrews

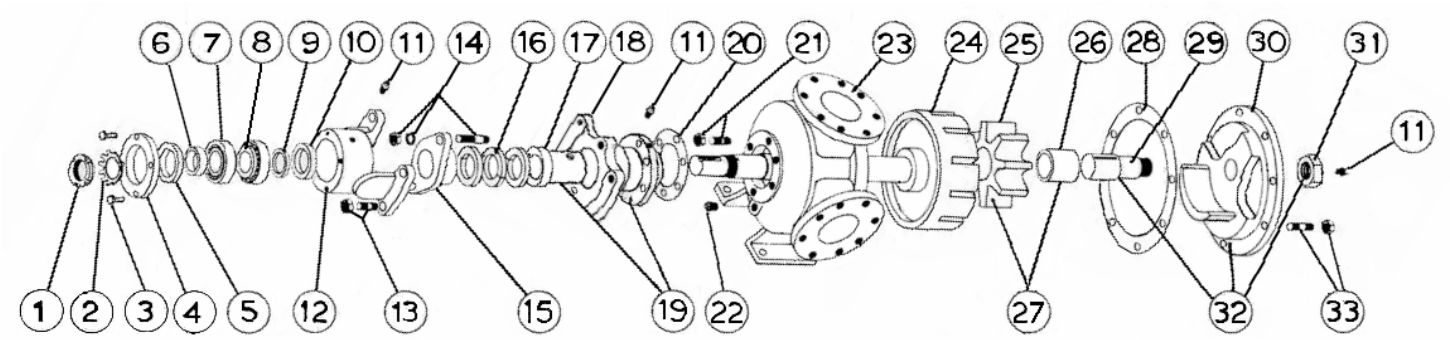
Strainers: Use a strainer on the suction side of the pump to prevent foreign material from entering the pump causing damage to the gears, and casing or lock-up the pump. Keep the strainer on the suction side of the pump clean and free of debris. A blocked strainer will not allow sufficient liquid to reach the pump. The lack of liquid reaching the pump will create cavitation. Cavitation is when the liquid vaporizes on its way to the pump, then returns to a liquid form on the surfaces of the pump. This is very noisy, damaging to a pump, and seriously affects the output.

Figure 5, Pushing the idler bushing



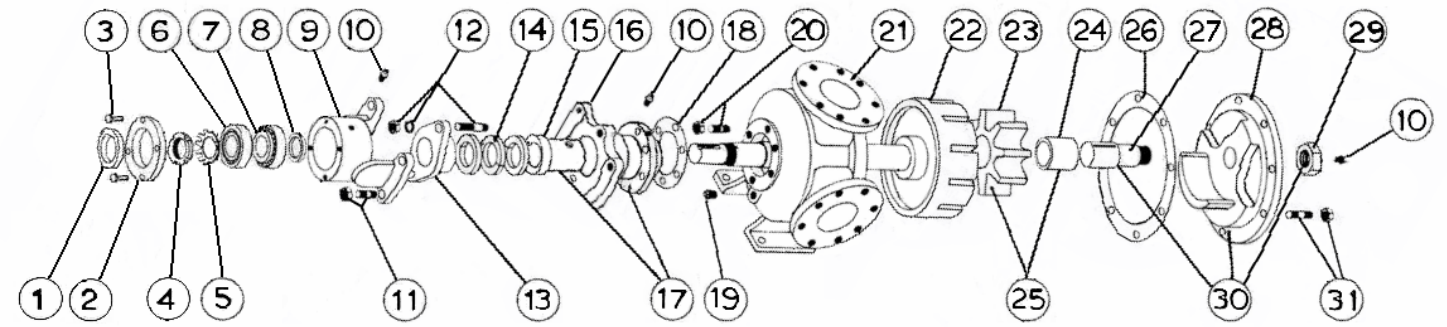
PACKED PUMPS

Exploded View for Packed Models: Q-260, M-260



ITEM	NAME OF PART	ITEM	NAME OF PART	ITEM	NAME OF PART	ITEM	NAME OF PART
1	Locknut	10	Lip seal (inner)	19	RBS & bushing ass'y	28	Head gasket
2	Lockwasher	11	Grease fitting	20	RBS gasket	29	Idler pin
3	End cap bolts	12	Bearing housing	21	RBS fasteners	30	Head
4	End cap	13	Bearing housing fasteners	22	Pipe plug	31	Idler pin nut
5	Lip seal (Outer)	14	Packing gland fasteners	23	Casing	32	Head & idler pin ass'y
6	Bearing Spacer (outer)	15	Packing gland	24	Rotor & shaft ass'y	33	Head fasteners
7	Roller bearing (outer)	16	Packing	25	Idler		
8	Roller bearing (inner)	17	RBS bushing	26	Idler bushing		
9	Bearing spacer (inner)	18	Rotor bearing sleeve (RBS)	27	Idler & bushing ass'y		

Exploded View for Packed Models: N-260



ITEM	NAME OF PART	ITEM	NAME OF PART	ITEM	NAME OF PART	ITEM	NAME OF PART
1	Outer Lipseal	9	Bearing Housing	17	RBS & bushing ass'y	25	Idler & bushing ass'y
2	End cap bolts	10	Grease fitting	18	RBS gasket	26	Head gasket
3	End cap	11	Bearing housing fasteners	19	Pipe plug	27	Idler pin
4	Locknut	12	Packing gland fasteners	20	RBS fasteners	28	Head
5	Lockwasher	13	Packing gland	21	Casing	29	Idler pin nut
6	Bearing Cup	14	Packing	22	Rotor & shaft ass'y	30	Head & idler pin ass'y
7	Bearing Cone	15	RBS bushing	23	Idler	31	Head fasteners
8	Inner Lipseal	16	Rotor bearing sleeve (RBS)	24	Idler bushing		

PACKED PUMP DISASSEMBLY

1. Mark head and casing before disassembly to ensure proper re-assembly. The idler pin, which is offset in pump head, must be positioned towards and equal distance between port connections to allow for proper flow of liquid through pump. It is not necessary to remove relief valve to take head off pump; however, removing relief valve will lessen total weight of the part.

2. Do not use chain or cable around relief value body to support the head during removal. Remove nuts from head. Jackscrews should be used to back head away from casing. Proper size and length of jackscrews for pump size are shown in figure 4. Put the jackscrews in the tapped holes on the perimeter of the head. Figure 3. Alternately turn them into the head, to push the head away from the pump. Until a hook from a hoist can be inserted into a fastener hole in the head.

3. Use a hoist to support the head pull it away from the pump. Do not allow idler to fall from idler pin. If a hoist is not available put blocks under the crescent on the head to support it, if there is a relief valve support it as well. This will eliminate having to lift head into position when reassembling pump.

4. Remove the idler and bushing assembly, and all gasket material.

5. Remove pipe plug from drain hole in casing, this breaks vacuum behind rotor.

6. Remove packing gland nuts and slide gland out of rotor bearing sleeve.

7. Remove the end cap and lip seal assembly.

8. Insert length of hard wood or brass bar through port opening between rotor teeth to keep shaft from turning.

9. Bend up the tab on the lock washer and with a spanner wrench, remove the lock nut and lock washer from shaft.

10. Remove length of hardwood or brass bar from port opening.

11. Protect the end of the shaft with a hardwood block and drive rotor out of casing, be careful to avoid damaging rotor bearing sleeve bushing. Support weight of rotor with a hoist. A cable sling can be used around shaft, or around rotor teeth, to carry weight of part.

12. Remove nuts and take off thrust bearing housing.

13. Remove packing from rotor bearing sleeve.

14. Check the rotor-bearing sleeve bushing while it is still mounted on the casing. If worn, the bushing should be replaced.

15. If the RBS bushing needs replacement, remove the rotor-bearing sleeve from casing. A press will be required to remove the old bushing

16. Clean all parts thoroughly and examine for wear and damage, replace if necessary.

17. Wash anti-friction bearings (roller bearings) in clean solvent. Blow out bearings with compressed air. Do not allow bearings to spin; turn bearing slowly by hand. Spinning bearings will damage race and rollers. Make sure bearings are clean, check for roughness. Roughness can be determined by turning outer race by hand noting if the movement is smooth and free or rough and sticky. Smooth and free is desired. CAUTION: Replace the rollers with the original race. Lubricate with non-detergent SAE 30, weight oil and

    Examine casing for wear. Check condition of casing at seal area (surface between suction and discharge port). If surface is in good condition, casing need not be replaced.

    When making major repairs, such as replacement of a rotor, it is usually considered advisable to install a new head and idler. When making minor repairs, where only an idler bushing and idler pin are required, other new parts are usually not necessary.

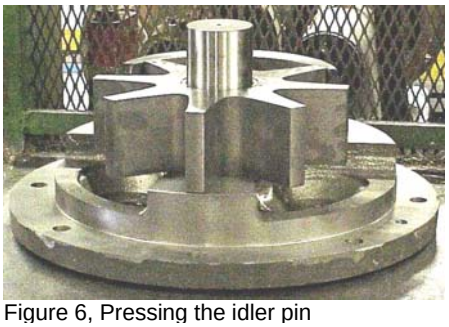


Figure 6, Pressing the idler pin

Figure 7, The RBS bushing installed

Figure 8, Installing the idler bushing

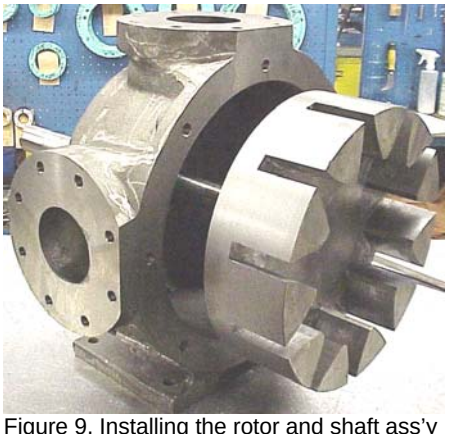


Figure 9, Installing the rotor and shaft ass'y

PACKED PUMP ASSEMBLY

Pumps are supplied with a wide variety of bushing materials. These materials should not all be treated the same. See “Bushing Material” page 10.

1. Press the idler bushing into the idler gear, figure 5, page 3. If installing carbon graphite bushings see “Installation of Carbon Bushings” page 10. The bushing must flush with the gear.

2. Use the idler and bushing assembly as a guide to press the idler pin into the head. Lubricate the pin with clean oil prior to pressing. If the pin has lubrication holes, then orient the pin so that the tapped hole end is in the head, and the hole in the side of the pin faces the centre of the crescent on the head. Figure 6

3. Press the RBS bushing into the RBS as shown in figure 7, page 5. Be sure to orient the bushing so that the lubrication hole lines up with the tapped hole in the side of the sleeve.

4. Install the rotor bearing sleeve and gasket on the casing. Coat both sides of gasket with thread sealant (pipe dope) and quickly install gasket and rotor bearing sleeve on casing. Place a support under rotor bearing sleeve to prevent casing and rotor bearing sleeve from tilting down while rotor is being installed.

5. Check casing to be sure drain plug has been removed.

6. Carefully check shaft, remove any burrs or rough surfaces to avoid damaging rotor bearing sleeve bushing while installing rotor and shaft into casing. Coat inner diameter of rotor bearing sleeve bushing and shaft with a thin coat of non-detergent SAE 30 weight oil.

7. Support weight of rotor with a hoist. A cable or sling can be used around shaft, or around rotor teeth, to carry weight of the part while being assembled into casing. Place the end of the rotor shaft through casing and into the bushing. Slowly turn the rotor back and forth while pushing it into the casing. Figure 9, page 5. If the bearing housing is still mounted on the RBS then stop pushing the rotor and shaft when the shaft emerges from the stuffing box. Place the packing gland on the shaft, and continue to push the rotor and shaft assembly into the casing.

8. Use packing suitable for the liquid being pumped. Lubricate packing rings with oil, grease or graphite to aid assembly. Packing ring joints should be staggered from one side of shaft to the other, figure 10. Wrap the packing rings around the shaft and push into the stuffing box. Use the packing gland to push each ring in as far as possible.

9. Fasten down the packing gland loosely for adjustment later. Figure 11

10. Press the inner lip seal into the bearing housing with the lip pointing away from the bearing area, as pictured in figure 12.

11. Press the outer race of the inner roller bearing into the bearing housing as shown in figure 13.

12. Mount the bearing housing on the RBS.

13. Place a wooden wedge between the rotor teeth and the casing port opening. This will prevent the rotor and shaft assembly from moving out of the casing while completing the bearing assembly.

Note: The N and R model pumps do not have bearing spacers.

14. Place the inner spacer on the shaft and up to the step.

15. Push the bearing cones on the shaft and push up to the bearing spacer. Figure 15, page 7

16. Place the outer spacer on the shaft and up to the outer bearing

17. Tap the bearing cup into the bearing housing with a hammer and punch.

18. Press the outer lip seal into the end cap.

19. Put the end cap onto the shaft and tighten down evenly. This will push the outer bearing race into position. If the pump model is “N” or “R”, remove the endcap.


Figure 10, Packing Rings


Figure 11, Packing gland installed


Figure 12, Inner lip seal orientation


Figure 13, Inner bearing race installed

20. Put the lock washer and lock nut on shaft. Tighten the lock nut with a spanner wrench. One tab of lock washer will line up with a slot in the lock nut. Bend that tab into the slot. Figure 16, page 7.

21. Remove the wooden wedge from the pump and place it through the port and between the rotor teeth to prevent rotation of the shaft.

22. On models “N” and “R” replace the endcap and tighten down.

23. Perform the “End Clearance Adjustment” on page 11.

24. Check that the shaft will turn freely.

25. If the relief valve was not removed from head, skip step 26.

26. Mount the relief valve on the head with the bonnet pointing toward the suction port.

27. Install drain plug in casing.

28. Lubricate all grease fittings with multi-purpose grease.

29. The pump is complete, however packing adjustment will be needed after installation. Page 2.

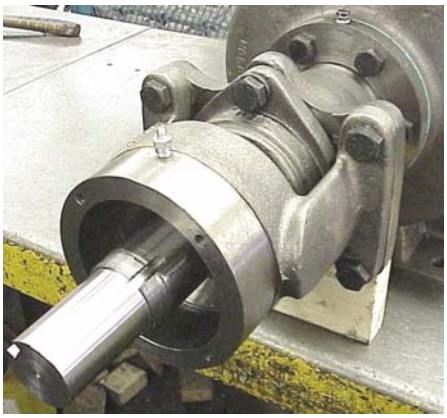


Figure 14, The bearing housing mounted

Figure 15, Installing the bearings

Figure 16, Lock nut and washer installed

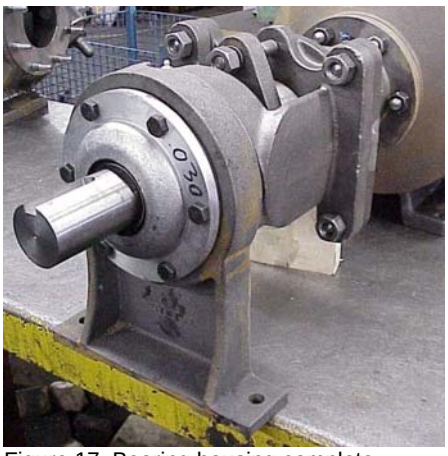
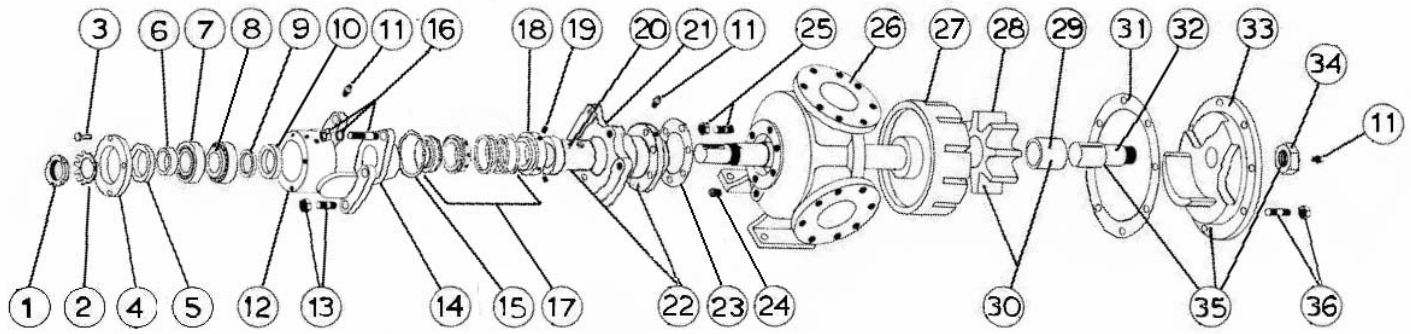


Figure 17, Bearing housing complete

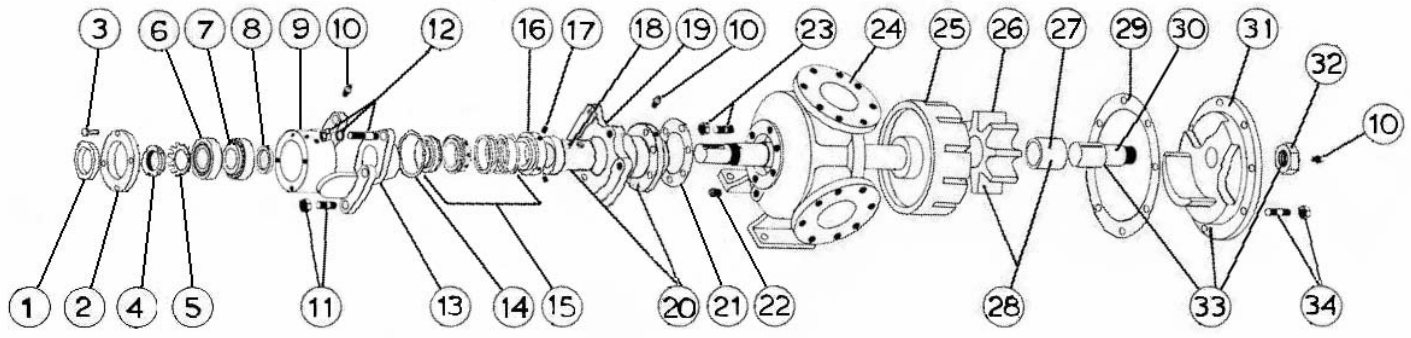
MECHANICAL SEAL PUMPS

Exploded View for Mechanical Seal Models: Q-260, M-260

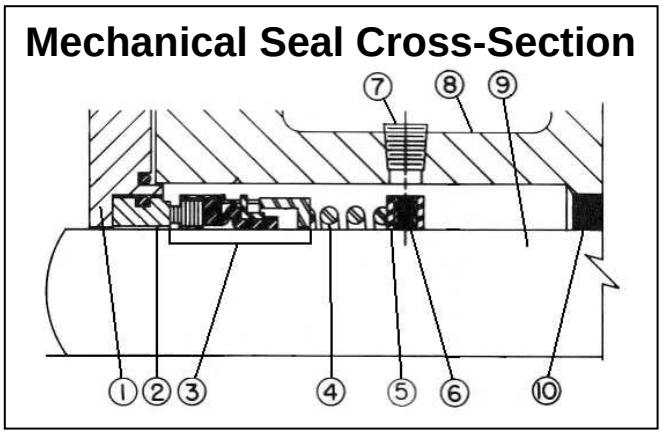


ITEM	NAME OF PART	ITEM	NAME OF PART	ITEM	NAME OF PART	ITEM	NAME OF PART
1	Locknut	10	Lip Seal (inner)	19	Set Screws	28	Idler
2	Lockwasher	11	Grease Fitting	20	RBS Bushing	29	Idler Bushing
3	End Cap Bolts	12	Bearing Housing	21	Rotor Bearing Sleeve	30	Idler & Bushing Assy.
4	End Cap	13	Bearing Housing Fasteners	22	RBS & Bushing Assy.	31	Head Gasket
5	Lip Seal (Outer)	14	Seal Seat Retainer	23	RBS Gasket	32	Idler Pin
6	Bearing Spacer (outer)	15	Seal Seat Retainer Oring	24	Pipe Plug	33	Head
7	Roller Bearing (outer)	16	Seal Seat Retainer Fasteners	25	RBS Fasteners	34	Idler Pin Nut
8	Roller Bearing (inner)	17	Mechanical Seal	26	Casing	35	Head & Pin Assy.
9	Bearing Spacer (inner)	18	Driving Ring	27	Rotor & Shaft Assy.	36	Head Fasteners

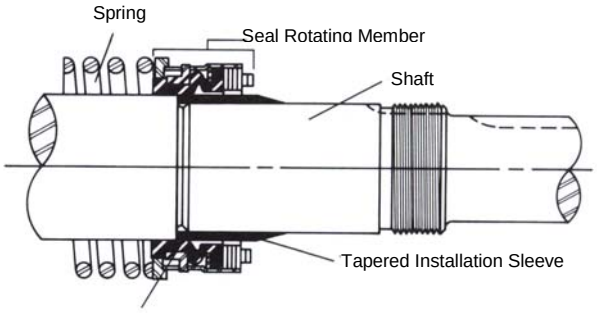
Exploded View for Mechanical Seal Models: N-260



ITEM	NAME OF PART	ITEM	NAME OF PART	ITEM	NAME OF PART	ITEM	NAME OF PART
1	Outer Lip Seal	10	Grease Fitting	19	Rotor Bearing Sleeve (RBS)	28	Idler & Bushing Ass'y
2	End Cap Bolts	11	Bearing Housing Fasteners	20	RBS & Bushing Ass'y	29	Head Gasket
3	End Cap	12	Seal Retainer Fasteners	21	RBS Gasket	30	Idler Pin
4	Locknut	13	Seal Seat Retainer	22	Pipe Plug	31	Head
5	Lockwasher	14	Retainer Oring	23	RBS Fasteners	32	Idler Pin Nut
6	Bearing Cup	15	Mechanical Seal Ass'y	24	Casing	33	Head & Idler Pin Ass'y
7	Bearing Cone	16	Driving Ring	25	Rotor & Shaft Ass'y	34	Head Fasteners
8	Inner Lip Seal	17	Driving Ring Set Screw	26	Idler		
9	Bearing Housing	18	RBS Bushing	27	Idler Bushing		



ITEM	NAME OF PART
1	Seal seat retainer
2	Stationary Seat
3	Rotating Seat
4	Spring
5	Drive ring
6	Setscrew
7	Pipe plug
8	RBS
9	Shaft
10	RBS bushing



Coat the shaft, tapered installation sleeve and inner diameter of mechanical seal with lubricant as recommended by your seal supplier.

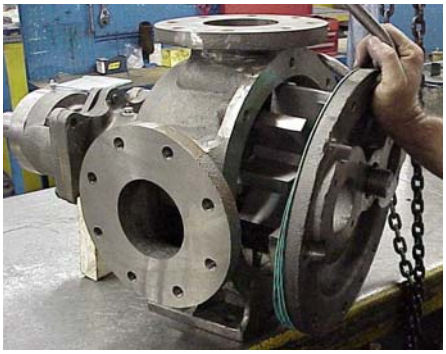


Figure 18 Installing the head

SEALED PUMP DISSASSEMBLY

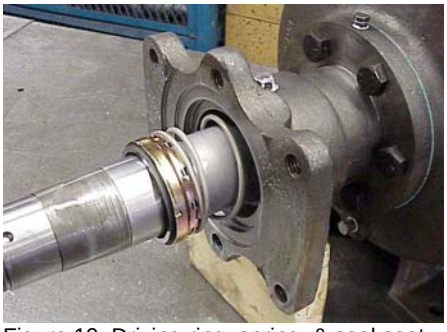


Figure 19, Driving ring, spring, & seal seat

1. Do steps 1 to 3 from the packed pump disassembly on page 6.
2. Remove the pipe plug from the RBS to access the setscrew on the driving ring. Loosen the 2 set screws through the hole.
3. Loosen the fasteners from the seal seat retainer.
4. Remove the end cap with the lip seal.
5. Insert length of hardwood or brass through port opening between rotor teeth to keep shaft from turning.
6. Bend up tab on lock washer and with a spanner wrench, remove lock nut and lock washer from shaft. Refer to figure 16.
7. Remove length of hardwood or brass bar from port opening.
8. Remove the outer bearing spacer.
9. Cushion the end of shaft with a hardwood block or piece of brass and drive rotor out of casing being careful to avoid damaging rotor bearing sleeve bushing.
10. Support weight of rotor with a hoist. A cable sling can be used around shaft, or around rotor teeth to carry weight of part.
11. Remove nuts and take off the bearing housing.
12. Remove nuts holding the seal seat retainer and remove the retainer. The stationary seal seat can be removed from the retainer. The rotating portion of seal from rotor bearing sleeve. Remove the spring and driving ring from the seal chamber.
13. Do steps 10 through 14 of packed pump disassembly on page 5.

SEALED PUMP ASSEMBLY

The seal used in this pump is simple to install and good performance will result if care is taken during installation.

The principle of the mechanical seal is that contact between the rotary and stationary members. These parts are lapped to a high finish and their sealing effectiveness depends on complete contact.

A number of heavy-duty pumps with special mechanical seals are supplied. Information is available by contacting the factory. When requesting special seal information, be sure to give pump model number and serial number.

The wide variety of bushing materials used should not all be treated the same. See “Bushing Material” page 10.
Prepare all parts for re-assembly ahead of time. Pack roller bearings with multi-purpose grease and have all new gaskets on hand.

Be especially careful to keep mechanical seal parts clean, minute dirt particles especially on seal faces, will cause damage. Never touch seal faces with anything except clean hands or clean cloth.

Once rotating position of mechanical seal is installed on rotor shaft, it is necessary to assemble parts as quickly as possible to ensure seal does not stick to shaft in the wrong axial position. The seal should be expected to stick to shaft after several minutes setting time.

1. Do steps 1 through 4 of the packed pump assembly on page 6.

2. Install driving ring on shaft in rotor bearing sleeve directly under tapped access hole. The center of the driving ring setscrews must line up with center of the access hole. Rotate shaft and tighten all setscrews.

3. Replace pipe plug in seal access hole.

4. Place tapered installation sleeve on shaft.

5. Apply a generous amount of seal lubricant as recommended by your seal supplier to the large diameter of shaft, tapered installation sleeve and inner diameter of mechanical seal rubber parts.

6. Slide seal spring on shaft and into seal chamber against set collar. Place rotating element, polished surface facing the end of the shaft against spring.

7. Coat seal seat retainer and stationary element with seal lubricant and press in seal seat with lapped faced out into the seal seat retainer. Protect the face of seal seat with a clean piece of cardboard while pressing into place. Figure 21, page 9

8. Place a wood wedge between the rotor teeth and the casing. Figure 22

9. Install the seal seat retainer over the shaft until seal faces touch. Push the retainer to compress the spring, then start the fasteners into the RBS. A second person may be required to start the fasteners while the retainer is being held into place. Pull seal seat retainer evenly against face of seal chamber with fasteners, alternately tightening one and then the other. This will compress mechanical seal to correct operating length and compress the retainer o-ring to seal off seal chamber. Figure 23

10. Do steps 10 through 29 of the packed pump assembly, page 6.


Figure 21, Stationary seat install

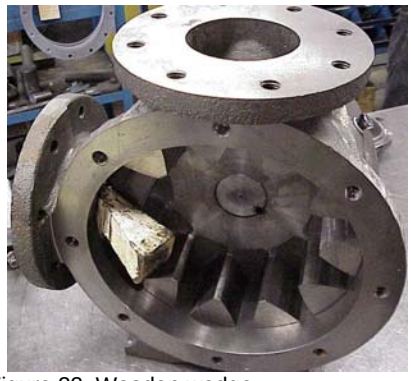


Figure 22, Wooden wedge

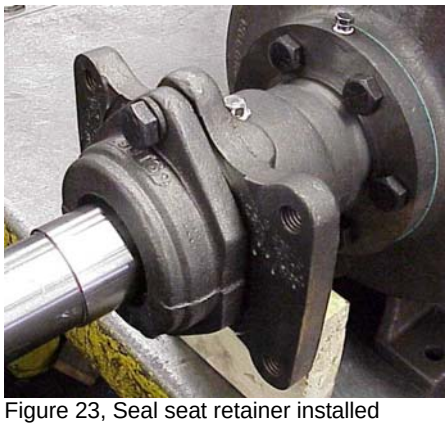


Figure 23, Seal seat retainer installed

INSTALLATION OF CARBON GRAPHITE BUSHINGS

When installing carbon graphite bushings, extreme care must be taken to prevent breaking. Carbon graphite is a brittle material and easily cracked. If cracked, the bushing will quickly disintegrate. Using a lubricant and adding a chamfer on the bushing and the mating part will help in installation. The additional precautions listed below must be followed for proper installation:

1. A press must be used for installation.
2. Lubricate the bushing and bore with soapy water.
3. Be certain bushing is started straight.
4. Do not stop pressing operation until bushing is in proper position. Starting and stopping will result in a cracked bushing.
5. Check bushing for cracks after installation.

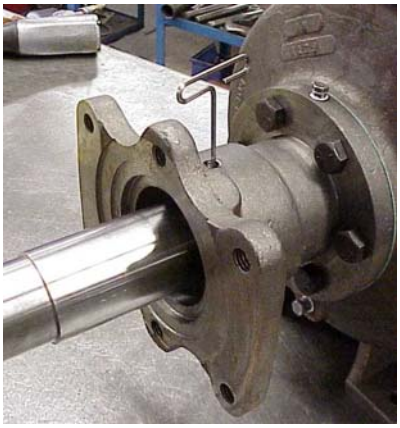


Figure 20, Setting the driving ring

BUSHING MATERIALS

Viking bushing material recommendations:

Material	Appearance	Installation Lubricant	Operating Lubrication
Bronze	Yellowish	Not required	Required
Carbon	Black	Soapy Water	Not required
Iron	Steel	Oil or anti-seize	Required
Nitralloy	Steel	Oil or anti-seize	Required
Tungsten	Steel	Oil or anti-seize	Not required

END CLEARANCE ADJUSTMENT

1. The bearing assembly must be complete and tight.
2. Measure the distance between the rotor teeth and the outer face of the casing. Figure 24.
3. Measure the distance between the head mounting surface and the first step on the head. Figure 25.
4. Subtract the two measurements and add your required end-clearance.
5. Use 0.015” gaskets to attain the thickness as calculated above.
6. Place the gaskets on the head. Figure 18, page 9.
7. Prior to installing the head, coat the casing face with thread sealant (pipe dope) and place the appropriate number of new 0.015" head gaskets on mounting studs. Place a bead of thread sealant (pipe dope) on the mating surface of the head, then prepare to mount head and idler assembly.
8. Pump head and casing should have been marked before disassembly to ensure proper re-assembly. If not, be sure idler pin, which is offset in pump head, is positioned toward and equal distance between port connections to allow for proper flow of liquid through pump. Figure 1, page 2 shows the proper orientation of the idler pin in the pump. Place head on pump, slightly tilting top of head away from casing until crescent enters inside diameter of rotor. Rotate idler on idler pin until idler teeth mesh with rotor teeth. Raise head until the face of the head is parallel with the face of the casing and work into position. Care must be taken to avoid damaging head gasket. Fasten head to casing with nuts and tighten evenly.

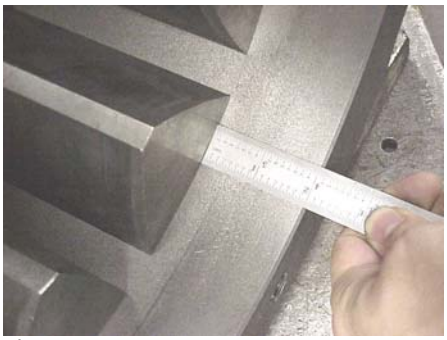


Figure 24

Figure 25

Standard catalog pumps require the following end clearance settings.

Pump Size	Standard End Clearance (Inch)
Q	.005
M	.005
N	.005

Pumps built for viscous liquid or high temperature service may require extra end clearance. Consult an authorized Viking distributor or the factory for further information.

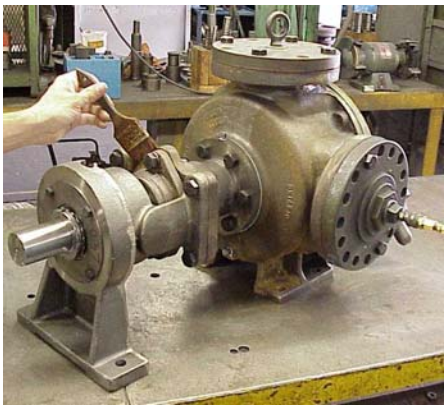


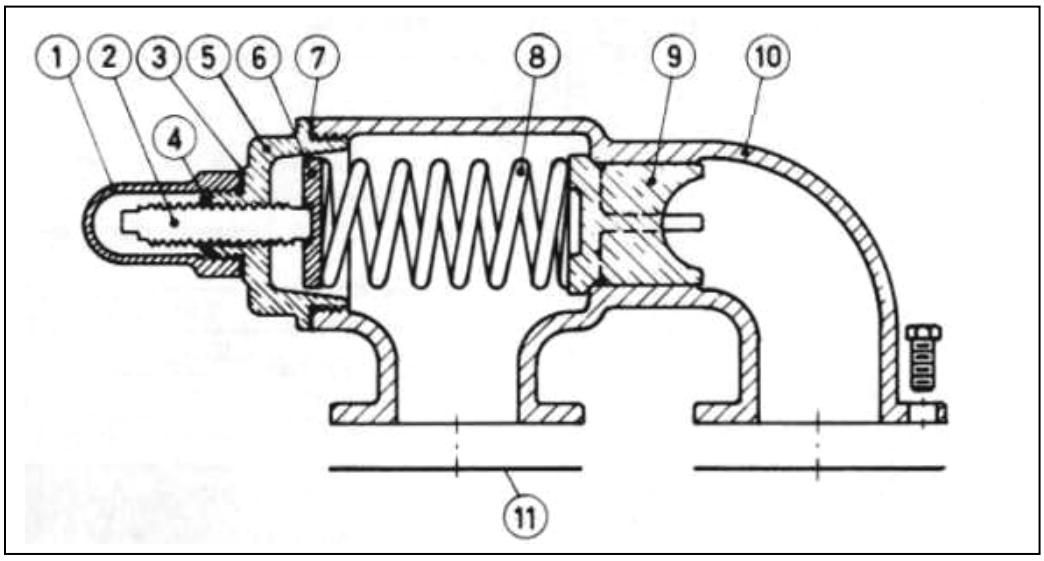
Figure 26, Pneumatic testing

PNEUMATIC TESTING

1. Seal the ports with pipe plugs or plates and gaskets. Be sure to provide a male air line connection to one of the ports.
2. Apply air pressure to the pump.
3. Spray or brush the externals with soapy water and watch for growing air bubbles around the seal, fitting, and gaskets.
4. Relieve the pressure from the pump.
5. Carefully disconnect the air supply.
6. Remove the plugs or covers from the ports.
7. Return the pump to service.

Figure 27, Poppet installation

PRESSURE RELIEF VALVE INSTRUCTIONS



ITEM	NAME OF PART	ITEM	NAME OF PART	ITEM	NAME OF PART	ITEM	NAME OF PART
1	Bonnet	4	Bonnet o-ring	7	Cap Gasket	10	Poppet
2	Adjusting Screw	5	End cap	8	Spring	11	Relief valve port gasket
3	Lock nut	6	Spring Guide	9	Casing		

DISASSEMBLY

Mark valve and head before disassembly to insure proper reassembly.

1. Remove bonnet.
2. Measure and record length of adjusting screw protruding out of the end cap.
3. Loosen lock nut and back out adjusting screw until spring pressure is released.
4. Remove relief valve cap, spring guide, spring and poppet from valve body. Clean and inspect all parts for wear or damage and replace as necessary.


Figure 28, Spring and retianer installed

ASSEMBLY

Reverse procedures outlined under Disassembly. Figures 27, 28 and 29 show a relief valve being assembled. If valve is removed for repairs, be sure to replace in same orientation. Relief valve adjusting screw cap must *always* point towards suction side of pump. If pump rotation is reversed, remove relief valve and turn end for end.

PRESSURE ADJUSTMENT

If a new spring is installed or if pressure setting of pressure relief valve is to be changed from that which the factory has set, the following instructions must be carefully followed.

1. Carefully remove the bonnet, which covers the adjusting screw.
2. Loosen the lock nut, which locks the adjusting screw so that the pressure setting will not change during operation of pump.
3. Install a pressure gauge in discharge line for actual adjustment operation.
4. Turn adjusting screw in to increase pressure and out to decrease pressure.
5. Closing a valve in the piping will stop all flow. The pressure gauge on the discharge port of the pump will show the maximum pressure that the relief valve will allow while pump is in operation.


Figure 29, End cap, adjusting screw & locknut

IMPORTANT

In ordering parts for pressure relief valve, always give model number and serial number of pump as it appears on nameplate and name of part wanted. When ordering springs, be sure to give pressure setting desired.

Troubleshooting

No Discharge:	Pump priming may be required
	Suction lift is too great
	Relief valve is stuck open
	Strainer needs cleaning
	Wrong direction of rotation
Insufficient Discharge Volume	Air leeks in suction
	Speed is to slow
	Relief valve is set to low
	Suction lift too high for liquid handled. This is very important on hot or volatile fluids
	Suction line is not submerged
	Suction piping too small in diameter, or foot valve is to small
	Wrong rotation
	Pump internals worn
	Air or gases in suction piping
	Viscosity is higher than expected
Insufficient Pressure	Relief valve set to low
	Air or gases in the fluid
	Pump internals are worn
	Insufficient volume being pumped
	Wrong rotation
	Improper clearances in the internals
Loss of suction after a period of operation	Suction line is leaking (letting air into the pump)
	Packing is too loose or the mechanical seal is leaking
	Leaking Gaskets
Excessive power equipment	Viscosity to high
	Discharge pressure is to high
	Insufficient lubrication
	Shaft or rotor bent, misalignment or packing gland is to tight
Noisy operation with good Performance	Misalignment of coupling
	Worn bearings
Noisy operation with poor or No performance	Cavitation – Not enough fluid getting to the pump
	Worn bearings or bushings and pump internals
Leaking around the shaft	Packing is loose, or needs replacement, see “packing adjustment” page 3
	Mechanical seal is damaged or miss-aligned
	Shaft is scored
	Shaft is bent

PUMP INSPECTION REPORT DATE:_____

PUMP MODEL: _____ SERIAL NUMBER: _____

CUSTOMER:_____

SALES ORDER NUMBER:_____ OTHER REFERENCE:_____

APPLICATION AND/OR PROBLEM: _____

DESCRIPTION	STANDARD DIMENSIONS	EX. CL. (IF ANY)	ACTUAL	WEAR
ROTOR O.D.				
ROTOR I.D.				
ROTOR TOOTH LENGTH				
IDLER O.D.				
IDLER (BUSHING) I.D.				
IDLER TOOTH LENGTH				
IDLER PIN O.D.				
SHAFT O.D.				
SHAFT BUSHING I.D.				
CRESCENT LENGTH				
CASING I.D.				
END CLEARANCE				

COMMENTS & RECOMMENDATIONS:_____

NOTES

WARRANTY

Viking warrants all products manufactured by it to be free from defects in workmanship or material for a period of one (1) year from date of startup, provided that in no event shall this warranty extend more than eighteen (18) months from the date of shipment from Viking. If, during said warranty period, any products sold by Viking prove to be defective in workmanship or material under normal use and service, and if such products are returned to Viking's factory at Windsor, Ontario, transportation charges prepaid, and if the products are found by Viking to be defective in workmanship or material, they will be replaced or repaired free of charge, FOB. Windsor, Ontario.

Viking assumes no liability for consequential damages of any kind and the purchaser by acceptance of delivery assumes all liability for the consequences of the use or misuse of Viking products by the purchaser, his employees or others. Viking will assume no field expense for service or parts unless authorized by it in advance.

Equipment and accessories purchased by Viking from outside sources which are incorporated into any Viking product are warranted only to the extent of and by the original manufacturer's warranty or guarantee, if any.

THIS IS VIKING'S SOLE WARRANTY AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, WHICH ARE HEREBY EXCLUDED, INCLUDING IN PARTICULAR ALL WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. No officer or employee of IDEX Corporation or Viking Pump Canada is authorized to alter this warranty.