

**TECHNICAL SERVICE MANUAL: INSTALLATION, OPERATION & MAINTENANCE**



UNIVERSAL PRODUCT LINE: STEEL EXTERNALS

8123A SERIES™

SIZES: H, HL, K, KK, L, LQ, LL, LS, Q, QS

TSM	1303
Page	1 of 27
Issue	C

**TABLE OF CONTENTS**

Model Number Chart.....1  
 Introduction .....1  
 Safety Information & Instructions.....2  
 Special Information .....3  
     *Rotation* .....3  
     *Pressure Relief Valves*.....3  
 Maintenance.....3  
     *Cleaning Pump*.....3  
     *Lubrication*.....3  
     *Storage*.....3  
     *Suggested Repair Tools*.....3  
 Pump Disassembly (*H, HL, K, KK, L, LQ, LL, LS Sizes*) .....6  
 Pump Disassembly (*Q, QS Sizes*) .....7  
 Disassembly: Bracket Bearing (*H, HL, K, KK, L, LQ, LL, LS Sizes*).....8  
 Disassembly: Bearing Housing (*Q, QS Sizes*) .....8  
 Assembly: Bracket Bearing (*H, HL, K, KK, L, LQ, LL, LS Sizes*).....9  
 Assembly: Bearing Housing (*Q, QS Sizes*) .....9  
 Installation: Carbon Graphite Bushings .....9  
     *Adaptor Plate Bushing* .....9  
     *Canister Bushing* .....9  
 Pump Assembly (*H, HL, K, KK, L, LQ, LL, LS Sizes*) .....10  
 Pump Assembly (*Q, QS Sizes*) .....13  
 Pump Rotation .....15  
 End Clearance Adjustment .....15  
     *Procedure A*.....15  
     *Procedure B* .....15  
 Pressure Relief Valve Instructions .....16  
     *Disassembly*.....17  
     *Assembly*.....17  
     *Pressure Adjustment*.....17  
     *Important Ordering Information*.....17  
 APPENDIX (*Formerly TSM 000*) .....17  
 General Installation Notes.....17  
 Foundation .....19  
 Component & Unit Lifting Features .....19  
 Alignment .....20  
 Piping .....21  
 Start Up .....22  
 Troubleshooting .....22  
     *Vacuum Gauge - Suction Port* .....22  
     *Pressure Gauge - Discharge Port*.....23  
 Rapid Wear .....24  
 Preventative Maintenance .....24  
 Do's & Don'ts .....25  
     *Installation* .....25  
     *Operation*.....25  
     *Maintenance*.....25  
 ESB-515 .....26  
     *Lubrication of Viking Pumps*.....26  
     *Lubrication of Viking Reducers*.....26  
     *Lubrication of Viking Associative Equipment*.....26

**MODEL NUMBER CHART**

SEALLESS MAG DRIVE		
H8123A	K8123A	Q8123A
HL8123A	KK8123A	QS8123A
	L8123A	
	LQ8123A	
	LL8123A	
	LS8123A	

**⚠ WARNING !**

Persons with surgical implants of a metallic or electronic nature should avoid working on pump – especially the inner magnet assembly.

This information must be read fully before beginning any maintenance or repair of the pump. All maintenance or repair must be done by SUITABLY TRAINED or qualified persons only.

**INTRODUCTION**

The illustrations used in this manual are for identification purposes only and cannot be used for ordering parts.

Obtain a parts list from your Viking Pump® representative. Always give a complete name of part, part number and material with the model number and serial number of pump when ordering repair parts. The unmounted pump or pump unit model number and serial number are on the nameplate. This manual only applies to the pump models specified in the "Model Number Chart" on page 1. Pump specifications and recommendations are listed in the Catalog Sections, which are available at [vikingpump.com](http://vikingpump.com).

FIGURE 1: H, HL SIZES



FIGURE 2: K, KK, L, LQ, LL, LS SIZES



FIGURE 3: Q, QS SIZES



# SAFETY INFORMATION & INSTRUCTIONS

IMPROPER INSTALLATION, OPERATION OR MAINTENANCE OF PUMP MAY CAUSE SERIOUS INJURY OR DEATH, AND/OR RESULT IN DAMAGE TO PUMP AND/OR OTHER EQUIPMENT. VIKING'S WARRANTY DOES NOT COVER FAILURE DUE TO IMPROPER INSTALLATION, OPERATION OR MAINTENANCE.

THIS INFORMATION MUST BE FULLY READ BEFORE BEGINNING INSTALLATION, OPERATION OR MAINTENANCE OF PUMP, AND MUST BE KEPT WITH PUMP. PUMP MUST BE INSTALLED, OPERATED AND MAINTAINED ONLY BY SUITABLY TRAINED AND QUALIFIED PERSONS.

THE FOLLOWING SAFETY INSTRUCTIONS MUST BE FOLLOWED AND ADHERED TO AT ALL TIMES.

 **DANGER** = FAILURE TO FOLLOW THE INDICATED INSTRUCTION MAY RESULT IN SERIOUS INJURY OR DEATH.

 **WARNING** = IN ADDITION TO SERIOUS INJURY OR DEATH, FAILURE TO FOLLOW THE INDICATED INSTRUCTION MAY CAUSE DAMAGE TO PUMP AND/OR OTHER EQUIPMENT

## **DANGER**

**BEFORE** opening any liquid chamber (pumping chamber, reservoir, relief valve adjusting cap fitting, etc.) be sure that:

- Any pressure in the chamber has been completely vented through the suction or discharge lines or other appropriate openings or connections.
- The pump drive system (motor, turbine, engine, etc.) has been "locked out" or otherwise been made non-operational, so that it cannot be started while work is being done on the pump.
- You know what material the pump has been handling, have obtained a material safety data sheet (MSDS) for the material, and understand and follow all precautions appropriate for the safe handling of the material.

## **DANGER**

**BEFORE** operating the pump, be sure all drive guards are in place.

## **DANGER**

**DO NOT** operate pump if the suction or discharge piping is not connected.

## **DANGER**

**DO NOT** place fingers into the pumping chamber, or its connection ports, or into any part of the drive train if there is any possibility of the pump shaft being rotated.

## **WARNING**

**DO NOT** exceed the pumps rated pressure, speed, and temperature, or change the system/duty parameters from those the pump was originally supplied, without confirming its suitability for the new service.

## **WARNING**

**BEFORE** operating the pump, be sure that:

- It is clean and free from debris.
- All valves in the suction and discharge pipelines are fully opened.
- All piping connected to the pump is fully supported and correctly aligned with the pump.
- Pump rotation is correct for the desired direction of flow.

## **WARNING**

**INSTALL** pressure gauges/sensors next to the pump suction and discharge connections to monitor pressures.

## **WARNING**

**USE** extreme caution when lifting the pump. Suitable lifting devices should be used when appropriate. Lifting eyes installed on the pump must be used only to lift the pump, not the pump with drive and/or base plate. If the pump is mounted on a base plate, the base plate must be used for all lifting purposes. If slings are used for lifting, they must be safely and securely attached. For weight of the pump alone (which does not include the drive and/or base plate) refer to the Viking Pump® product catalog.

## **DANGER**

**DO NOT** attempt to dismantle a pressure relief valve that has not had the spring pressure relieved or is mounted on a pump that is operating.

## **DANGER**

**AVOID** contact with hot areas of the pump and/or drive. Certain operating conditions, temperature control devices (jackets, heat-tracing, etc.), improper installation, improper operation, and improper maintenance can all cause high temperatures on the pump and/or drive.

## **WARNING**

**THE PUMP** must be provided with pressure protection. This may be provided through a relief valve mounted directly on the pump, an in-line pressure relief valve, a torque limiting device, or a rupture disk. If pump rotation may be reversed during operation, pressure protection must be provided on both sides of pump. Relief valve adjusting screw caps must always point towards suction side of the pump. If pump rotation is reversed, position of the relief valve must be changed. Pressure relief valves cannot be used to control pump flow or regulate discharge pressure. For additional information, refer to **Appendix, General Installation Notes**, item 5 on Pressure Protection or contact your Viking Pump® representative for Engineering Service Bulletin ESB-31.

## **WARNING**

**THE PUMP** must be installed in a manner that allows safe access for routine maintenance and for inspection during operation to check for leakage and monitor pump operation.

## SPECIAL INFORMATION

### ROTATION

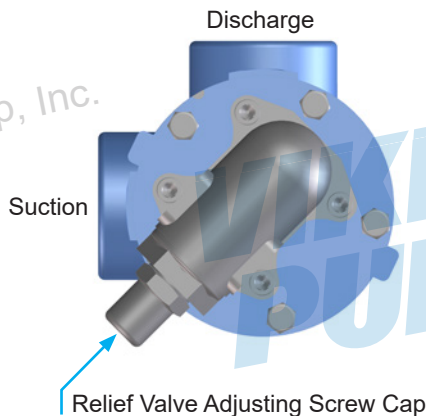
Viking Mag Drive® pumps are designed to run in either direction. Refer to **Pump Rotation**.

### 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. Do not rely on decoupling of magnets for protection from over pressure; this may result in damage to the magnets, pump, or other equipment.
2. Relief valves are mounted as standard on the casing of all pumps.
3. If pump rotation is reversed during operation, pressure protection must be provided on **both** sides of pump.
4. Relief valve adjusting screw cap must **always** point towards suction side of pump, see **"Figure 4" on page 3**. If pump rotation is reversed, remove pressure relief valve and turn end for end. Refer to **"Pump Rotation" on page 15**.
5. Pressure relief valves cannot be used to control pump flow or regulate discharge pressure.

For additional information on pressure relief valves, Refer to **Appendix, General Installation Notes**, item 5 on Pressure Protection or contact your Viking Pump® representative for Engineering Service Bulletin ESB-31.

FIGURE 4: RELIEF VALVE POSITION



## CAUTION !

Rare earth magnets used in couplings have extremely strong magnetic fields capable of changing performance or damaging items such as the following:

- Pacemakers
- Metal Implants
- Watches
- Computers
- Cellular or Mobile Devices
- Credit Cards

<sup>1</sup> TR-813 has a list of locknut socket tools. Contact your Viking Pump® representative to obtain a copy.

## MAINTENANCE

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

### CLEANING PUMP

Keep pump as clean as possible. This will facilitate inspection, adjustment and repair work.

### LUBRICATION

External lubrication must be applied slowly with a hand gun to all lubrication fittings every 500 hours of operation with multi-purpose grease, NLGI # 2. Contact your Viking Pump® representative with specific lubrication questions.

**Engineering Service Bulletin ESB-515** is located in the **Appendix** for standard grease thickener types used by Viking to check compatibility. Applications involving very high or low temperatures will require other types of lubrication.

### STORAGE

If pump is to be stored, or not used for six months or more, pump must be drained and a light coat of non-detergent SAE 30 weight oil must be applied to all internal pump parts.

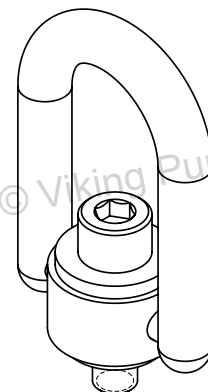
Lubricate fittings and apply grease to pump shaft extension. Viking suggests rotating pump shaft by hand one complete revolution every 30 days to circulate the oil. Tighten all pump assembly bolts before putting pump in service after being stored.

### SUGGESTED REPAIR TOOLS

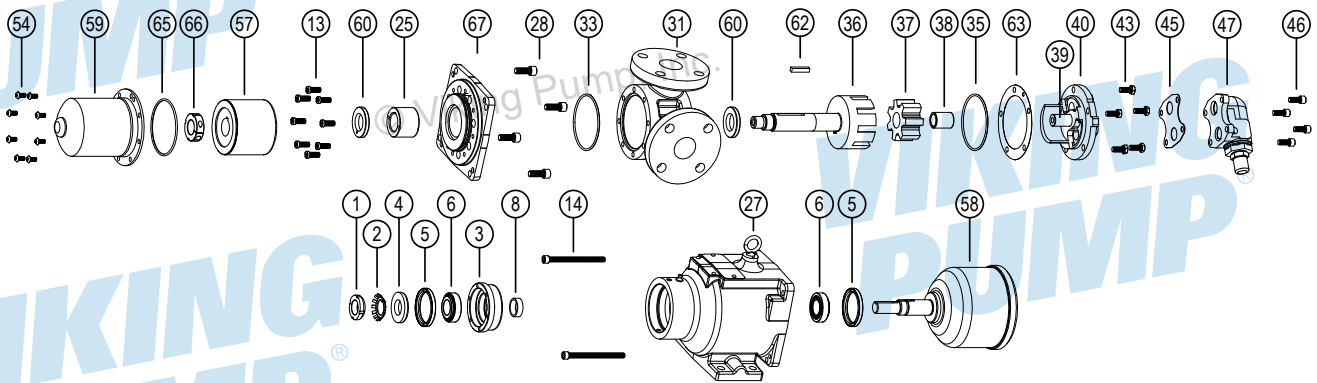
The following tools must be available to properly repair these pumps. These tools are in addition to standard mechanics' tools such as open-end wrenches, pliers, screwdrivers, etc. Most of the items can be obtained from an industrial supply house.

1. Soft headed hammer
2. Allen wrench set (SAE)
3. Torque wrench with a locknut socket<sup>1</sup>
4. Two feeler gauge sets
5. Brass or plastic bar
6. Arbor press
7. Hook style spanner wrench
8. Hoist rings for bearing housing: 5/8"-11 x 3/4" to 1" thread length (see **"Figure 5" on page 3** & **"Figure 12" on page 7**); Q, QS pumps

FIGURE 5: HOIST RINGS FOR BEARING HOUSING (Q, QS ONLY)

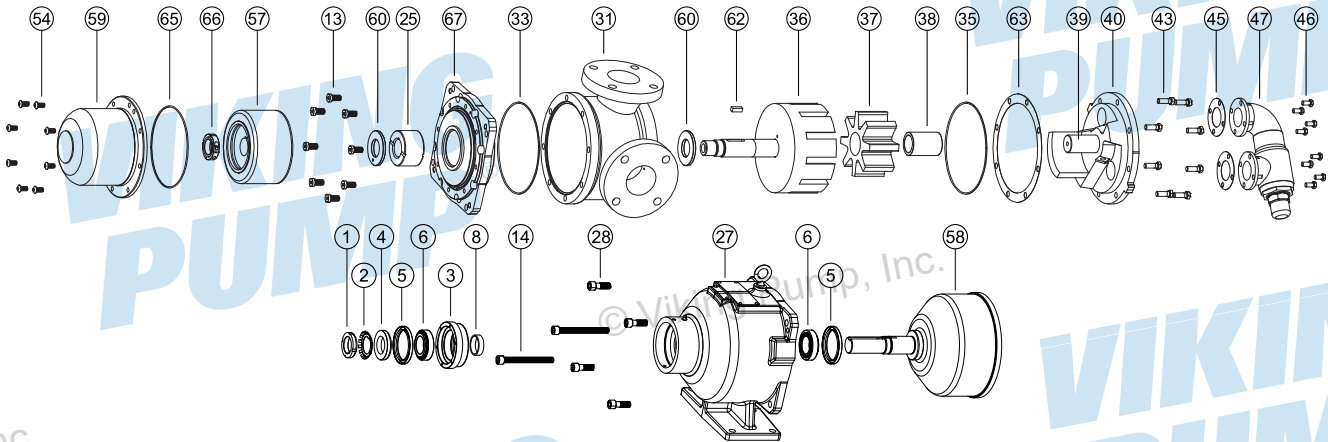


**FIGURE 6: EXPLODED VIEW (H, HL SIZES)**



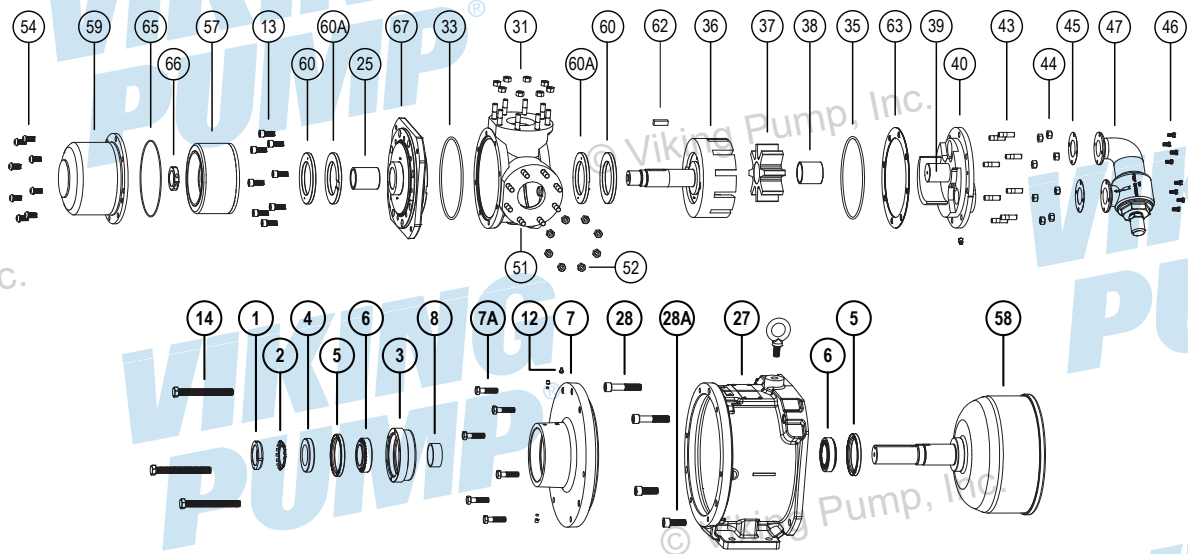
Item	Name of Part	Item	Name of Part	Item	Name of Part
1	Locknut	31	Casing	54	Capscrews for Canister (8-Req'd)
2	Lockwasher	33	Adaptor Plate O-Ring	57	Inner Magnet Assembly
3	End Cap	35	Head O-Ring	58	Outer Magnet Assembly
4	Outer Bearing Spacer	36	Rotor and Shaft Assembly	59	Canister
5	Lipseal (2-Req'd)	37	Idler and Bushing Assembly	60	Thrust Washer (2-Req'd)
6	Tapered Roller Bearing (2-Req'd)	38	Idler Bushing	62	Key for Rotor Shaft
8	Inner Bearing Spacer	39	Idler Pin	63	Shims for Head
13	Capscrews for Adaptor Plate (8-Req'd)	40	Head and Idler Pin Assembly	65	Canister O-Ring
14	Capscrews for Disassembly (2-Req'd)	43	Capscrews for Head (6-8-Req'd)	66	Split Locknut
25	Adaptor Plate Bushing	45	Relief Valve Gaskets (2-Req'd)	67	Adaptor Plate
27	Bracket	46	Capscrews for Relief Valve (8-Req'd)		
28	Capscrews for Mounting Bracket (4-Req'd)	47	Relief Valve		

**FIGURE 7: EXPLODED VIEW (K, KK, L, LQ, LL, LS SIZES)**



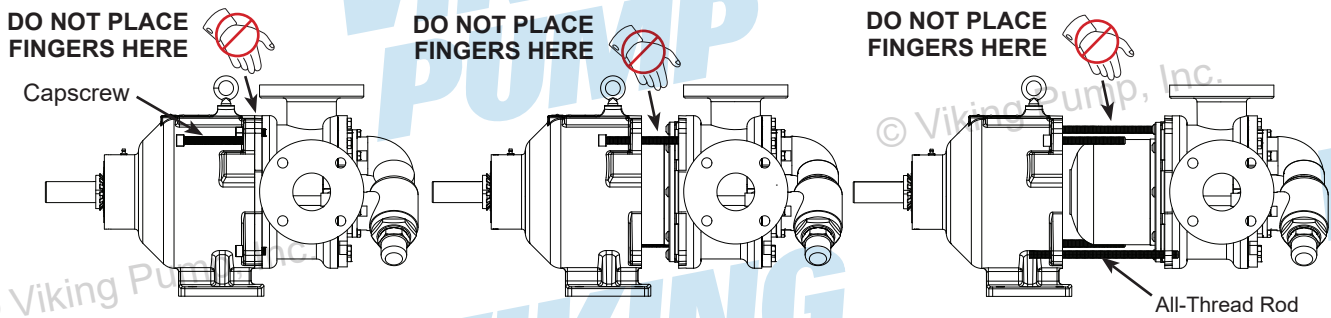
Item	Name of Part	Item	Name of Part	Item	Name of Part
1	Locknut	31	Casing	54	Capscrews for Canister (8-Req'd)
2	Lockwasher	33	Adaptor Plate O-Ring	57	Inner Magnet Assembly
3	End Cap	35	Head O-Ring	58	Outer Magnet Assembly
4	Outer Bearing Spacer	36	Rotor and Shaft Assembly	59	Canister
5	Lipseal (2-Req'd)	37	Idler and Bushing Assembly	60	Thrust Washer (2-Req'd)
6	Tapered Roller Bearing (2-Req'd)	38	Idler Bushing	62	Key for Rotor Shaft
8	Inner Bearing Spacer	39	Idler Pin	63	Shims for Head
13	Capscrews for Adaptor Plate (8-Req'd)	40	Head and Idler Pin Assembly	65	Canister O-Ring
14	Capscrews for Disassembly (2-Req'd)	43	Capscrews for Head (6-8-Req'd)	66	Split Locknut
25	Adaptor Plate Bushing	45	Relief Valve Gaskets (2-Req'd)	67	Adaptor Plate
27	Bracket	46	Capscrews for Relief Valve (8-Req'd)		
28	Capscrews for Mounting Bracket (4-Req'd)	47	Relief Valve		

**FIGURE 8: EXPLODED VIEW (Q, QS SIZES)**

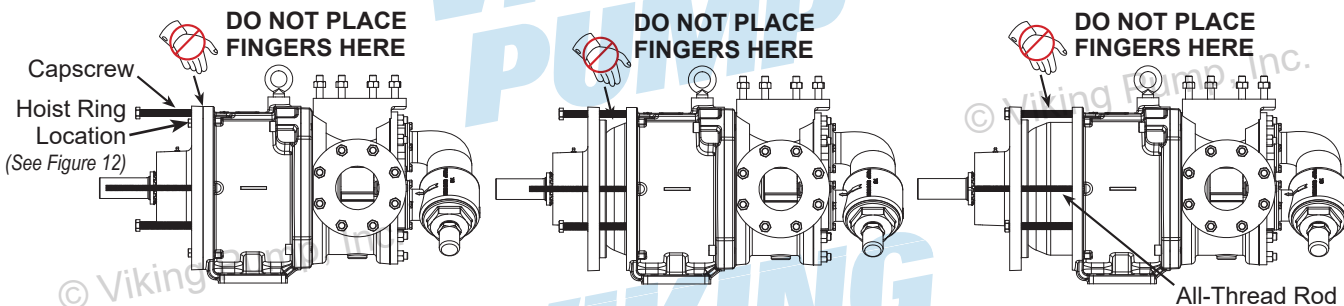


Item	Name of Part	Item	Name of Part	Item	Name of Part
1	Locknut	28	Capscrews for Mounting Bracket (2-Req'd)	47	Relief Valve
2	Lockwasher	28A	Capscrews for Bracket (2-Req'd)	51	Studs for Flanges (16-Req'd)
3	End Cap	31	Casing	52	Nuts for Flanges (16-Req'd)
4	Outer Bearing Spacer	33	Adaptor Plate O-Ring	54	Capscrews for Canister (8-Req'd)
5	Lipseal (2-Req'd)	35	Head O-Ring	57	Inner Magnet Assembly
6	Tapered Roller Bearing (2-Req'd)	36	Rotor and Shaft Assembly	58	Outer Magnet Assembly
7	Bearing Housing	37	Idler and Bushing Assembly	59	Canister
7A	Capscrews for Bearing Housing (6-Req'd)	38	Idler Bushing	60	Thrust Washer - Rotating (2-Req'd)
8	Inner Bearing Spacer	39	Idler Pin	60A	Thrust Washer - Stationary (2-Req'd)
12	Grease Fitting	40	Head and Idler Pin Assembly	62	Key for Rotor Shaft
13	Capscrews for Adaptor Plate (8-Req'd)	43	Studs for Head (8-Req'd)	63	Shims for Head
14	Capscrews for Disassembly (3-Req'd)	44	Nuts for Head (8-Req'd)	65	Canister O-Ring
25	Adaptor Plate Bushing	45	Relief Valve Gaskets (2-Req'd)	66	Split Locknut
27	Bracket	46	Capscrews for Relief Valve (8-Req'd)	67	Adaptor Plate

**FIGURE 9: PUMP SEPARATION SEQUENCE (H, HL, K, KK, L, LQ, LL, LS SIZES)**



**FIGURE 10: PUMP SEPARATION SEQUENCE (Q, QS SIZES)**



## **⚠ DANGER !**

Before opening any Viking pump liquid chamber (pumping chamber, reservoir, relief valve adjusting cap fitting, etc.) be sure:

1. That any pressure in the chamber has been completely vented through the 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.

## **⚠ WARNING !**

Refer to DANGER and WARNING notes in "Safety Information & Instructions" on page 2 before proceeding.

## **PUMP DISASSEMBLY (H, HL, K, KK, L, LQ, LL, LS SIZES)**

Use a non-magnetic surface to disassemble the pump.

1. Drain the liquid being pumped by removing the two drain plugs (if present). Both are located in the bottom of the casing. Once the liquid has drained, replace the plugs.
2. Refer to "Figure 6" on page 4 or "Figure 7" on page 4 for the names of parts.
3. Mark the head (40) and casing (31) before disassembly to ensure proper reassembly.
4. To inspect the head and pin assembly (39 and 40) and idler and bushing assembly (37 and 38), remove the head capscrews (43) or nuts (44).
5. Remove the head from the pump. If the casing was not drained in **Step 1**, be careful of the liquid draining out between the head and casing. Do not allow the idler to fall from the idler pin. Tilt the top of the pump head back during removal to prevent this. Avoid damaging the head shim set (63) since all shims are required to maintain end clearance. Inspect the head O-ring (35). If a new O-ring is required, see Pump Assembly.
6. Remove the idler and bushing assembly. Inspect the idler bushing for wear. If the idler bushing needs to be replaced, refer to "Installation: Carbon Graphite Bushings" on page 9. If further disassembly is required, proceed to the next step.
7. If further disassembly is required, separate the pump from the bracket.

Remove the four socket head capscrews (28) securing the pump to the bracket. Support the pump with an overhead hoist, if possible.

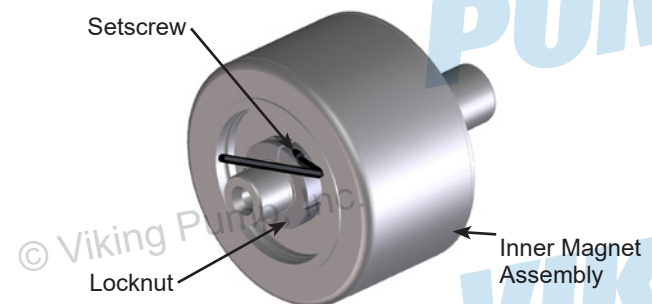
8. Use the jackscrews (14) in the bracket to separate the inner magnet (57) from the outer magnet (58), see sequence in "Figure 6" on page 4 or "Figure 7" on page 4. To keep the pump and bracket assemblies properly aligned and for additional safety, it is recommended to use 2 lengths of all-thread rod (6-8") threaded into diagonal capscrew locations in the bracket and slide through the corresponding holes in the adaptor plate.
9. Visually inspect the outer magnets from the end of the bracket. If removal is necessary, remove the locknut (1), lockwasher (2) and outer bearing spacer collar (4) from the shaft. Slide the outer magnet assembly out of the bracket. Inspect the magnet assembly for damage or wear; replace if needed. If further disassembly of the bracket is required, refer to "Disassembly: Bracket Bearing (H, HL, K, KK, L, LQ, LL, LS Sizes)" on page 8 and "Assembly: Bracket Bearing (H, HL, K, KK, L, LQ, LL, LS Sizes)" on page 9.
10. Remove the socket head capscrews (54) from the canister (59). If the canister was not drained in Step 1, it will contain liquid. Use care when removing the canister from the pump by pulling it straight off. Inspect the canister bushing (64) for wear. If the canister bushing needs to be replaced, see "Installation: Carbon Graphite Bushings" on page 9.
11. Inspect the canister O-ring. Do not remove the O-ring from the plate adaptor (67) / canister unless it is damaged, especially if it is PTFE (derivative) encapsulated. If a new O-ring is required, refer to "Pump Assembly (H, HL, K, KK, L, LQ, LL, LS Sizes)" on page 10.
12. Insert a brass bar into the rotor (36) through a port between two rotor teeth and remove the split locknut (66), see "Figure 11" on page 6.

### **DO NOT FORGET THIS IS A VERY STRONG MAGNET.**

Slide the inner magnet assembly off of the shaft. Make sure the outer thrust washer (60) does not come off with the inner magnet assembly.

If the thrust washer hits the shaft key (62), it may crack or break. Set the magnet down with the thrust washer pin up and away from all other objects. Inspect the magnet assembly for damage or wear; replace if needed. Inspect the thrust washers for damage or wear; replace if needed. If further disassembly is required, proceed to the next step.

**FIGURE 11: INNER MAGNET & LOCKNUT ASSEMBLY**



13. Remove the shaft key from the rotor shaft. The rotor and shaft (36) may now be removed by tapping on the end of the shaft with a soft head hammer (If a soft head hammer is not available a regular hammer may be used with a piece of hardwood).

Remove the thrust washer (60) from behind the rotor. Check the thrust washers for cracks or wear; replace if necessary. Inspect the rotor and shaft assembly for damage or wear; replace if needed.

14. Inspect the adaptor plate bushing. If the bushing needs to be replaced, see **"Installation: Carbon Graphite Bushings" on page 9**. If the pump is leaking between adaptor plate and casing (31), remove the socket head capscrews (13) from the adaptor plate. Slide the adaptor plate out of the casing.

15. Do not remove the O-ring from the plate adaptor / casing unless it is damaged, especially if it is PTFE (derivative) encapsulated. If a new O-ring is required, See **"Pump Assembly (H, HL, K, KK, L, LQ, LL, LS Sizes)" on page 10**.

16. Inspect the casing for wear, particularly in the area between the ports. Clean all other parts thoroughly and examine for wear or damage; replace if needed.

When making major repairs, such as replacing a rotor and shaft, it is advisable to also install a new head and idler pin, idler and bushing, and adaptor plate bushing. See **"Installation: Carbon Graphite Bushings" on page 9**.

## DANGER !

Before opening any Viking pump liquid chamber (pumping chamber, reservoir, relief valve adjusting cap fitting, etc.) be sure:

1. That any pressure in the chamber has been completely vented through the 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.

## WARNING !

Refer to DANGER and WARNING notes in "Safety Information & Instructions" on page 2 before proceeding.

## PUMP DISASSEMBLY (Q, QS SIZES)

Use a non-magnetic surface to disassemble the pump.

Note: Some steps require a second person for ease of disassembly.

1. Drain the liquid being pumped by removing the two drain plugs (if present). Both are located in the bottom of the casing. Once the liquid has drained, replace the plugs.
2. Refer to **"Figure 8" on page 5** for the names of parts.
3. Mark the head (40) and casing (31) before disassembly to ensure proper reassembly.
4. To inspect the head and pin assembly (39 and 40) and idler and bushing assembly (37 and 38), remove the head capscrews (43) or nuts (44).
5. Remove the head from the pump. If the casing was not drained in **Step 1**, be careful of the liquid draining out between the head and casing. Do not allow the idler to fall from the idler pin. Tilt the top of the pump head back during removal to prevent this. Avoid damaging the head shim set (63) since all shims are required to maintain end clearance. Inspect the head O-ring (35). If a new O-ring is required, see Pump Assembly.
6. Remove the idler and bushing assembly. Inspect the idler bushing for wear. If the idler bushing needs to be replaced, refer to **"Installation: Carbon Graphite Bushings" on page 9**. If further disassembly is required, proceed to the next step.
7. If further disassembly is required, separate the pump from the motor.

Remove the six hex head capscrews (7A) securing the bearing housing to the bracket. Support the bearing housing with an overhead hoist using two hoist rings installed in the 1 o'clock and 11 o'clock threaded holes. See **"Figure 12" on page 7** and **"Figure 5" on page 3**. Do not use hoist rings to lift pump, use eye bolt on bracket.

8. Use the jackscrews (14) in the bearing housing to separate the inner magnet (57) from the outer magnet (58), see sequence in **"Figure 8" on page 5**. To keep the bearing housing and bracket assemblies properly aligned and for additional safety, it is recommended to use 2 lengths of all-thread rod (12") threaded into opposite capscrew locations in the bracket and slide through the corresponding holes in the bearing housing.

Slide the outer magnet assembly out of the bracket (27). Visually inspect the outer magnets. Inspect the magnet assembly for damage or wear; replace if needed. If further disassembly of the bearing housing is required, refer to **"Disassembly: Bearing Housing (Q, QS Sizes)" on page 8** and **"Assembly: Bearing Housing (Q, QS Sizes)" on page 9**.

FIGURE 12: HOIST RING LOCATIONS (Q, QS ONLY)



9. Remove the socket head capscrews (28 & 28A) securing the bracket to the pump. Support the pump with an overhead hoist and fixture that is in-line with the center of gravity of the pump. After parting the bracket slightly, it will have a tendency to be drawn to one side due to the inner magnet. Pull the bracket completely away.

10. Remove the socket head capscrews (54) from the canister (59). If the canister was not drained in Step 1, it will contain liquid. Use care when removing the canister from the pump by pulling it straight off. Inspect the canister bushing (64) for wear. If the canister bushing needs to be replaced, see **"Installation: Carbon Graphite Bushings" on page 9.**

11. Inspect the canister O-ring. Do not remove the O-ring from the plate adaptor (67) / canister unless it is damaged, especially if it is PTFE (derivative) encapsulated. If a new O-ring is required, refer to **"Pump Assembly (Q, QS Sizes)" on page 13.**

12. Insert a brass bar into the rotor (36) through a port between two rotor teeth and remove the split locknut (66), see **"Figure 11" on page 6.**

**The inner magnet has a very strong magnetic field and is most dangerous in the unassembled condition. The magnet is quite heavy and will be drawn to any ferrous object or surface, causing potential pinching. Use extreme care sliding the magnet off of the pump shaft.** Make sure the outer thrust washer (60) does not fall off the inner magnet assembly. Set the magnet down with the thrust washer up and away from all other objects.

If the thrust washer hits the shaft key (62), it may crack or break. Inspect the magnet assembly for damage or wear; replace if needed. Inspect the thrust washers for damage or wear; replace if needed. If further disassembly is required, proceed to the next step.

13. Remove the shaft key from the rotor shaft. The rotor and shaft (36) may now be removed by tapping on the end of the shaft with a soft head hammer (If a soft head hammer is not available a regular hammer may be used with a piece of hardwood).

Make sure the thrust washer (60A) does not come off the adaptor plate assembly.

Remove the thrust washer (60) from behind the rotor. Check the thrust washers for cracks or wear; replace if necessary. Inspect the rotor and shaft assembly for damage or wear; replace if needed.

14. Inspect the adaptor plate bushing. If the bushing needs to be replaced, see **"Installation: Carbon Graphite Bushings" on page 9.** If the pump is leaking between adaptor plate and casing (31), remove the socket head capscrews (13) from the adaptor plate. Slide the adaptor plate out of the casing.

15. Do not remove the O-ring from the plate adaptor / casing unless it is damaged, especially if it is PTFE (derivative) encapsulated. If a new O-ring is required, See **"Pump Assembly (Q, QS Sizes)" on page 13.**

16. Inspect the casing for wear, particularly in the area between the ports. Clean all other parts thoroughly and examine for wear or damage; replace if needed.

When making major repairs, such as replacing a rotor and shaft, it is advisable to also install a new head and idler pin, idler and bushing, and adaptor plate bushing. See **"Installation: Carbon Graphite Bushings" on page 9.**

## DISASSEMBLY: BRACKET BEARING (H, HL, K, KK, L, LQ, LL, LS SIZES)

The bracket bearing assembly features two tapered roller bearings, two lipseals, and one spacer. If further disassembly of this unit is required, proceed as follows:

1. Loosen the setscrews holding the end cap (3) in the bracket. Screw the end cap out of the bracket.
2. Inspect the bearings (6) for wear; replace as needed.
3. Inspect the lipseals (5) for wear; replace as needed. The lipseals will need to be replaced if removed.
4. If the bearings are worn it is recommended to replace the entire bearing. Remove the inner bearing spacer collar (8). Press the inner bearing cup (6) out of the bracket and the outer bearing cup out of the end cap. The bearings will need to be replaced if the cups are removed.

## DISASSEMBLY: BEARING HOUSING (Q, QS SIZES)

The bracket bearing assembly features two tapered roller bearings, two lipseals, and one spacer. If further disassembly of this unit is required, proceed as follows:

1. Remove locknut (1) and washer (2).
2. Loosen the setscrews holding the end cap (3) in the bracket. Screw the end cap out of the bracket.
3. Inspect the bearings (6) for wear; replace as needed.
4. Inspect the lipseals (5) for wear; replace as needed. The lipseals will need to be replaced if removed.
5. If the bearings are worn it is recommended to replace the entire bearing. Remove the inner bearing spacer collar (8). Press the inner bearing cup (6) out of the bearing housing and the outer bearing cup out of the end cap. The bearings will need to be replaced if the cups are removed.



## ASSEMBLY: BRACKET BEARING (H, HL, K, KK, L, LQ, LL, LS SIZES)

1. If the bearing cups were removed, press the cup of the outer bearing into the end cap. Press the cup of the inner bearing into the bracket.
2. Press the inner lipseal into the bracket and the outer lipseal into the end cap and then lubricate the lipseals, see **"Figure 13" on page 9** for lipseal and bearing orientation.
3. Screw the end cap (clockwise) into the bracket until it contacts. Do not over-tighten the end cap.
4. Inspect the outer magnet to make sure it has not picked up any foreign particles, which could damage the pump. Slide the inner roller bearing onto the shaft, followed by the inner bearing spacer.
5. Slide the outer magnet assembly into the bracket. Slide the outer roller bearing onto the shaft. Slide the outer bearing spacer collar onto the shaft and into the outer lipseal, followed by the lockwasher and locknut.
6. Tighten the locknut to 50-70 ft-lbs of torque and then bend over the appropriate lockwasher tab.
7. Unscrew the end cap (counterclockwise) by hand until there is considerable drag on the bearings. Mark the end cap and bracket in the same spot. Then screw in the end cap (clockwise) 5/16", radially from the mark. Tighten the end cap setscrews.
8. Grease the bracket using the bracket fitting with NLGI #2 grease. Make sure the shaft freely rotates by hand.

## ASSEMBLY: BEARING HOUSING (Q, QS SIZES)

1. If the bearing cups were removed, press the cup of the outer bearing into the end cap. Press the cup of the inner bearing into the bearing housing.
2. Press the inner lipseal into the bearing housing and the outer lipseal into the end cap and then lubricate the lipseals, see **"Figure 13" on page 9** for lipseal and bearing orientation.
3. Screw the end cap (clockwise) into the bearing housing until it contacts. Do not over-tighten the end cap.
4. Inspect the outer magnet to make sure it has not picked up any foreign particles, which could damage the pump. Slide the inner roller bearing onto the shaft, followed by the inner bearing spacer.
5. Slide the outer magnet assembly into the bearing housing. Slide the outer roller bearing onto the shaft. Slide the outer bearing spacer collar onto the shaft and into the outer lipseal, followed by the lockwasher and locknut.
6. Tighten the locknut to 170-190 ft-lbs of torque and then bend over the appropriate lockwasher tab.
7. Unscrew the end cap (counterclockwise) by hand until there is considerable drag on the bearings. Mark the end cap and bracket in the same spot. Then screw in the end cap (clockwise) 5/16", radially from the mark. Tighten the end cap setscrews.
8. Grease the bracket using the bracket fitting with NLGI #2 grease. Make sure the shaft freely rotates by hand.

## INSTALLATION: 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. Be certain bushing is started straight.
3. Do not stop pressing operation until bushing is in proper position. Starting and stopping will result in a cracked bushing.
4. Check bushing for cracks after installation.

**NOTE:** Hardened cast iron bushings can be pressed into the mating part. Use steps 1 and 2 above.

Improper location of bushings in mating part may result in a pump with excessive slip, premature wear or requiring a large number of shims.

## ADAPTOR PLATE BUSHING

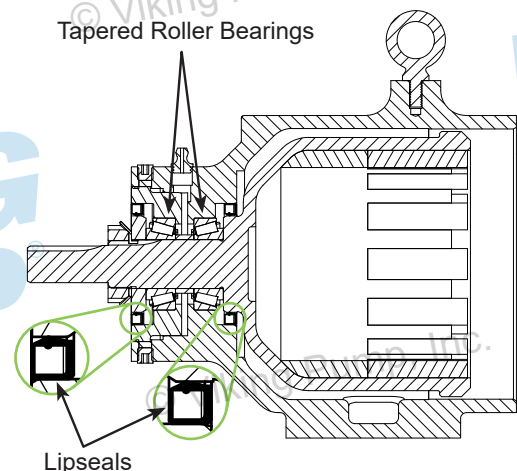
The groove in the ID of the bushing should line up with the groove in the adaptor plate. **"Figure 14" on page 10** (H-LS Sizes) and **"Figure 15" on page 10** (Q-QS Sizes) show the proper position of the adaptor plate bushing after installation. This may require a special fixture to ensure proper positioning.

## CANISTER BUSHING

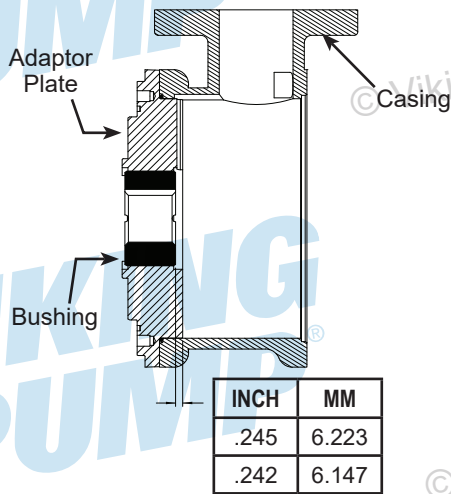
**H, HL, K, KK, L, LQ, LL, LS Sizes Only:** The canister bushing requires a special fixture for proper assembly so the bushing is only sold as part of the canister assembly.

**Q, QS Sizes Only:** **"Figure 16" on page 10** shows the proper orientation of the canister bushing after installation. Bushing should be flush with or up to 0.010" below bushing hub face. Be certain canister is properly supported.

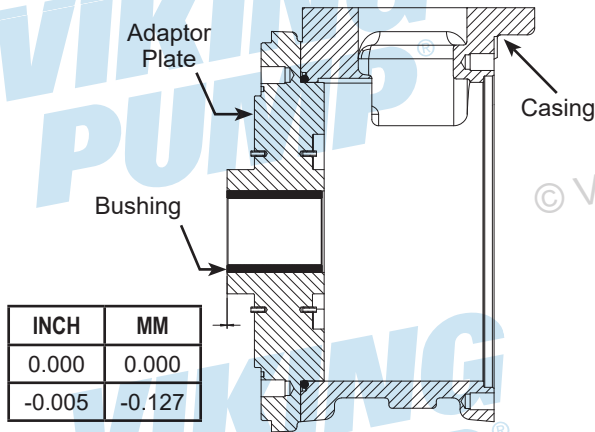
**FIGURE 13:  
BRACKET BEARING & LIPSEAL ORIENTATION**



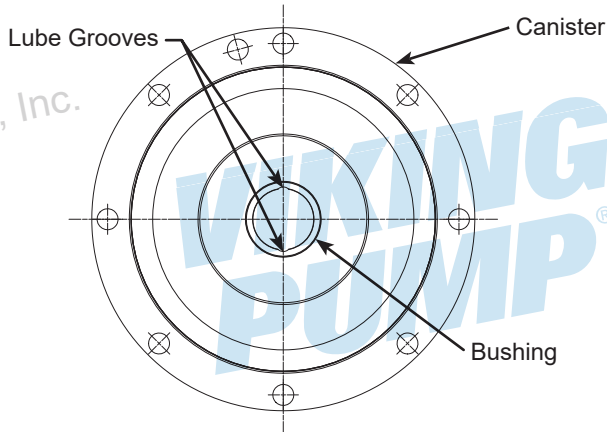
**FIGURE 14: ADAPTOR PLATE BUSHING POSITION (H, HL, K, KK, L, LQ, LL, LS)**



**FIGURE 15: ADAPTOR PLATE BUSHING POSITION (Q, QS)**



**FIGURE 16: PROPER ORIENTATION OF THE CANISTER BUSHING AFTER INSTALLATION (Q, QS)**



**⚠ DANGER !**

Follow these directions exactly to avoid injury to self or damage to the pumping unit. Be careful to keep the inner and outer magnets at least (1) foot apart until step 14. Do not engage the magnets in any other fashion.

**⚠ CAUTION !**

Do not place fingers onto the front of pump mounting flange. Align the canister into bore of the bracket and gently slide it in. When the magnets start to engage, the unit will finish engagement on its own very rapidly unless the 5/16" x 4" (H, HL) / 1/2" x 5" (K, KK, L, LQ, LL, LS) capscrew is properly used. Make sure fingers are not on the front of the pump. See Sequence in "Figure 20" on page 12.

**⚠ DANGER !**

Be certain 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.

**PUMP ASSEMBLY (H, HL, K, KK, L, LQ, LL, LS SIZES)**

**NOTE:** Some steps require a second person for ease of assembly.

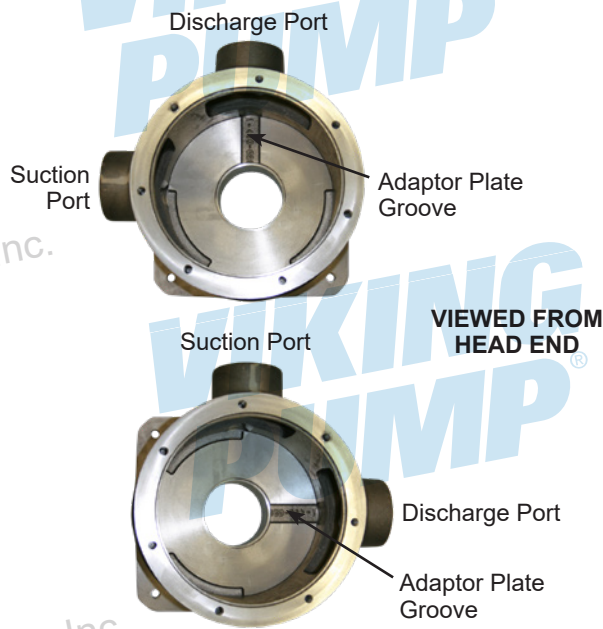
Use a suitable lubricant compatible with the fluid being handled when reassembling the pump.

Use a non-magnetic surface to assemble the pump.

Inspect all parts, especially drilled holes in the casing (for draining) to make sure they are not plugged. Replace any worn parts, remove any burrs and clean all parts before assembling the pump.

1. If the adaptor plate O-ring needs to be replaced, apply a lubricant to the O-ring and place it onto the casing side of the plate adaptor. If the O-ring is PTFE (derivative) encapsulated, follow these special instructions. Do not attempt to reuse this type of O-ring if it has been removed. Immerse a new O-ring in boiling water for a few minutes. Remove it from the water and stretch out the O-ring. This ensures it will fit into the plate or groove without forcing the O-ring over a sharp edge. Run hot water over the O-ring until it shrinks down tight. Hot water makes the PTFE pliable and allows the inner elastomer to pull the PTFE back to the original size. Dry it with compressed air.
2. Position the adaptor plate so the adaptor plate groove aligns with groove in the casing bore, see "Figure 17" on page 11. Carefully slide the adaptor plate into the bracket side of the casing. Use care to prevent cutting the O-ring with the edge of the adaptor plate or casing. Secure into position by tightening the eight capscrews.
3. Apply lubricant to the ID of the adaptor plate bushing. Clean the rotor and shaft so it is free of dirt, grit and other debris. Remove burrs around the keyway and shoulder of the shaft.

**FIGURE 17: ADAPTOR PLATE / CASING POSITIONING (H, HL, K, KK, L, LQ, LL, LS SIZES)**

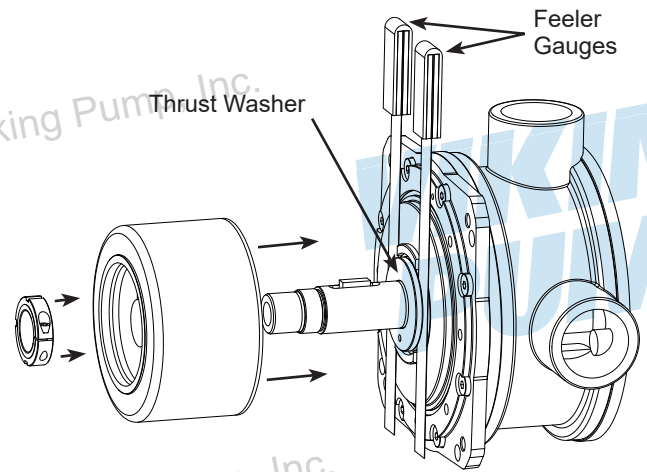


4. Place one thrust washer onto the shaft so that the blind hole in the thrust washer will line up with the drive pin on the back of the rotor. Slide the shaft into the adaptor plate bushing as far as it will go. Make sure that the thrust washer remains seated on the drive pin and flat against the rotor.
5. Slide the second thrust washer onto the shaft, drive hole facing out. Then install the key into the shaft.
6. Clean face on the inner magnet that faces the adaptor plate. Slide the inner magnet onto the shaft and engage the pin of the magnet into the hole of the thrust washer. Install the split locknut with the raised face out, do not tighten completely.
7. Place two feeler gauges (0.001" for sizes H, HL / 0.002" for sizes K, KK, L, LQ, LL, LS), one on each side of the shaft, between the adaptor plate bushing and the inner magnet thrust washer. See "Figure 18" on page 11.

This will establish the proper clearance for the thrust washers. Tighten the locknut until the feeler gauges are snug, but can still be removed. Do not remove the feeler gauges at this time.

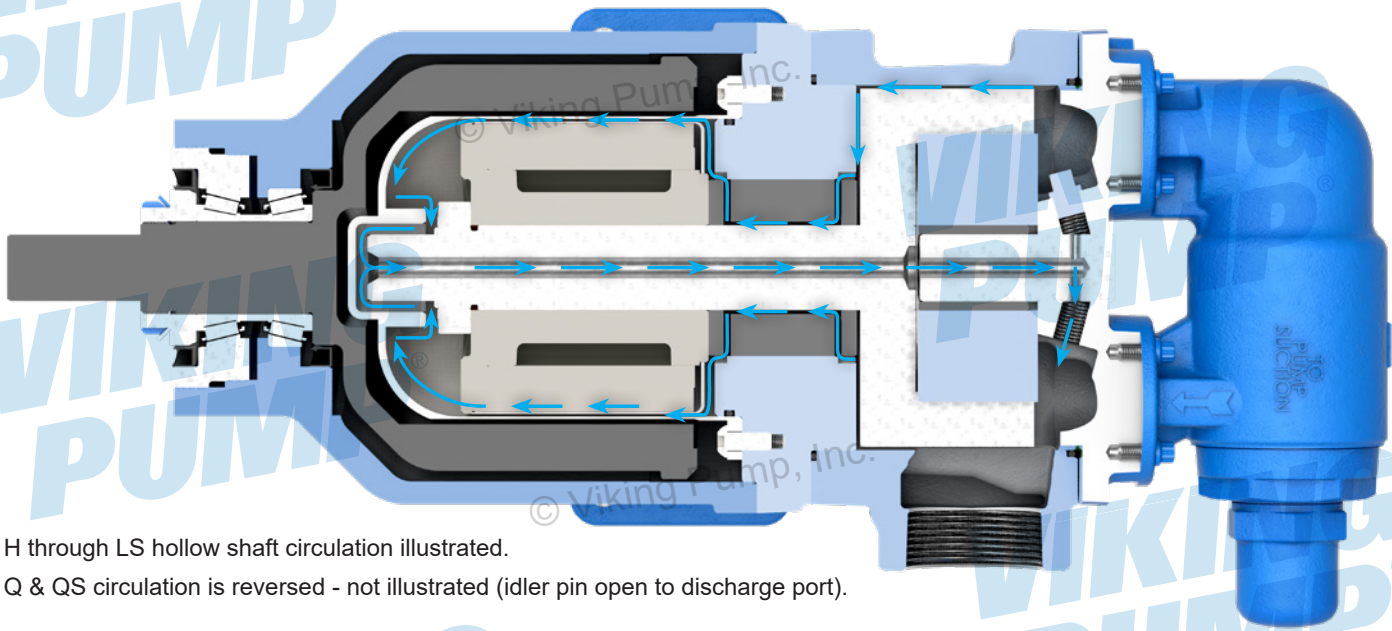
8. Tighten the setscrew in the locknut. Check the feeler gauges. If the gauges are too tight, loosen the setscrew and locknut slightly and repeat tightening procedure. Remove the feeler gauges. Check to make sure the pump rotates freely by turning the inner magnet assembly.
9. Inspect the magnet to make sure it has not picked up any foreign particles, which could damage the pump. Inspect the canister bushing; replace if needed. Refer to "Installation: Carbon Graphite Bushings" on page 9. Lubricate the ID of the canister bushing. Inspect the canister o-ring; replace if needed. Refer to Step 1 if PTFE (derivative) encapsulated. Lubricate and place the o-ring into the groove in the adaptor plate. Align the roll pin in the adaptor plate with the corresponding hole in the canister and place the canister onto the shaft. Secure the canister using eight capscrews. Be careful placing the setscrews as this is a strong magnet. Do not place fingers between magnet and capscrews.

**FIGURE 18: SETTING THRUST WASHER CLEARANCE (H, HL, K, KK, L, LQ, LL, LS SIZES)**



10. If the old head shims are not reusable or if any parts have been replaced, operating clearances will need to be re-established. Refer to "End Clearance Adjustment" on page 15. Otherwise, place the head shims on the head. The proper amount of shims should be used to provide the correct end clearance (0.004" for sizes H, HL / 0.008" for sizes K, KK, L, LQ, LL, LS).  
Inspect the head o-ring; replace if needed. Refer to Step 1 if PTFE (derivative) encapsulated. Lubricate the O-ring and place on the head.
11. **K, KK, L, LQ, LL, LS Sizes Only:** Ensure pipe plug is installed in the hole in the head, at the base of the idler pin, that aligns with the vertical groove in the adaptor plate (normally discharge side). Ensure the hole in the opposite side is unobstructed. See "Figure 19" on page 12.
12. Coat the ID of the idler bushing with a suitable lubricant and place the idler on the idler pin in the head.
13. **H, HL Sizes Only:** Align the hole in the head, at the base of the idler pin, with the casing port opposite the groove in the adaptor plate. Hole will be slightly offset to CCW side of the port.
14. The head can now be assembled onto the pump. Tilt the top of the pump head away from the pump slightly until the crescent enters the inside diameter of the rotor and rotate the idler until its teeth mesh with the rotor teeth. Secure the head to the casing using six to eight capscrews or nuts (pump size dependent). Check the end clearance. Refer to "End Clearance Adjustment" on page 15, if needed. Rotate the shaft by hand to make sure it turns freely.  
The pump head and casing should have been marked before disassembly to ensure proper reassembly. If not, be sure the idler pin, which is offset in the pump head, is placed between the port connections to allow for proper flow of liquid through the pump.
15. Inspect the bracket/bearing housing bearings and lipseals; replace if needed. Refer to "Disassembly: Bracket Bearing (H, HL, K, KK, L, LQ, LL, LS Sizes)" on page 8 and "Assembly: Bracket Bearing (H, HL, K, KK, L, LQ, LL, LS Sizes)" on page 9. Inspect the outer magnet for any steel objects, which may be attached. Remove any foreign material.

FIGURE 19: CIRCULATION OF LIQUID THROUGH PUMP



H through LS hollow shaft circulation illustrated.

Q & QS circulation is reversed - not illustrated (idler pin open to discharge port).

**16. Secure the bracket to a base or other stable platform.**

Rotate the outer magnet shaft by hand to make sure there is no interference. If rubbing occurs, visually inspect for debris. Consult your Viking Pump® representative if rubbing between the outer magnet and bracket persists.

Inspect the canister to make sure it has not picked up any foreign particles, which could damage the pump.

**17. H, HL Sizes Only:** Insert two fully threaded 5/16" X 4" socket head capscrews into the bracket until they are fully extended in front of the bracket to control assembling the pump, see "Figure 20" on page 12. To keep the pump and bracket assemblies properly aligned and for additional safety, it is recommended to use 2 lengths of all-thread rod (6-8") threaded into diagonal capscrew locations in the bracket and slide through the corresponding holes in the adaptor plate.

**K, KK, L, LQ, LL, LS Sizes Only:** Insert two fully threaded 1/2" X 5" socket head capscrews into the bracket until they are fully extended in front of the bracket to control assembling the pump, see "Figure 20" on page 12. To keep the pump and bracket assemblies properly aligned and for additional safety, it is recommended to use 2 lengths of all-thread rod (6-8") threaded into diagonal capscrew locations in the adaptor plate and slide through the corresponding holes in the bracket.

**18.** Support the pump with an overhead hoist, if possible, while guiding the canister into the bracket opening. Back the capscrews off, being careful that the end of the capscrew is positioned in the counterbore hole of the adaptor plate. Secure the pump/bearing housing to the bracket with four capscrews.

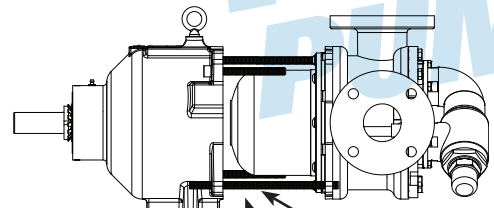
**Make certain that the power supply to the pump is "Locked-out". Check that the pump rotates freely by spinning the motor fan blades or pump shaft.**

**⚠ DANGER !**

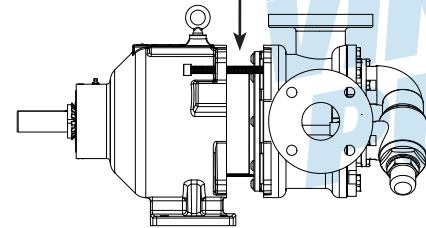
**Before starting pump, be sure all drive equipment guards are in place.**

**Failure to properly mount guards may result in serious injury or death.**

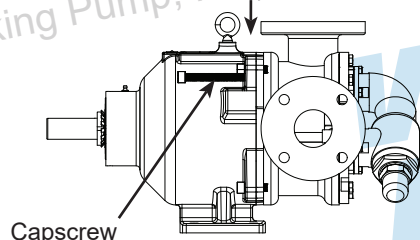
FIGURE 20: PUMP ASSEMBLY SEQUENCE (H, HL, K, KK, L, LQ, LL, LS SIZES)



**DO NOT PLACE FINGERS HERE**

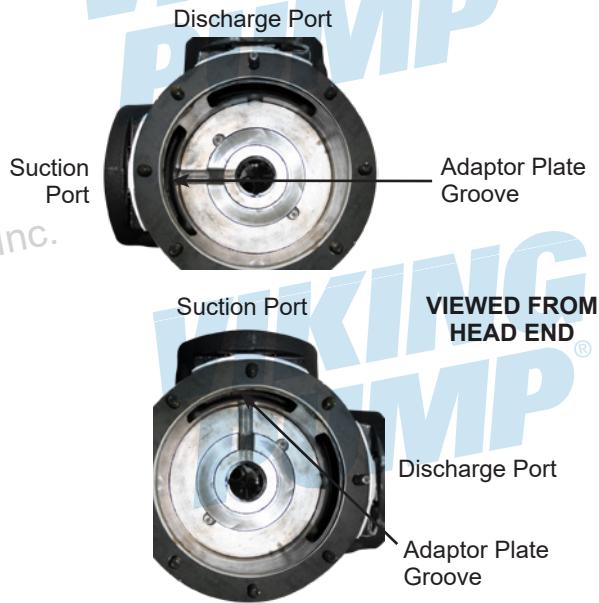


**DO NOT PLACE FINGERS HERE**



Capscrew

**FIGURE 21: ADAPTOR PLATE / CASING POSITIONING (Q, QS SIZES)**



**PUMP ASSEMBLY (Q, QS SIZES)**

**NOTE: Some steps require a second person for ease of assembly.**

Use a suitable lubricant compatible with the fluid being handled when reassembling the pump.

Use a non-magnetic surface to assemble the pump.

Inspect all parts, especially drilled holes in the casing (for draining) to make sure they are not plugged. Replace any worn parts, remove any burrs and clean all parts before assembling the pump.

1. If the adaptor plate O-ring needs to be replaced, apply a lubricant to the O-ring and place it onto the casing side of the plate adaptor. If the O-ring is PTFE (derivative) encapsulated, follow these special instructions.

Do not attempt to reuse this type of O-ring if it has been removed. Immerse a new O-ring in boiling water for a few minutes. Remove it from the water and stretch out the O-ring. This ensures it will fit into the plate or groove without forcing the O-ring over a sharp edge. Run hot water over the O-ring until it shrinks down tight. Hot water makes the PTFE pliable and allows the inner elastomer to pull the PTFE back to the original size. Dry it with compressed air.

2. Position the adaptor plate so the adaptor plate groove aligns with groove in the casing bore, see "Figure 21" on page 13. Carefully slide the adaptor plate into the bracket side of the casing. Use care to prevent cutting the O-ring with the edge of the adaptor plate or casing. Secure into position by tightening the eight capscrews.
3. Apply lubricant to the ID of the adaptor plate bushing. Clean the rotor and shaft so it is free of dirt, grit and other debris. Remove burrs around the keyway and shoulder of the shaft.
4. Apply lubricant to the thrust washers on the mounting sides, not between the faces. Place the thrust washer that does not have a groove onto the shaft so that the blind holes in the thrust washer will line up with the drive pins on the back of the rotor. Place the thrust washer with a groove onto the adaptor plate so that the groove in the thrust washer will line up with the grooves in the adaptor plate, see "Figure 21" on page 13. Make sure that the thrust washer remains seated on the drive pin and flat against the rotor and adaptor plate.
5. Having a second person on the opposite side of the casing will help in placing the rotor and shaft into the pump and prevent damage to the adaptor plate bushing. Have the second person support the shaft through the hollow shaft. Slide the shaft into the adaptor plate bushing until the thrust washers come in contact. Make sure that the thrust washers remain seated on the drive pins and flat against the rotor or adaptor plate.
6. Slide the second thrust washer onto the shaft, drive hole facing out. Then install the key into the shaft.

Apply lubricant to the thrust washers on the mounting sides, not between the faces. Slide the thrust washer with a groove over the shaft into the adaptor plate (bracket side), groove facing out. Then install the key into the shaft.

**⚠ DANGER !**

Follow these directions exactly to avoid injury to self or damage to the pumping unit. Be careful to keep the inner and outer magnets at least (1) foot apart until step 17. Do not engage the magnets in any other fashion.

**⚠ CAUTION !**

Do not place fingers onto the front of pump mounting flange. Align the canister into bore of the bracket and gently slide it in. When the magnets start to engage, the unit will finish engagement on its own very rapidly unless the 5/8" x 6" capscrew is properly used. Make sure fingers are not on the front of the pump. See Sequence in "Figure 23" on page 15.

**⚠ DANGER !**

Be certain 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.

7. Clean face on the inner magnet that faces the adaptor plate. Slide the inner magnet onto the shaft and engage the pin of the magnet into the hole of the thrust washer. Install the split locknut with the raised face out, do not tighten completely. Place the second thrust washer that does not have a groove onto the inner magnet so that the blind holes in the thrust washer will line up with the drive pins on the inner magnet. **The inner magnet has a very strong magnetic field and is most dangerous in the unassembled condition. The magnet is quite heavy and will be drawn to any ferrous object or surface, causing potential pinching. Use extreme care sliding the magnet on to the pump shaft.** Slide the inner magnet onto the shaft until the thrust washers are almost touching. Install split locknut with the raised face towards the inner magnet, do not tighten completely.
8. Place two feeler gauges (0.003"), one on each side of the shaft, between the adaptor plate thrust washer and the inner magnet thrust washer. See **"Figure 22" on page 14**. This will establish the proper clearance for the thrust washers. Tighten the locknut until the feeler gauges are snug, but can still be removed. Do not remove the feeler gauges at this time.
9. Tighten the setscrew in the locknut. Check the feeler gauges. If the gauges are too tight, loosen the setscrew and locknut slightly and repeat tightening procedure. Remove the feeler gauges. Check to make sure the pump rotates freely by turning the inner magnet assembly.
10. Inspect the magnet to make sure it has not picked up any foreign particles, which could damage the pump. Inspect the canister bushing; replace if needed. Refer to **"Installation: Carbon Graphite Bushings" on page 9**. Lubricate the ID of the canister bushing. Inspect the canister o-ring; replace if needed. Refer to Step 1 if PTFE (derivative) encapsulated. Lubricate and place the o-ring into the groove in the adaptor plate. Align the roll pin in the adaptor plate with the corresponding hole in the canister and place the canister onto the shaft. Secure the canister using eight capscrews. Be careful placing the setscrews as this is a strong magnet. Do not place fingers between magnet and capscrews.

11. If the old head shims are not reusable or if any parts have been replaced, operating clearances will need to be re-established. Refer to **"End Clearance Adjustment" on page 15**. Otherwise, place the head shims on the head. The proper amount of shims should be used to provide the correct end clearance of 0.010".

There is an offset hole in the head, casing and shims. These parts will only fit together one way. There is a notch in the shims to indicate the offset hole.

Inspect the head o-ring; replace if needed. Refer to Step 1 if PTFE (derivative) encapsulated. Lubricate the O-ring and place on the head.

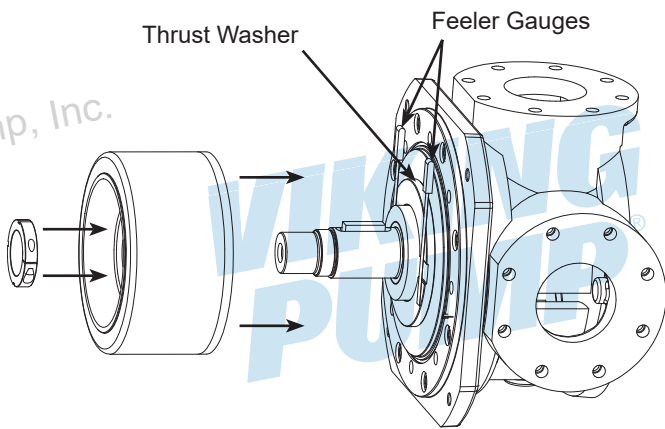
12. Ensure pipe plug is installed in the hole in the head, at the base of the idler pin, that aligns with the vertical groove in the adaptor plate (suction side). Ensure the hole in the discharge side is unobstructed. See **"Figure 19" on page 12**.
13. Coat the ID of the idler bushing with a suitable lubricant and place the idler on the idler pin in the head.
14. The head can now be assembled onto the pump. Tilt the top of the pump head away from the pump slightly until the crescent enters the inside diameter of the rotor and rotate the idler until its teeth mesh with the rotor teeth. Secure the head to the casing using six to eight capscrews or nuts (pump size dependent). Check the end clearance. Refer to **"End Clearance Adjustment" on page 15**, if needed. Rotate the shaft by hand to make sure it turns freely. The pump head and casing should have been marked before disassembly to ensure proper reassembly. If not, be sure the idler pin, which is offset in the pump head, is placed between the port connections to allow for proper flow of liquid through the pump.
15. Inspect the bracket/bearing housing bearings and lipseals; replace if needed. Refer to **"Disassembly: Bearing Housing (Q, QS Sizes)" on page 8** and **"Assembly: Bearing Housing (Q, QS Sizes)" on page 9**. Inspect the outer magnet for any steel objects, which may be attached. Remove any foreign material.

16. Secure the bracket to a base or other stable platform. Support the pump with an overhead hoist and fixture while guiding the canister into the bracket opening. It will have a tendency to be drawn to one side due to the inner magnet. Secure the pump to the bracket using four socket head capscrews. Remove the canister sleeve.

Inspect the canister to make sure it has not picked up any foreign particles, which could damage the pump.

17. Insert three fully threaded 5/8" X 6" hex head capscrews into the bearing housing until they are fully extended in front of the bearing housing to control assembling the pump, see **"Figure 23" on page 15**. To keep the bearing housing and bracket assemblies properly aligned and for additional safety, it is recommended to use 2 lengths of all-thread rod (12") threaded into opposite capscrew locations in the bracket and slide through the corresponding holes in the bearing housing. **Be careful to center the outer magnet while starting to engage canister.**

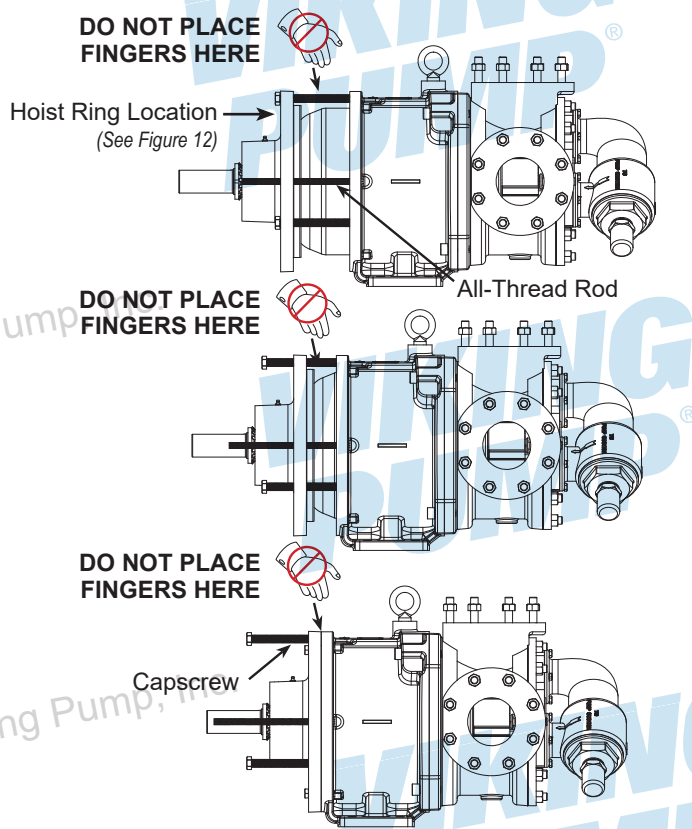
**FIGURE 22: SETTING THRUST WASHER CLEARANCE (Q, QS SIZES)**



18. Support the bearing housing with an overhead hoist, if possible, while guiding the outer magnet into the bracket opening. Back the capscrews off, being careful that the end of the capscrew is positioned in the counterbore hole of the bracket. Secure the bearing housing to the bracket with six capscrews.

**Make certain that the power supply to the pump is "Locked-out". Check that the pump rotates freely by spinning the motor fan blades or pump shaft.**

**FIGURE 23: PUMP ASSEMBLY SEQUENCE (Q, QS SIZES)**



## PUMP ROTATION

The pump is designed to operate in either direction. Process fluid is generally fed to the inner thrust washer and bushing interface and then through a groove in the bushing to the outer thrust washer. Then the fluid is pulled into the canister bushing and back through the hollow shaft and idler pin to the suction side of the pump. When the pump is operated in the opposite direction, the fluid flow is reversed, see "Figure 19" on page 12.

## ⚠ DANGER !

Before opening any Viking pump liquid chamber (pumping chamber, reservoir, relief valve adjusting cap fitting, etc.) be sure:

1. That any pressure in the chamber has been completely vented through the 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.

## END CLEARANCE ADJUSTMENT

Standard end clearance of 0.004" (H, HL Sizes), 0.008" (K, KK, L, LQ, LL, LS Sizes) and 0.010" (Q, QS Sizes) is used. End Clearances are adequate for viscosities up to 2500 SSU / 540 cSt (SAE 40 lube oil at room temperature). Higher viscosities require additional clearances. As a general rule, the end clearance is doubled for higher viscosities. For specific recommendations on end clearance for high viscosity or for operating temperatures above 225°F (107°C), check with your Viking Pump® representative or consult the factory. Use either of the following procedures to properly adjust the end clearance when replacing shims or reassembling the pump.

### PROCEDURE A

After the rotor has been installed and the locknut has been positioned and retained, insert a feeler gage of the proper end clearance into the port and between two rotor teeth, see "Figure 24" on page 16. With the idler on the idler pin, place the head into the pump casing. With the capscrews tight, the feeler gage should fit snugly; otherwise shims should be added or reduced in thickness until the proper clearance is attained.

### PROCEDURE B

If the pump is in line and ports are not accessible, remove the head and shims. Put the head back on (without shims) and measure the gap as shown, see "Figure 25" on page 16. After determining the gap between the head and casing, select a combination of shims equal to the measured gap plus the desired end clearance. Remove head, install shims then install head. Tighten the head capscrews and check the pump clearance by making sure the pump turns freely by hand.

## ⚠ DANGER !

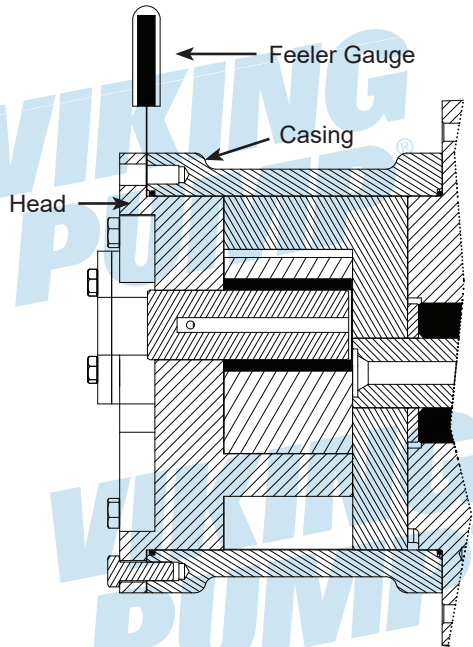
Before starting pump, be sure all drive equipment guards are in place.

Failure to properly mount guards may result in serious injury or death.

FIGURE 24: PROCEDURE A



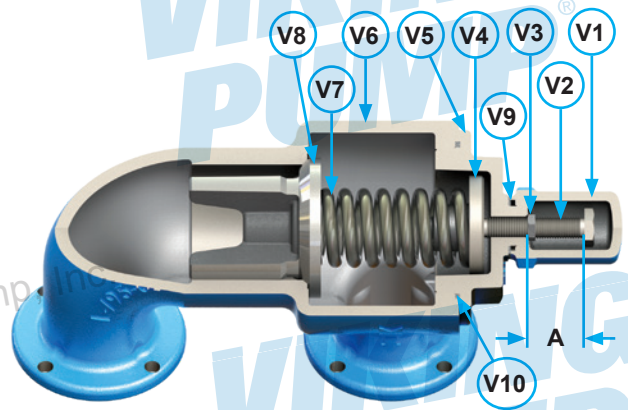
FIGURE 25: PROCEDURE B



## PRESSURE RELIEF VALVE INSTRUCTIONS

FIGURE 26: RELIEF VALVE - ALL SIZES

NOTE: Image is representative only.



Valve - List Of Parts

V1.	Valve Cap	V6.	Valve Body
V2.	Adjusting Screw	V7.	Valve Spring(s)
V3.	Lock Nut	V8.	Poppet
V4.	Spring Guide	V9.	Cap Gasket
V5.	Bonnet	V10.	Bonnet Gasket*

\* K, KK, L, LQ, LL, LS, Q, QS sizes only

### **⚠ DANGER !**

Before opening any Viking pump liquid chamber (pumping chamber, reservoir, relief valve adjusting cap fitting, etc.) be sure:

1. That any pressure in the chamber has been completely vented through the 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.



## DISASSEMBLY

Mark valve and head before disassembly to ensure proper reassembly.

1. Remove valve cap.
2. Measure and record length of extension of adjusting screw. Refer to "A" on "Figure 26" on page 16.
3. Loosen locknut and back out adjusting screw until spring pressure is released.
4. Remove bonnet, spring guide, spring and poppet from valve body. Clean and inspect all parts for wear or damage and replace if necessary.

## ASSEMBLY

Reverse procedures outlined under Disassembly. If valve is removed for repairs be sure to replace in same position. 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 valve cap which covers adjusting screw.

Loosen locknut which locks adjusting screw so pressure setting will not change during operation of pump.

2. Install a pressure gauge in discharge line for actual adjusting operation.
3. Turn adjusting screw CW (in) to increase pressure and CCW (out) to decrease pressure. For guidance dimensions, contact your Viking Pump® representative for Engineering Standard ES-37.
4. Close the discharge line at a point beyond the pressure gauge. Limit the amount of time the pump is being operated at this condition. The temperature inside the pump will rise rapidly. Gauge will show maximum pressure that valve will allow while pump is in operation.
5. Once pressure is set, tighten locknut and replace cap gasket and valve cap.

## IMPORTANT ORDERING INFORMATION

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.

## APPENDIX (FORMERLY TSM 000)

**NOTE:** This Appendix section is for reference only. Not all pump construction features apply to pumps within this Technical Service Manual.

## GENERAL INSTALLATION NOTES

Before installation is started, a few items of a general nature should be considered.

1. **Location** - always locate the pump as close as possible to the supply of liquid to be pumped. Locate it below the liquid supply if at all practical. Viking pumps are self priming but the better the suction conditions the better the performance.
2. **Accessibility** - the pump should be located where it is accessible for inspection, maintenance, and repair. For large pumps, allow room to remove the rotor and shaft without removing the pump from the base.
3. **Port Arrangement** - since the pumps have different port arrangements depending on the model, port location should be checked before starting the installation. The ports may be upright, opposite or at right angles to each other, see **Figure A1**. The right angle ports are normally right-hand, see **Figure A2**; some models are available with left-hand arrangements; still other models are available with the right angle ports located in any one of eight positions including right-hand and left-hand.
4. **Suction/Discharge** - shaft rotation will determine which port is suction and which is discharge. A look at **Figure A3** will show how rotation determines which port is which. As the pumping elements (gears) come out of mesh, point "A" on **Figure A3**, liquid is drawn into the suction port. Then at point "B" the gears come into mesh, and the liquid is forced out the discharge port. Reversing the rotation reverses the flow through the pump. When determining shaft rotation, always look from the shaft end of the pump. Unless otherwise specified, rotation is assumed to be clockwise (CW), which makes the suction port on the right side of the pump. The idler pin, which is offset in the pump head, should be properly positioned toward and an equal distance between the port connections. See **Figure A3** for correct idler pin location in relation to pump ports.

FIGURE A1

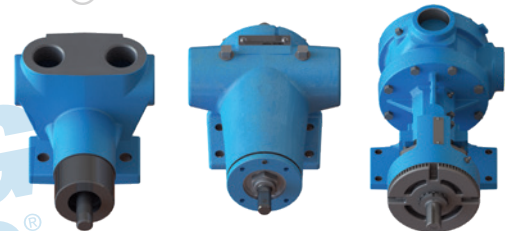


FIGURE A2



FIGURE A3

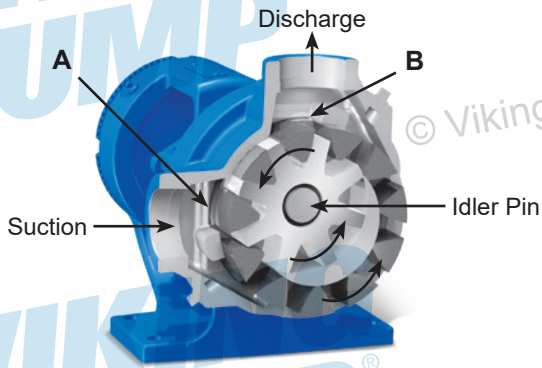


FIGURE A4:  
CUTAWAY OF VIKING INTERNAL  
PRESSURE RELIEF VALVE

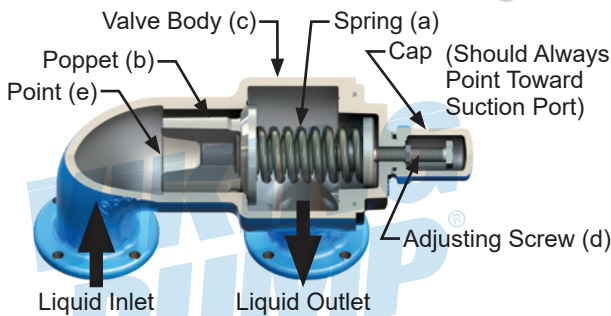


FIGURE A5-A:  
INTERNAL PRESSURE RELIEF VALVE

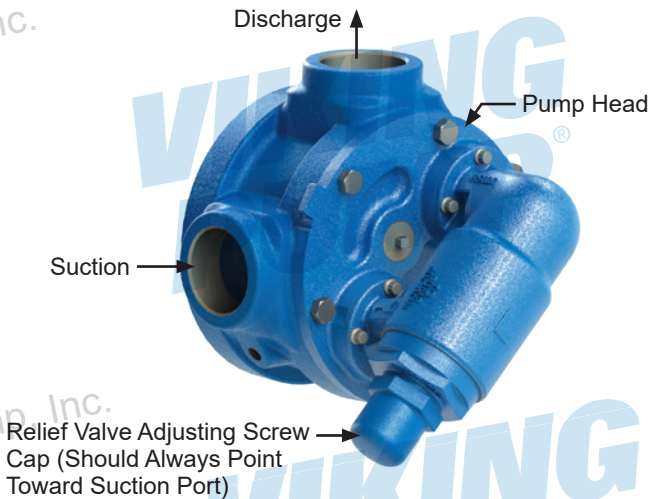
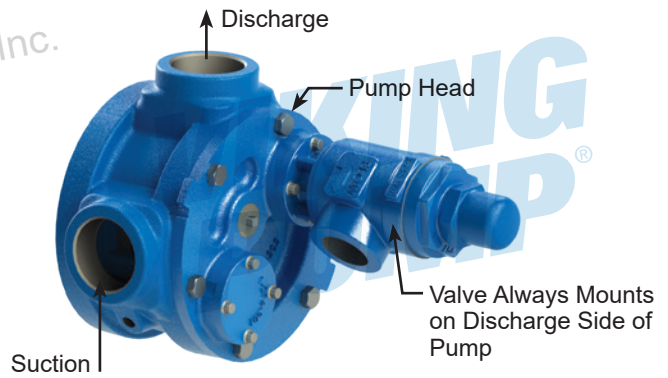


FIGURE A5-B:

RETURN-TO-TANK PRESSURE RELIEF VALVE



**CAUTION !**

Internal type relief valves mounted on Viking pumps should always have the cap or bonnet pointed toward the suction side of the pump. Return-to-tank type relief valves should always be mounted on the discharge side of the pump. If pump rotation is reversed, change the relief valve. Turn the internal type end for end; move the return-to-tank type to the other port. If on a particular installation rotation is reversed, e.g., using one pump to fill a tank, and then by use of a reversing switch or other means of changing the rotation to permit the same pump to circulate the liquid through a heater or to load out, then pressure protection must be provided on both sides of the pump for both rotations. This may be a combination of relief valves, torque limiting devices or rupture disks.

**CAUTION !**

Pumps or systems without relief valves should have some form of pressure protection, e.g. torque limiting devices or rupture disks.

**5. Pressure Protection** - Viking pumps are positive displacement pumps. This means that when the pump is rotated, liquid will be delivered to the discharge side of the pump. If there is no place for this liquid to go, i.e. the discharge line is blocked or closed, pressure can build up until the motor stalls, the drive equipment fails, a pump part breaks or ruptures, or the piping bursts. Because of this, some form of pressure protection must be used with a positive displacement pump. This may be a relief valve mounted directly on the pump, an inline relief valve, a torque limiting device or a rupture disk.

The pressure relief valve mounted on most Viking pumps and most in-line valves are of the spring-loaded poppet design. See **Figure A4**. The spring (a) holds poppet (b) against the seat in the valve body (c) with a given force determined by the spring size and by how tightly it is compressed by the adjusting screw (d). The pump discharge pressure pushes against the underside of the poppet at point (e). When the force exerted by the liquid under the poppet exceeds that exerted by the spring, the poppet lifts and liquid starts to flow through the valve.

As the discharge pressure builds up, more and more of the liquid flows through until a pressure is reached at which all of the liquid being pumped is going through the valve. This pressure is the relief valve setting.

Viking pumps can be furnished with either an internal pressure relief valve - one which directs the flow from the valve back to the suction side of the pump - or a return-to-tank valve - which directs the flow through piping back to the supply tank. See **Figure A5-A** and **Figure A5-B**.

An inline relief valve mounted in the discharge piping also directs the flow back to the supply tank. This type of valve should be mounted close to the pump so that the pressure drop through the piping between the pump and the valve is at a minimum. Be sure there are no shutoff valves between the pump and relief valve. Piping from a return-to-tank or an in-line valve to the supply tank should also be as short and as large as possible.

**NOTE:** On some models, the relief valve is mounted on the pump casing instead of the pump head.

The spring-loaded poppet-type valve is strictly a differential valve, sensing only those pressures on each side of the poppet. It should not be used as a pressure or flow control device. It is intended strictly as a relief valve.

The pressure at which either the return-to-tank or internal relief valve bypasses can be changed by turning the adjusting screw. Do not back the adjusting screw all the way out. Stop when spring tension is off the screw (the screw starts to turn easily). For details on maintenance of the relief valve, refer to the Technical Service Manual covering your model series.

- 6. Motor** - follow local electrical codes when hooking up motors.

## FOUNDATION

Every pump should have a solid foundation. It may be any structure sufficiently strong to hold the pump rigid and to absorb any strain or shock that may be encountered.

A certified print of the pumping unit should be used in preparing the foundation. If a separate foundation is provided, make it at least four inches wider and longer than the base of the unit.

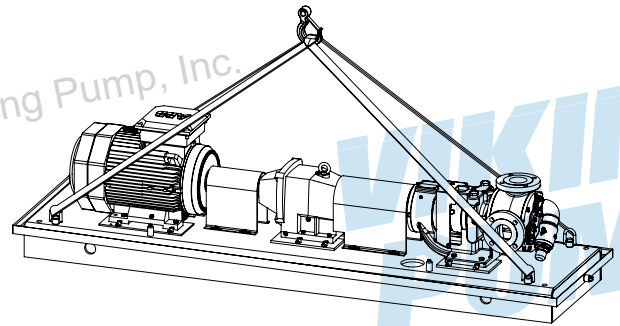
When the unit is placed on the foundation, it should be leveled and checked for position against the piping layout and then fastened down.

## COMPONENT & UNIT LIFTING FEATURES

Removable lifting features, such as threaded eye bolts and hoist rings, installed in components (pumps, reducers, motors, etc.) and baseplates should be left on the components.

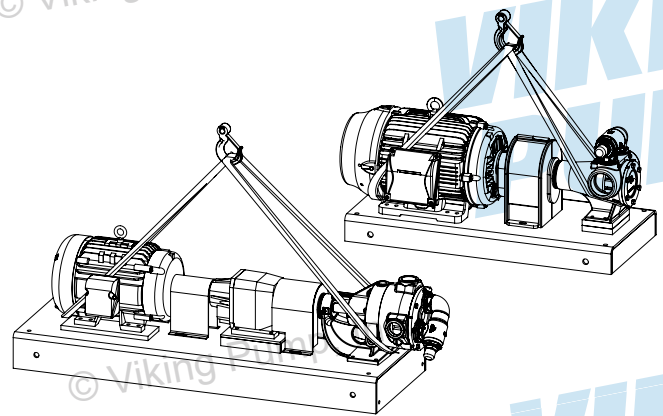
These features are used to safely lift and move the individual components. Following are general guidelines for lifting Viking Pump® units.

**FIGURE A6:  
EXAMPLE OF PROPER LIFTING METHOD**



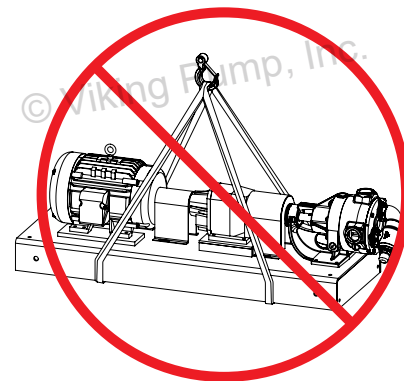
**NOTE:** Units should be lifted by the base lifting features using two or more lifting slings.

**FIGURE A7:  
EXAMPLES OF PROPER LIFTING METHOD**



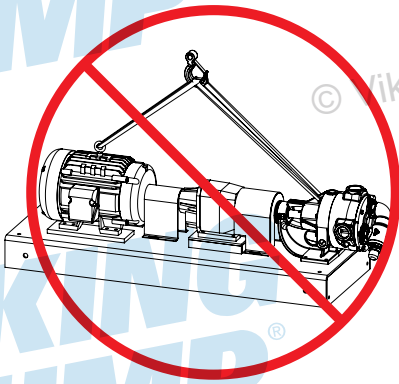
**NOTE:** Use two or more lifting slings around the pump and the motor when the base does not have lifting features. Make sure the slings are secure and the load is balanced before attempting to lift.

**FIGURE A8:  
EXAMPLE OF IMPROPER LIFTING METHOD**



**NOTE: NEVER** lift the unit with slings unsecured under the base. The slings can slide, allowing the unit to tip and/or fall. Improper lifts can result in personal injury and/or damage to the unit.

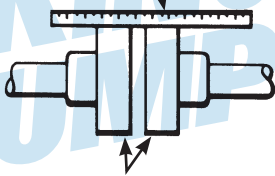
**FIGURE A9**  
**EXAMPLE OF IMPROPER LIFTING METHOD**



**NOTE: NEVER** lift the unit with slings connected to the component lifting features. The lifting features are designed for the individual component and are not rated to lift the entire unit. Improper lifts can result in personal injury and/or damage to the unit.

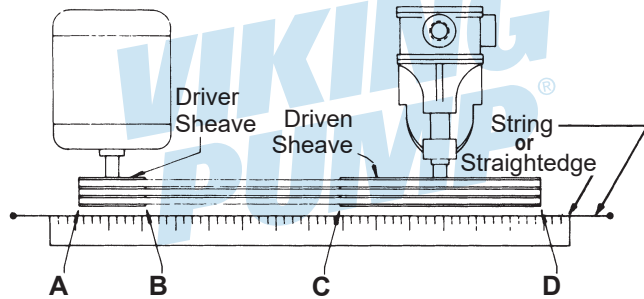
**FIGURE A10-A**

Use a straightedge. These surfaces must be parallel.



Check width between these surfaces with inside calipers to be certain the faces are equal distance apart and parallel.

**FIGURE A10-B**



When sheaves are properly aligned, all points A, B, C, D will touch string or straightedge.

## ALIGNMENT

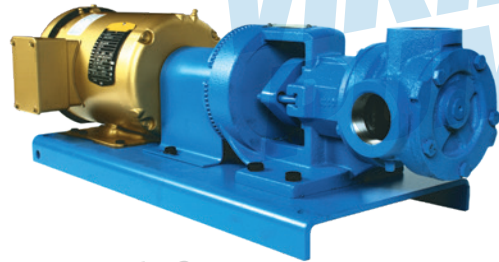
### CHECK ALIGNMENT AFTER MOUNTING

*For detailed coupling alignment procedures see coupling manufacturers' recommendations.*

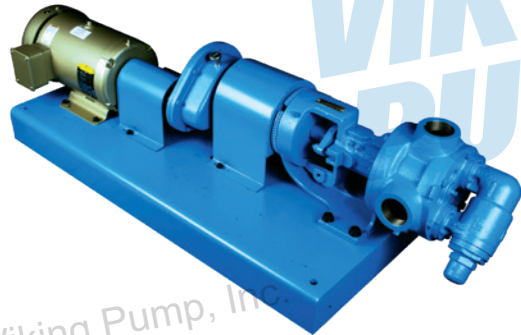
The pump, drive, and motor were properly aligned at the time they were assembled. During shipping and mounting the alignment is often disturbed. **BE SURE TO RECHECK ALIGNMENT AFTER THE PUMP UNIT IS INSTALLED!**

1. Check pump ports to be sure they are square and in the proper position; shim or move the pump as required. Do not force piping to line up with the ports.
  2. If the pump is driven by a flexible coupling(s) either directly connected to the motor or through a reducer, remove any coupling guards or covers and check alignment of the coupling halves. At a minimum, a straightedge (such as a piece of key stock) across the coupling must rest evenly on both rims at the top, bottom, and sides. See **Figure A10-A**.
  3. If the pump is driven by V-belts, check the alignment by using a long straightedge or tightly drawn string across the face of the sheaves. See **Figure A10-B**.
  4. Make a final check on alignment after piping is hooked up. Refer to item 13 in **Piping** section.
- Figure A11** and **Figure A12** show typical direct drive and gear reducer drive units.
5. For high temperature applications (those above 300°F) allow the pump to reach operating temperature, then recheck alignment.

**FIGURE A11: DIRECT DRIVE**



**FIGURE A12: REDUCER DRIVE**



## PIPING

The cause of many pumping problems can be traced to suction piping. It should always be as large and short as practical. For help in selecting the proper size suction and discharge piping, refer to **Viking General Catalog Section 510**.

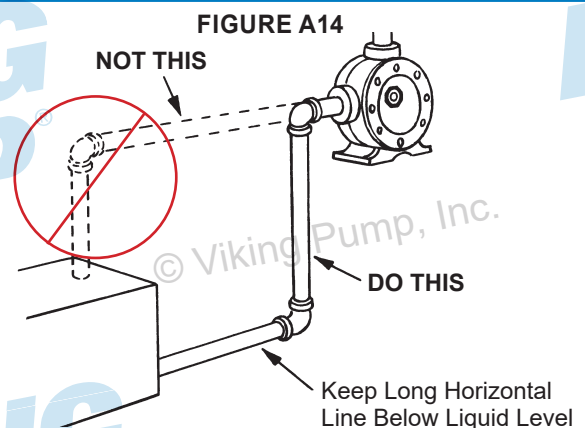
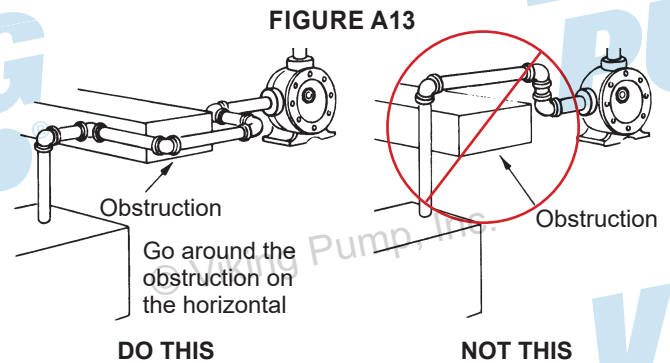
Before starting the layout and installation of your piping system, consider the following points:

1. Never use piping smaller than the pump port connections.
2. Be sure the inside of the pipe is clean before hooking it to the pump.
3. **FOOT VALVE** - When pumping a light liquid with a suction lift, a foot valve at the end of the suction piping or a check valve in the first horizontal run will hold the liquid in the line and make it easier for the pump to prime. Be sure the foot or check valve is big enough so that it doesn't cause excessive line loss.
4. When approaching an obstacle in the suction or discharge line, go around the obstacle instead of over it. Going over it creates an air pocket. See **Figure A13**.
5. Where practical, slope the piping so no air or liquid pockets will be formed. Air pockets in the suction line make it hard for the pump to prime.
6. For a suction line with a long horizontal run, keep the horizontal portion below the liquid level if possible. This keeps the pipe full of liquid and reduces the amount of air the pump must evacuate at startup. This is most helpful when there is no foot valve. See **Figure A14**.
7. When piping a hot or cold system (liquid being handled is at a temperature different from the air surrounding the pump), be sure allowance is made for expansion and contraction of the piping. Loops, expansion joints, or unsecured (this does not mean unsupported) runs should be used so the pump casing is not distorted.
8. **STRAINER** - It is always good practice to consider a strainer on the suction side of a positive displacement pump. The strainer will keep foreign objects from going into the pump. Without a strainer objects can lock the pump, and damage the internals and drive. The strainer basket mesh or perforation size should be big enough so that it does not cause excessive pressure drop, but it should be fine enough to protect the pump. When in doubt as to the proper size, check with the manufacturer, giving pipe size, flow rate, and viscosity involved. Provision should be made for cleaning the strainer. If the pump operates continuously, a bypass should be built around the strainer, or two strainers should be put in parallel with proper valving so they can be isolated for cleaning. Use of a strainer is particularly important at start up to help clean the system of weld beads, pipe scale, and other foreign objects. For additional information, refer to **TSM 640**.
9. If the pump is not equipped with a relief valve, consideration should be given to mounting one in the discharge line. Refer to discussion on pressure protection under item 5 in **General Installation Notes** section.
10. The pump should not be used to support the piping. The weight of the piping should be carried by hangers, supports, stands, etc.
11. When fastening the piping to the pump it should not be necessary to impose any strain on the pump casing. "Springing" or "drawing" the piping up to the pump will

cause distortion, possible misalignment, and probable rapid wear of the pump. Do not use the pump to correct errors in piping layout or assembly.

12. All joints of the piping system should be tight; pipe sealer will help assure leak-free threaded joints. Leaks in the suction line permitting air to be drawn in may cause a noisy pump or a reduction in capacity. It is not recommended to use PTFE tape on NPT ports as a pipe sealer. This action can result in cracks in the pump.
13. **ALIGNMENT** - Check the alignment of the drive after the piping is hooked up. As a final check on pump alignment, remove the head of the pump and with a feeler gauge determine if there is clearance all the way around between the rotor and casing. Because of manufacturing tolerances, bushing clearances, etc., the rotor may not be centered in the casing, but it should not drag; dragging would indicate unit misalignment or casing distortion from piping strain. Making this check is most desirable on installations involving Q, M and N size general purpose pumps.
14. The auxiliary piping hooked to jackets, glands, etc. for heating, cooling, quenching, or for other purposes should receive the same attention as the piping handling the pumped liquid.
15. Provide a pressure relief device in any part of a pump and piping system that can be valved off and, thus, completely isolated. This is particularly important:
  - a. When handling a cold liquid such as refrigeration ammonia that can warm up to ambient temperatures when the pump is shut off.
  - b. When handling a liquid such as asphalt or molasses that has to be heated before it can be pumped.

The rise in temperature causes the liquid to expand; if there is no provision for pressure relief in the closed off section, there is a chance that the pump or piping will rupture.



## START UP

Before starting the pump, check the following:

1. Are there vacuum and pressure gauges on or near the pump? These gauges are the quickest and most accurate way of finding out what is happening in the pump.
2. Check alignment - See suggestions in the Alignment section of this manual.
3. Check piping to be sure there is no strain on the pump casing.
4. Rotate the pump shaft by hand to be sure it turns freely. **MAKE SURE THE PUMP DRIVER IS LOCKED OUT OR CANNOT BE ENERGIZED BEFORE DOING THIS.**
5. Jog motor to be sure it is turning in the right direction; refer to discussion on pump rotation under item 4 in **General Installation Notes** section.
6. Check any relief valves to be sure they are installed correctly. Refer to discussion on relief valves in **General Installation Notes** section.
7. Check suction piping to be sure:
  - a. It is all connected and tight
  - b. Valves are open
  - c. End of pipe is below liquid level
8. Check discharge piping to be sure:
  - a. It is all connected and tight
  - b. Valves are open
  - c. There is a place for the liquid to go
9. Lubricate any grease fitting on the pump using a #2 NLGI grease. Check any gear reducer, motor, coupling, etc. for instructions and lubricate as recommended by the manufacturer. See **Engineering Service Bulletin ESB-515** at the end of the **Appendix** for Viking standard grease types to check compatibility.
10. For packed pumps, loosen packing gland nuts so gland can be moved slightly by hand. Adjust gland to reduce leakage only after pump has run long enough to reach constant temperature. Packing should weep a little to keep it cool and lubricated.
11. Do not use the Viking pump to flush, pressure test or prove the system with water. Either remove the pump or run piping around it while flushing or testing. Pumping water, dirty or otherwise, can do more damage in a few minutes than months of normal service.
12. Check to be sure all guards are in place.
13. Check the pump to be sure it is heated to operating temperature (if jacketed or heat traced).

If the pump begins to deliver liquid within 60 seconds, it can continue to be operated. If liquid is not leaving the discharge port, stop the pump. Running the pump longer than one minute without liquid inside it can damage the pump. Review the steps just outlined, consider what the suction and discharge gauges indicate, and see **Troubleshooting** section. If everything appears to be in order, put some liquid in the pump. This will help it prime.

The pump can be restarted. If nothing is flowing within two minutes, stop the pump. The pump is not a compressor; it will not build up much air pressure. It may be necessary to vent the discharge line until liquid begins to flow.

If the pump still does not deliver flow, the cause may be one or more of the following:

1. Suction line air leaks. Vacuum gauge reading should help determine if this is the problem.
2. End of suction pipe not submerged deep enough in liquid.
3. Suction lift is too great or the suction piping is too small.
4. Liquid is vaporizing in the suction line before it gets to the pump.

If after consideration of these points it still does not pump, review again all points under **START UP**. Read through **Troubleshooting** in this manual and try again. If it still does not pump, contact your Viking Pump® representative.

## TROUBLESHOOTING

A Viking pump that is properly installed and maintained will give long and satisfactory performance.

**NOTE:** Before making any pump adjustment or opening the pump liquid chamber in any manner, make sure that:

1. Any pressure in the pumping chamber has been vented through the suction or discharge lines or other openings provided for this purpose.
2. The driver has been "locked out" so that it cannot inadvertently be started while work is being done on the pump.
3. The pump has been allowed to cool down to the point where there is no chance of anyone being burned.

If trouble does develop, one of the first steps toward finding the difficulty is to *install a vacuum gauge in the suction port and a pressure gauge in the discharge port*. Readings on these gauges often will give a clue as to where to start looking for the trouble.

### VACUUM GAUGE - SUCTION PORT

1. **High reading would indicate:**
  - a. Suction line is blocked by a stuck foot valve, stuck gate valve, or plugged strainer.
  - b. Liquid is too viscous to flow through the piping.
  - c. Lift is too high.
  - d. Line is too small.
2. **Low reading would indicate:**
  - a. Air leak in suction line.
  - b. End of pipe is not in liquid.
  - c. Pump is worn.
  - d. Pump is dry - should be primed.
3. **Fluttering, jumping, or erratic reading:**
  - a. Liquid is vaporizing.
  - b. Liquid is coming to pump in slugs, possibly an air leak, insufficient liquid above the end of the suction pipe.
  - c. Vibrating from cavitation, misalignment, or damaged parts.

## PRESSURE GAUGE - DISCHARGE PORT

### 1. High reading would indicate:

- a. High viscosity, small diameter discharge line or long discharge line.
- b. Gate valve is partially closed.
- c. Filter is plugged.
- d. Vertical head did not consider a high specific gravity liquid.
- e. Line is partially plugged from build up on inside of pipe.
- f. Liquid in the pipe is not up to temperature.
- g. Liquid in the pipe has undergone a chemical reaction and has solidified.
- h. Relief valve is set too high.

### 2. Low reading would indicate:

- a. Relief valve is set too low.
- b. Relief valve poppet is not seating properly.
- c. Bypass around the pump is partially open.
- d. Too much extra clearance.
- e. Pump is worn.

### 3. Fluttering, jumping, or erratic reading:

- a. Cavitation.
- b. Liquid is coming to the pump in slugs.
- c. Air leak is in the suction line.
- d. Vibrating from misalignment or mechanical problems.

## Some of the following may also help pinpoint the problem:

### A. Pump does not pump.

1. Pump has lost its prime due to air leak, low level in tank, foot valve stuck.
2. Suction lift is too high.
3. Rotating in wrong direction.
4. Motor does not come up to speed.
5. Suction and discharge valves not open.
6. Strainer is clogged.
7. Bypass valve open, relief valve set too low, relief valve poppet stuck open.
8. Pump is worn out.
9. Any changes in the liquid system or operation that would help explain the trouble, e.g. new source of supply, added more lines, inexperienced operators, etc.
10. Too much end clearance.
11. Head position is incorrect. See **Figure A3**.
12. Temperature changes either in the liquid or environment.
13. **Mag Drive pumps ONLY:** The magnetic coupling is decoupling. Changes in application (temperature, pressure, viscosity, etc.) may require torque beyond coupling capabilities.

### B. Pump starts, then loses its prime.

1. Supply tank is empty.
2. Liquid is vaporizing in the suction line.
3. Air leaks or air pockets in the suction line; leaking air through packing or mechanical seal.
4. Pump is worn out.

### C. Pump is noisy.

1. Pump is being starved (heavy liquid cannot get to pump fast enough). Increase suction pipe size or reduce length.
2. Pump is cavitating (liquid vaporizing in the suction line). Increase suction pipe size or reduce length. If pump is above the liquid, raise the liquid level closer to the pump. If the liquid is above the pump, increase the head of liquid.
3. Check alignment.
4. May have a bent shaft or rotor tooth. Straighten or replace.
5. Relief valve chatter. Increase pressure setting.
6. May have to anchor base or piping to eliminate or reduce vibration.
7. May be a foreign object trying to get into the pump through the suction port.
8. **Mag Drive pumps ONLY:** The magnetic coupling has decoupled. Shut off and let cool, then restart.

### D. Pump not up to capacity.

1. Starving or cavitating. Increase suction pipe size or reduce length.
2. Strainer partially clogged.
3. Air leak in suction piping or along pump shaft.
4. Running too slowly. Check the motor is running at the correct speed and that it is wired correctly.
5. Bypass line around pump partially open.
6. Relief valve set too low or stuck open.
7. Pump is worn out.
8. Too much end clearance.
9. Head position incorrect. See **Figure A3**.

### E. Pump takes too much power.

1. Running too fast. Verify the motor speed, reducer ratio, sheave size, and other drive components are correct for the application?
2. The liquid is too viscous for the size of the unit. Heat the liquid to reduce viscosity, increase the pipe size, slow down the pump, or use a larger motor.
3. Discharge pressure higher than calculated. Verify with a pressure gauge. Increase size or reduce length of pipe, reduce speed (capacity), or get bigger motor.
4. Packing gland drawn down too tight.
5. Pump misaligned.
6. Extra clearance on pumping elements may not be sufficient for operating conditions. Check parts for evidence of drag or contact in pump and increase clearance where necessary.
7. System pressure relief valve is set too high.
8. Bushings have locked to shaft or pin, or the liquid has set up in the pump.

### F. Rapid Wear.

On most applications the pump will operate for many months or years before it gradually loses its ability to deliver capacity or pressure. Examination of such a pump would show a smooth wear pattern on all parts. Rapid wear, occurring in a few minutes, hours or days, shows up as heavy grooving, galling, twisting, breaking or similar severe signs of trouble. See **Rapid Wear Table**.

# RAPID WEAR

**RAPID WEAR TABLE**

CAUSE	EVIDENCE	POSSIBLE SOLUTION
1 ABRASIVES	Gouges or marks made by large, hard particles; a rapid wearing away of bushings from very small abrasives; or anything in between.	Flush the system with the pump removed. Install strainer in suction line. Most abrasive objects and particulate is removed after a few cycles (or days) of flushing.
2 CORROSION	Rust, pitting or metal appears to be "eaten" away.	Check the Viking General Catalog Liquid List for materials of construction recommendation. Consider whether all of the materials used in pump construction were attacked; consider other materials used in the system to determine how they resisted the liquid. Check to see whether or not the liquid has been contaminated to make it more corrosive than anticipated.
3 EXCEEDING OPERATING LIMITS	Noisy operation, broken bushings, twisted shaft, parts show evidence of high heat (discoloration).	Review General Catalog for operating limits on particular model involved.
4 INSUFFICIENT EXTRA CLEARANCE	Pump may stall. Evidence of heavy contact between end of rotor teeth and head or other parts.	Increase end clearance and/or contact your Viking Pump® representative with details of the application, so that information regarding proper extra clearance may be provided.
5 LACK OF LUBRICATION	Noisy bearings, localized heating at bearings or lip seal, smoke, rapid bushing wear.	Be sure all grease fittings are greased before starting, and instructions for lubrication of drive equipment are followed; consider use of auxiliary lubricating equipment.
6 MISALIGNMENT	Wear on only one part of a surface, e.g., one side of the casing, one side of the packing gland, only a portion of the face of the head.	Double check alignment of drive equipment and piping. Check the alignment under conditions as close to operating conditions as possible.
7 RUN DRY	Pump stalls because parts have uneven expansion caused by frictional heat; galling between surfaces having relative motion; seal seats and idler pins changing color because of high heat.	Be sure there is liquid in the system at the time of start up. Provide some kind of automatic alarm or shut-off if supply tank runs dry.

# PREVENTATIVE MAINTENANCE

Performing a few preventative maintenance procedures will extend the life of your pump and reduce the overall cost of ownership.

**A. Lubrication** - Grease all grease fittings after every 500 hours of operation. If service is severe, grease more often. Do it gently with a hand gun until the grease exiting the lip seal or relief plug is similar in consistency and color to the new grease.

Use a NLGI #2 grease for normal applications. See **ESB-515** at the end of the **Appendix** for Viking standard grease types to check compatibility. For hot or cold applications, use appropriate grease.

**B. Packing Adjustment** - Occasional packing adjustment may be required to keep leakage to a slight weep. If impossible to reduce leakage by gentle tightening, replace packing or use different type. *Refer to Technical Service Manual on particular model series for details on repacking.*

**C. End Clearance Adjustment** - After long service, the running clearance between the end of the rotor teeth and the head may have increased through wear. This wear may cause a loss of capacity or pressure. Resetting end clearance will normally improve pump performance. *Refer to TSM on particular model series for procedure on adjusting end clearance for pump involved.*

**D. Examine Internal Parts** - Periodically remove the head, examine idler and bushing and head and pin for wear. Replacing a relatively inexpensive idler bushing and idler pin after only moderate wear will eliminate the need to replace more expensive parts at a later date. *Refer to TSM on particular model series for procedure in removing head of the pump.* Be sure idler does not slide off the idler pin as the head is removed. If it does slide off the idler can cause personal injury or damage the part.

**E. Cleaning the Pump** - A clean pump is easier to inspect, lubricate, adjust, and runs cooler.

**F. Storage** - If pump is to be stored or not used for six months or more, pump must be drained, and a light coat of non-detergent SAE 30 weight oil must be applied to all internal pump parts. Lubricate fittings and apply grease to pump shaft extension. Viking suggests rotating pump shaft by hand one complete revolution every 30 days to circulate the oil. Retighten all gasketed joints before using the pump.



## DO'S & DON'TS

Do's and Don'ts for installation, operation, and maintenance of Viking pumps to assure safe, long, trouble-free operation.

### INSTALLATION

1. **DO** install pump as close to supply tank as possible.
2. **DO** leave working space around the pumping unit.
3. **DO** use large, short, and straight suction piping.
4. **DO** install a strainer in the suction line.
5. **DO** double check alignment after the unit is mounted and piping is hooked up.
6. **DO** provide a pressure relief valve for the discharge side of the pump.
7. **DO** cut out the center of gaskets used as port covers on flanged port pumps.
8. **DO** record pump model number and serial number and file for future reference.

### OPERATION

1. **DON'T** run pump at speeds faster than shown in the catalog for your model.
2. **DON'T** require pump to develop pressures higher than those shown in the catalog for your model.
3. **DON'T** operate pumps at temperatures above or below limits shown in the catalog for your pump.
4. **DON'T** operate pumps without all guards being in place.
5. **DON'T** operate pump without a relief valve on the pump or in the discharge piping. Be sure valve is mounted and set correctly.
6. **DON'T** exceed catalog limits for temperature and pressures of fluids in jacketed areas of pump.
7. **DON'T** use the pump in a system which includes a steam, air, or vapor blow or purge **without** provision for over-speed shutdown, in case the pump starts to act as a turbine and over-speeds the drive.
8. **DON'T** operate the pump with all of the liquid bypassing through a pump mounted internal type relief valve, or without any flow of liquid going through the pump for more than a couple of minutes. Operation under either of these conditions may result in a heat build-up in the pump, which could cause hazardous conditions or happenings.

## MAINTENANCE

1. **DO** make sure any pump that has residual system pressure in it, or that has handled high vapor pressure liquids, such as LP-gas, ammonia, Freons, etc., has been vented through the suction or discharge lines or other openings provided for this purpose.
2. **DO** make sure that if the pump is still hooked to the driver while maintenance is being performed that the driver has been "locked out", so that it cannot be inadvertently started while work is being done on the pump.
3. **DO** make sure any pump that has handled a corrosive, flammable, hot, or toxic liquid has been drained, flushed, vented and/or cooled before it is disassembled.
4. **DO** remember that a few simple preventative maintenance procedures such as periodic lubrication, adjustment of end clearance, examination of internal parts, etc., will extend the service life of your pump.
5. **DO** obtain, read and keep maintenance instructions furnished with your pump.
6. **DO** have spare parts, pumps or standby units available, particularly if the pump is an essential part of a key operation or process.
7. **DON'T** drop parts during disassembly, e.g., idler can slip from the pin as the head is removed from the pump. It may cause personal injury or damage the part.
8. **DON'T** stick fingers in the ports of a pump. Serious injury may result.
9. **DON'T** spin the idler on the idler pin. Fingers may be jammed between teeth and crescent.

## ESB-515

Effective 25-July-19

### LUBRICATION OF VIKING PUMPS

Usage of Grease	General Description of Grease Used by Viking	Viking Recommended Supplier
Grease used for anti-friction bearings, sleeve bearings and lantern rings	Premium EP, Multi-purpose polyurea base grease	Any NLGI Grade 2 premium quality, multi-purpose, polyurea grease
Grease used for bracket bushing when seal is behind rotor	Petrolatum	Chevron Petrolatum Snow White
Grease used for O-Pro™ Seal	Edible Grease, aluminum complex	Chevron FM ALC EP 0, 1, 2

Lubricate each grease fitting every 500 hours of operation or every six months, whichever occurs first. If service is severe, grease more often. Be sure the grease is compatible with the grease used by Viking. Grease used for the bracket bushing and O-Pro™ Seal should be compatible with the liquid being pumped.

**Reservoir on Ammonia Pumps:** The Series 4924A ammonia pumps are shipped without oil in the reservoir. Before start-up, fill the reservoir with one pint of Light Refrigeration Oil that is compatible with the Neoprene seal and with a maximum viscosity of 15,000 SSU at operating temperature. Drain and refill the reservoir after the first 200 hours of operation and every 1000 hours thereafter. Refer to Technical Service Manual TSM 1467.

**Pumping Chamber of Stainless Pumps:** All internal parts are coated with test fluid to avoid galling when the pump is first installed. Be sure the pump is kept full of liquid when in operation to prevent damage to the pump.

### LUBRICATION OF VIKING REDUCERS

Viking gear reducers, "A", "B", "C" sizes use SAE 30 oil above 32°F and SAE 10W oil below 32°F.

- A Size: 3/8 PT. (6 oz.)
- B Size: 1/2 PT. (8 oz.)
- C Size: 2-1/4 PT. (36 oz.)

Viking gear reducers are shipped less oil. Before start-up, fill to proper level with quantity and type of oil shown in box at left. After first 100 hours of operation, drain and refill with new lubricant. Check lubricant level every 2000 hours or every six months. Once each year, drain and refill.

### LUBRICATION OF VIKING ASSOCIATIVE EQUIPMENT

Check any motor, coupling, gear reducer or other drive equipment for manufacturer's instructions and lubricate as recommended.

**TECHNICAL SERVICE MANUAL: INSTALLATION, OPERATION & MAINTENANCE****VIKING  
PUMP®**UNIVERSAL PRODUCT LINE: **STEEL EXTERNALS****8123A SERIES™****SIZES: H, HL, K, KK, L, LQ, LL, LS, Q, QS****TSM 1303****Page 27 of 27****Issue C****⚠ CAUTION !**

**TO REDUCE THE RISK OF LEAKAGE WITH VIKING MAG DRIVE PUMPS, USERS SHOULD COMPLY WITH THE FOLLOWING GUIDELINES AND ADHERE TO THE FOLLOWING PROCEDURES:**

- The pump configuration and materials used in a pump are tailored to the application for which it is ordered. Users should never use a pump for an application that is different from the application specified when the pump was ordered. This includes differences in liquid, speed, pressure, temperature or viscosity.
- Users must understand the characteristics of liquids they are pumping, and be especially aware of any particulates in the liquid. Particulates can cause rapid wear of the bushings, especially if carbon graphite bushings are used. Hard bushings and hard shafts can reduce the risk of rapid wear, but the use of hard materials is not always the optimal solution. In applications involving non-abrasive, non-self lubricating liquids, carbon graphite bushings are typically the preferred material.
- Users should periodically inspect their pump for wear. This is especially critical and should be carried out with greater frequency when carbon graphite bushings are used, or the same pump has not previously been used for the same application, including the same liquid, speed, pressure, temperature and viscosity. Users should promptly replace worn parts when they are discovered.
- Users should continuously monitor pumps that are handling hazardous liquids. This is especially critical for unmanned, remote locations. If a user does not have in-house expertise in the area of monitoring, it should contact a local engineering firm with monitoring experience.

**VIKING PUMP®****WARRANTY**

Viking pumps, strainers and reducers are warranted to be free of defects in material and workmanship under normal conditions of use and service. The warranty period varies by type of product. A Viking product that fails during its warranty period under normal conditions of use and service due to a defect in material or workmanship will be repaired or replaced by Viking. At Viking's sole option, Viking may refund (in cash or by credit) the purchase price paid to it for a Viking product (less a reasonable allowance for the period of use) in lieu of repair or replacement of such Viking product. Viking's warranty is subject to certain restrictions, limitations, exclusions and exceptions. A complete copy of Viking's warranty, including warranty periods and applicable restrictions, limitations, exclusions and exceptions, is posted on Viking's website ([www.vikingpump.com/warranty/warranty-info](http://www.vikingpump.com/warranty/warranty-info)). A complete copy of the warranty may also be obtained by contacting Viking through regular mail at Viking Pump, Inc., 406 State Street, Cedar Falls, Iowa 50613, USA.

THIS WARRANTY IS AND SHALL BE VIKING'S SOLE AND EXCLUSIVE WARRANTY AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ALL WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NON-INFRINGEMENT, ALL OF WHICH OTHER WARRANTIES ARE EXPRESSLY EXCLUDED.

THE RIGHTS AND REMEDIES UNDER THIS WARRANTY ARE AND SHALL BE THE SOLE AND EXCLUSIVE RIGHTS AND REMEDIES AGAINST VIKING. EXCEPT FOR THE SPECIFIC LIABILITIES AND OBLIGATIONS PROVIDED UNDER THIS WARRANTY, VIKING SHALL HAVE NO LIABILITY OR OBLIGATION WITH RESPECT TO ANY PRODUCT CLAIMED TO BE DEFECTIVE IN ANY MANNER.

UNDER NO CIRCUMSTANCES SHALL VIKING BE LIABLE UNDER THIS WARRANTY OR OTHERWISE FOR SPECIAL, INCIDENTAL, INDIRECT, CONSEQUENTIAL OR PUNITIVE DAMAGES OF ANY KIND, INCLUDING, BUT NOT LIMITED TO, LOST OR UNREALIZED SALES, REVENUES, PROFITS, INCOME, COST SAVINGS OR BUSINESS, LOST OR UNREALIZED CONTRACTS, LOSS OF GOODWILL, DAMAGE TO REPUTATION, LOSS OF PROPERTY, LOSS OF INFORMATION OR DATA, LOSS OF PRODUCTION, DOWNTIME, OR INCREASED COSTS, IN CONNECTION WITH ANY PRODUCT, EVEN IF VIKING HAS BEEN ADVISED OR PLACED ON NOTICE OF THE POSSIBILITY OF SUCH DAMAGES AND NOTWITHSTANDING THE FAILURE OF ANY ESSENTIAL PURPOSE OF ANY PRODUCT.