

TECHNICAL SERVICE MANUAL

INDUSTRIAL HEAVY DUTY MOTOR SPEED PUMPS SERIES 4076 and 4176 SIZES KE, KKE, and LQE

**VIKING
PUMP**

SECTION	TSM 710
PAGE	1 of 8
ISSUE	B

CONTENTS

INTRODUCTION	1
SAFETY INFORMATION	1
SPECIAL INFORMATION	2
ROTATION:	2
PRESSURE RELIEF VALVES:	2
MAINTENANCE	2
DISASSEMBLY	3
ASSEMBLY	5
MECHANICAL SEAL	6
THRUST BEARING ADJUSTMENT	6
INSTALLATION OF CARBON GRAPHITE BUSHINGS	6
INSTALLATION OF FOOT	6
PRESSURE RELIEF VALVE INSTRUCTIONS ..	7
IMPORTANT	7

INTRODUCTION

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

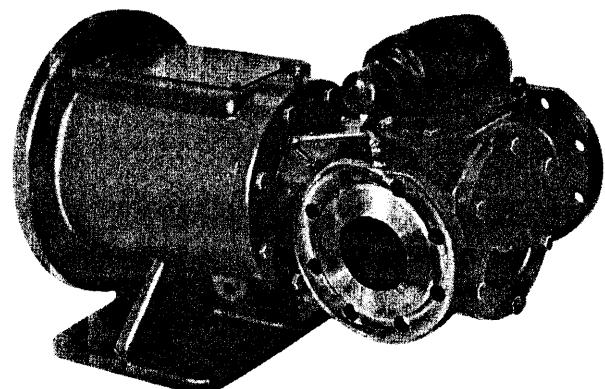
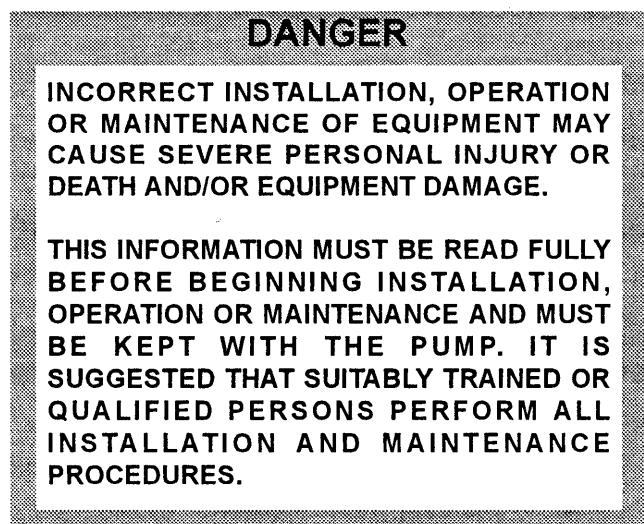
This manual deals only with Viking 4076/4176 pumps. Specifications and recommendations are listed in Catalog Section 710.

MODEL NUMBER CHART

UNMOUNTED PUMPS	UNITS
Flange Mounted	Units are designated by the unmounted pump model numbers followed by a letter(s) indicating drive style.
KE4076	
KKE4076	
LQE4076	M - Horizontal
Foot Mounted	D - Direct Drive
LQE4176	

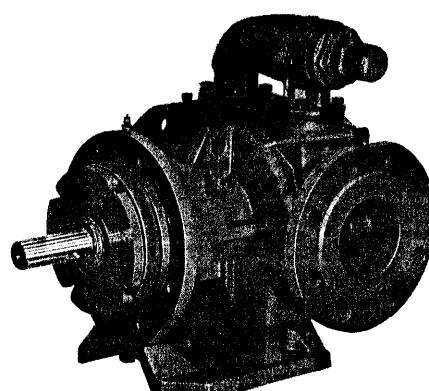
TABLE 1

SAFETY INFORMATION



Model KKE4076M (shown with relief valve on pump casing and flange mounted bracket - M Drive)

FIGURE 1



Model LQE4176 (shown with relief valve on pump casing and foot mounting)

FIGURE 2

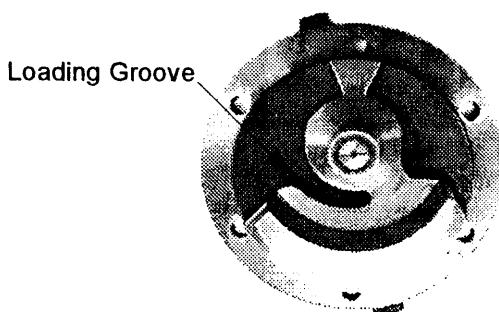
SPECIAL INFORMATION

DANGER

BEFORE OPENING ANY VIKING PUMP LIQUID CHAMBER BE SURE:

1. THAT ANY PRESSURE IN THE CHAMBER HAS BEEN COMPLETELY VENTED THROUGH SUCTION OR DISCHARGE LINES OR OTHER APPROPRIATE OPENINGS OR CONNECTIONS.
2. THAT THE DRIVING MEANS (MOTOR, TURBINE, ENGINE, ETC.) HAS BEEN "LOCKED OUT" OR MADE NON-OPERATIONAL SO THAT IT CANNOT BE STARTED WHILE WORK IS BEING DONE ON PUMP.
3. TO CHECK THE MATERIAL SAFETY DATA SHEET (MSDS) BEFORE WORKING WITH ANY LIQUID, AND READ ALL THE LISTED PROTECTIVE MEASURES.

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



Head - CCW Rotation
FIGURE 3

ROTATION:

See FIGURE 3. Viking 4076/4176 pumps are directional due to the loading groove in the head. If rotation is to be reversed, the head and pin assembly will have to be replaced and pump relief valve must be reversed so adjusting screw cap always points to suction side of pump. Standard rotation is clockwise, as viewed from the shaft end.

PRESSURE RELIEF VALVES:

Relief valves are mounted on the casing.

Pumps not furnished with a relief valve must be provided with some means of pressure protection

(inline pressure relief valve, torque limiting device, or rupture disk).

If pump rotation is to be reversed during operation, pressure protection must be provided on both sides of the pump. See also rotation.

Relief valve adjusting screw cap must always point towards the suction side of the pump.

Pressure relief valves are intended for use as protection for the pump only and should not be used to control pump flow or regulate discharge pressure.

MAINTENANCE

Viking 4076/4176 pumps are designed for long, trouble-free service life under a variety of application conditions with a minimum of maintenance. The following points will help provide long service life.

BUSHINGS: The bushings used in this pump do not require any external source of lubricant.

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

STORAGE: If a new 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 the pump shaft by hand one complete revolution every 30 days to circulate the oil.

SUGGESTED REPAIR TOOLS: The following tools must be available to properly repair Viking Series 4076/4176 pumps. These tools are in addition to standard mechanic's tools such as open end wrenches, pliers, and screw drivers. Most items can be obtained from an industrial supply house.

- Soft headed hammer
- Allen wrenches
- Bearing Locknut spanner wrench
- (Source: #472 J.H. Williams & Co. or equal)
- Spanner wrench, adjustable pin type for use on bearing housing end cap.
- (Source: #482 J.H. Williams & Co. or equal)
- Brass bar or wood block
- Arbor Press

DANGER

BEFORE OPENING ANY VIKING PUMP LIQUID CHAMBER BE SURE:

THAT ANY PRESSURE IN THE CHAMBER HAS BEEN COMPLETELY VENTED THROUGH SUCTION OR DISCHARGE LINES OR OTHER APPROPRIATE OPENINGS OR CONNECTIONS.

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.

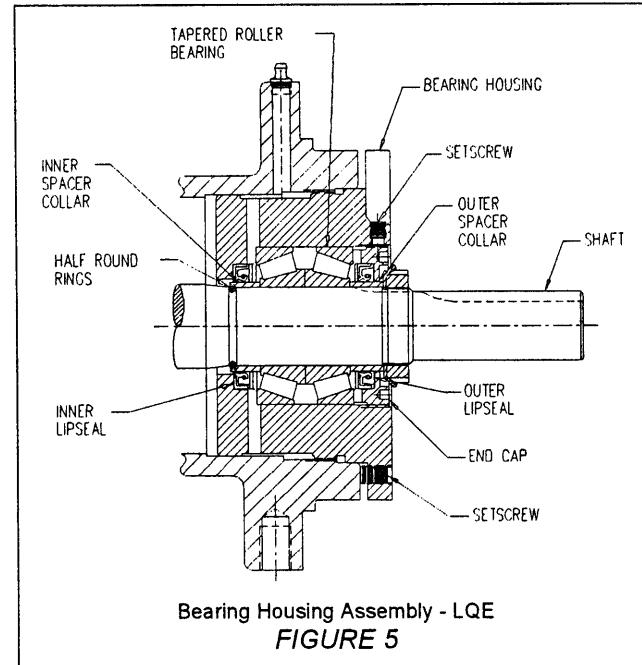
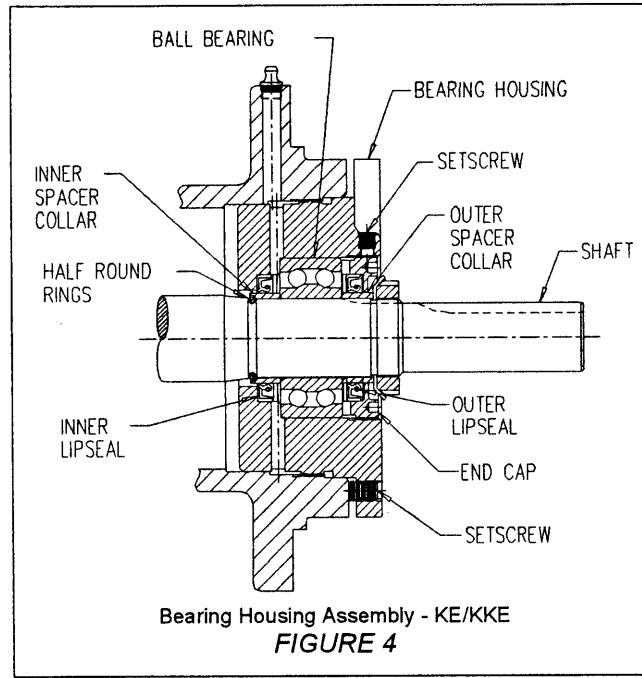
TO CHECK THE MATERIAL SAFETY DATA SHEET (MSDS) BEFORE WORKING WITH ANY LIQUID, AND READ ALL THE LISTED PROTECTIVE MEASURES.

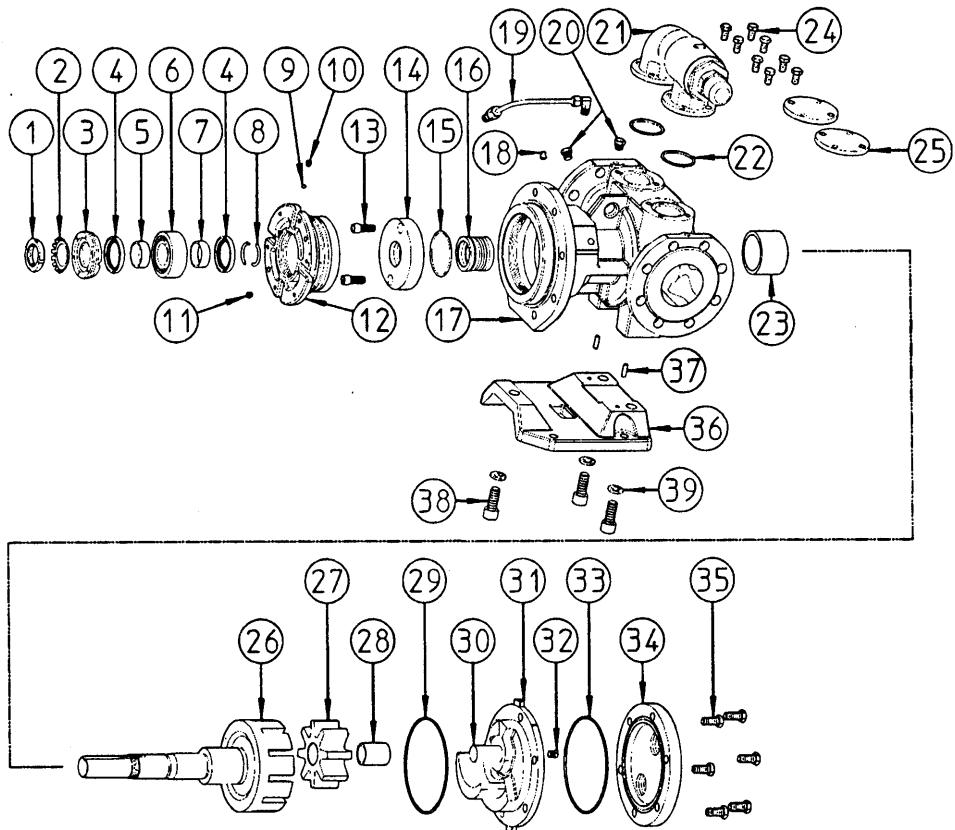
FAILURE TO FOLLOW THE ABOVE LISTED PRECAUTIONARY MEASURES MAY RESULT IN SERIOUS INJURY OR DEATH.

DISASSEMBLY

1. Remove head capscrews. Remove the head of the pump. *Do not allow the idler to fall from the idler pin.* To prevent this, tilt the top of the head back when removing. Avoid damaging the head o-ring. If the pump is furnished with a jacketed head plate, it will separate from the head when it is removed. Avoid damaging the jacketed head plate o-ring.
2. Remove the idler and bushing assembly.
3. Insert a length of hardwood or brass through the port opening between the rotor teeth to keep the shaft from turning. Straighten out the lock washer tab, and with a spanner wrench remove the locknut and lock washer from the shaft. Remove the length of hardwood or brass from the port opening.
4. Loosen the two setscrews in the face of the bearing housing, and remove the bearing housing assembly from the bracket. See FIGURE 4.
5. Remove the pair of half round rings under the inner spacer collar from the shaft.
6. Remove the rotor/shaft assembly, being careful to avoid damaging the seal faces and casing bushing.

7. Remove the rotating member of the mechanical seal from the shaft only if the seal is to be replaced.
8. Remove the mechanical seal holder plate and stationary member of the mechanical seal. Avoid damaging the seal plate holder o-ring.





Exploded View for Model Viking Series 4076/4176

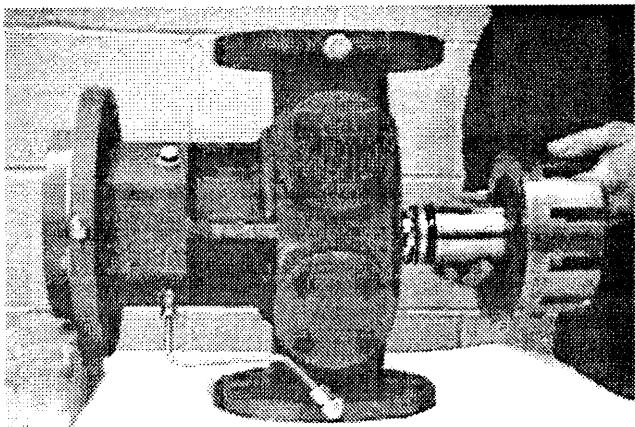
FIGURE 6

MODEL VIKING SERIES 4076/4176 PARTS LIST

ITEM	DESCRIPTION	ITEM	DESCRIPTION
1	Locknut	21	Relief Valve
2	Lockwasher	22	O-ring for Relief Valve/Cover Plates
3	End Cap	23	Bushing (casing)
4	Lip Seal (2 Req'd)	24	Capscrew for Relief Valve/Cover Plates (8 Req'd)
5	Bearing Spacer Collar (Outer)	25	Cover Plates (2 Req'd)
6	Ball Bearing - KE and KKE Roller Bearing - LQE (2 Req'd)	26	Rotor and Shaft Assembly
7	Bearing Spacer Collar (Inner)	27	Idler and Bushing Assembly
8	Half Round Ring (2 Req'd)	28	Bushing (idler)
9	Nylon Slug (2 Req'd)	29	O-ring for Head
10	Setscrew, M8-1.25 x 8 mm (2 Req'd)	30	Pin, lube
11	Setscrew, M10-1.5 x 14 mm (2 Req'd)	31	Head and Lube Idler Pin
12	Bearing Housing	32	Pipe Plug Hex Head $\frac{1}{4}$ " BSP
13	Capscrews for Seal Plate (2 Req'd)	33	O-ring for Jacket Head Plate
14	Mechanical Seal Plate	34	Jacketed Head Plate
15	O-ring for Seal Plate	35	Capscrews, Head
16	Mechanical Seal	36	Foot (4176 Models Only)
17	Casing and Bushing Assembly	37	Dowel Pins (4176 Models Only)
18	Grease Fitting $\frac{1}{8}$ " NPT	38	Capscrews for Foot (4176 Models Only)
19	Flush Line Assembly	39	Lockwashers for Foot (4176 Models Only)
20	Pipe Plug $\frac{1}{4}$ " BSP Hex Head (2 Req'd)	not illus.	Pipe Flange Gasket (2 Req'd)

TABLE 2

ASSEMBLY



Rotor Installation
FIGURE 7

NOTE: To facilitate assembly, place the pump casing so that it is standing on one of its flanges with a block of wood under the mounting flange. See **FIGURE 7**.

1. Install the casing bushing. See "INSTALLATION OF CARBON GRAPHITE BUSHINGS" on page 6
2. See **FIGURE 8**, and notes under "MECHANICAL SEAL" on page 6. Install the stationary member of the mechanical seal into the mechanical seal plate. Coat the mechanical seal plate o-ring with oil or grease to keep it in place and install the mechanical seal holder plate into the shaft end of the casing.
3. Apply a coating of light oil onto the shaft in the seal area, then install the rotating member of the mechanical seal onto the rotor/shaft assembly.
4. Slide the rotor/shaft assembly into the casing, taking care not to damage the bushing or the seal faces.

NOTE: When installing a new rotor/shaft assembly, use a file to carefully remove all burrs and sharp edges.

5. Coat the head o-ring with oil or grease and slip it over the head pilot to keep it in place. Apply a coating of light oil onto the bushing ID and the crescent. Place the idler/bushing assembly onto the idler pin.

NOTE: When installing a new head/pin assembly, use a file to carefully remove all burrs and sharp edges, especially around the loading groove.

6. Install the head. For proper head positioning, the pin should be at the top centered between the two ports. If the pump is equipped with a jacketed head plate, install at this time. Tighten cap-screws evenly.

Refer to **FIGURE 4** and **FIGURE 5** for bearing housing assembly.

7. Install the closure in the bearing housing (See the appropriate figure for lip orientation).
8. KE and KKE PUMPS: Pack the ball bearing with grease and push or press the bearing into the bearing housing. See **FIGURE 3** on page 2.

LQE PUMPS: Pack tapered roller bearings with grease and press or push bearings into housing with large end of inner races together. It is possible to install bearings incorrectly. For proper assembly (See **FIGURE 5** on page 3).
9. Install the closure in the end cap (See the appropriate figure for lip orientation). Thread the end cap into the bearing housing along with outer bearing spacer collar and tighten against the bearing.

LQE PUMPS ONLY: Tapered roller bearings require preload to operate properly. To set preload tighten end cap so that inner races of bearings cannot be rotated by hand. Back the end cap off to allow inner races to rotate with slight resistance.

Lock end cap in place with two set screws in the flange of the bearing housing.
10. Slide inner spacer collar over shaft with recessed end facing rotor.

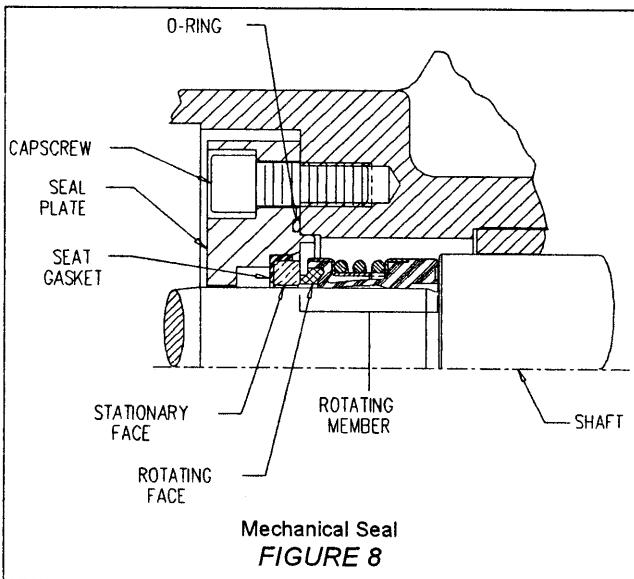
Place pair of half round rings on shaft and slide inner bearing spacer collar over half round rings to lock them in place.
11. Thread the bearing housing with closures, end cap, outer bearing spacer collar and bearings installed into bracket. Make sure inner spacer collar keeps split rings locked in place.
12. Insert a length of hardwood or brass through the port opening between the rotor teeth to keep the shaft from turning. Put the lock washer and locknut on the shaft and tighten 100 – 200 N•m and bend one tang of the lock washer into a slot of the locknut.
13. Adjust the pump end clearance as instructed in "THRUST BEARING ADJUSTMENT" on page 6.
14. Lubricate all grease fittings with multi-purpose grease, NLGI #2.

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.

MECHANICAL SEAL



For disassembly see "DISASSEMBLY" on page 3

For assembly see "ASSEMBLY" on page 5.

NOTE: Never touch the mechanical seal faces with anything except clean hands or clean cloth. Minute particles can scratch the seal faces and cause leakage.

Always clean the rotor shaft and seal housing bore. Make sure they are free of dirt, grit and scratches.

There are two available mechanical seals. The standard, shown in FIGURE 8, is for applications pumping liquids with viscosities up to 3,500 SSU. There is also a "pin style" seal available with the stationary face pinned to the seal plate for applications pumping liquids with viscosities up to 10,000 SSU.

THRUST BEARING ADJUSTMENT

See FIGURE 4 on page 3.

1. Loosen the two set screws in the outer face of the bearing housing and turn the thrust bearing assembly clockwise until it can no longer be turned by hand. Back off counter-clockwise until the rotor shaft can be turned by hand with a slight noticeable drag.
2. For standard (.12 mm) end clearance, back off the thrust bearing assembly 30 mm as mea-

sured on the outside diameter of the bearing housing.

3. Tighten the two set screws with equal force against the bracket. End clearances are now set and locked.

NOTE: Be sure the shaft can rotate freely by hand. If not, back off additional length on outside diameter and check again. If there is still some noticeable drag, see "ASSEMBLY" on page 5, reference notes under item 4 and 5.

4. High viscosity liquids require additional end clearances. The amount of extra end clearance depends on the viscosity of the liquid pumped. For specific recommendations, consult your nearest authorized Viking Pump distributor. Each 10 mm turn on the outside diameter of the bearing housing is equivalent to an extra end clearance of (.04 mm).

INSTALLATION OF CARBON GRAPHITE BUSHINGS

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

- A press must be used for installation.
- Be certain the bushing is straight.
- Do not stop the pressing operation until the bushing is in the proper position, starting and stopping will result in a cracked bushing.
- Check the bushing for cracks after installation

INSTALLATION OF FOOT

Series 4176 Pumps come equipped with a removable mounting foot. Removal of the foot is not normally required for maintenance. In cases where the foot needs to be replaced or is being added use the following steps.

1. Insure alignment pins are installed in the top of the foot prior to assembly of the foot to the casing.
2. Match foot to casing by inserting pins into the bottom of the casing.
3. Secure foot to casing using the socket head cap-screws and lock washers. Torque capscrews to 100 – 110 N·m.

PRESSURE RELIEF VALVE INSTRUCTIONS

DANGER

BEFORE OPENING ANY VIKING PUMP LIQUID CHAMBER BE SURE:

1. THAT ANY PRESSURE IN THE CHAMBER HAS BEEN COMPLETELY VENTED THROUGH SUCTION OR DISCHARGE LINES OR OTHER APPROPRIATE OPENINGS OR CONNECTIONS.
2. THAT THE DRIVING MEANS (MOTOR, TURBINE, ENGINE, ETC.) HAS BEEN "LOCKED OUT" OR MADE NON-OPERATIONAL SO THAT IT CANNOT BE STARTED WHILE WORK IS BEING DONE ON PUMP.
3. TO CHECK THE MATERIAL SAFETY DATA SHEET (MSDS) BEFORE WORKING WITH ANY LIQUID, AND READ ALL THE LISTED PROTECTIVE MEASURES.

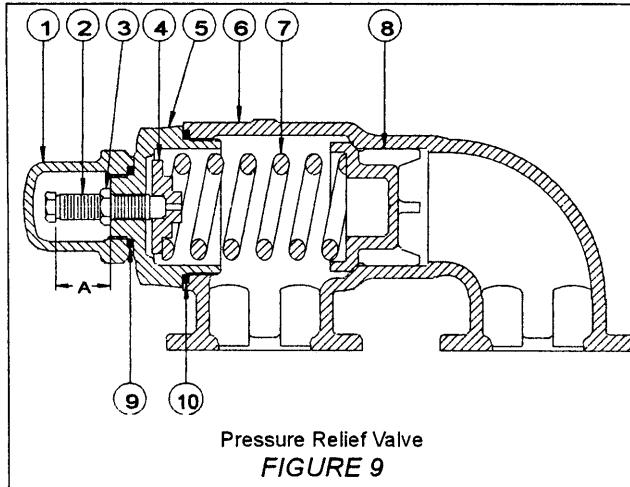
FAILURE TO FOLLOW THE ABOVE LISTED PRECAUTIONARY MEASURES MAY RESULT IN SERIOUS INJURY OR DEATH.

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

1. Carefully remove the valve cap that covers the adjusting screw.
2. Loosen the locknut that locks the adjusting screw so the pressure setting will not change during operation of the pump.
3. Install a pressure gauge in the discharge line for actual adjustment operation.
4. Turn the adjusting screw in to increase the pressure, and out to decrease the pressure.
5. With the discharge line closed at a point beyond the pressure gauge, the gauge will show the maximum pressure that the valve will allow while the pump is in operation.

IMPORTANT

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



Relief Valve Parts List

ITEM	DESCRIPTION	ITEM	DESCRIPTION
1.	Valve Cap	6.	Valve Body
2.	Adjusting Screw	7.	Valve Spring
3.	Locknut	8.	Poppet
4.	Spring Guide	9.	Cap Gasket
5.	Bonnet	10.	Bonnet Gasket

TABLE 3



WARRANTY

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

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

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

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

Viking® - Registered trademark of Viking Pump, Inc.



TECHNICAL SERVICE MANUAL

INDUSTRIAL HEAVY DUTY MOTOR SPEED PUMPS
SERIES 4076 AND 4176
SIZES HLE, ATE AND ALE

SECTION TSM 710.1
PAGE 1 of 8
ISSUE A

CONTENTS

INTRODUCTION	1
SAFETY INFORMATION	1
SPECIAL INFORMATION	2
ROTATION:	2
PRESSURE RELIEF VALVES:	2
MAINTENANCE	2
LUBRICATION	2
CLEANING THE PUMP:	2
STORAGE:	2
SUGGESTED REPAIR TOOLS:	2
DISASSEMBLY	3
ASSEMBLY	3
MECHANICAL SEAL	5
THRUST BEARING ADJUSTMENT	5
INSTALLATION OF CARBON GRAPHITE BUSHINGS	6
INSTALLATION OF FOOT	6
PRESSURE RELIEF VALVE INSTRUCTIONS	6
RELIEF VALVE PRESSURE ADJUSTMENT:	6

INTRODUCTION

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

This manual deals only with Viking 4076/4176 pumps. Specifications and recommendations are listed in Catalog Section 710.

MODEL NUMBER CHART

UNMOUNTED PUMPS		UNITS
FLANGE MOUNTED	FOOT MOUNTED	Units are designated by the unmounted pump model numbers followed by a letter(s) indicating drive style.
HLE4076	HLE4176	
ATE4076	ATE4176	M - Horizontal with bracket D - Direct Drive R - Viking Reducer Drive P - Commercial Reducer Drive
ALE4076	ALE4176	

TABLE 1



Model HLE4176 (Shown with relief valve on pump casing and foot mounting)

FIGURE 1



Model ALE 4076 (Shown with relief valve on pump casing and flange mounting - M Drive)

FIGURE 2



SPECIAL INFORMATION

DANGER

BEFORE OPENING ANY VIKING PUMP LIQUID CHAMBER BE SURE:

1. THAT ANY PRESSURE IN THE CHAMBER HAS BEEN COMPLETELY VENTED THROUGH SUCTION OR DISCHARGE LINES OR OTHER APPROPRIATE OPENINGS OR CONNECTIONS.
2. THAT THE DRIVING MEANS (MOTOR, TURBINE, ENGINE, ETC.) HAS BEEN "LOCKED OUT" OR MADE NON-OPERATIONAL SO THAT IT CANNOT BE STARTED WHILE WORK IS BEING DONE ON THE PUMP.
3. TO CHECK THE MATERIAL SAFETY DATA SHEET (MSDS) BEFORE WORKING WITH ANY LIQUID AND FOLLOW ALL THE LISTED PROTECTIVE MEASURES.

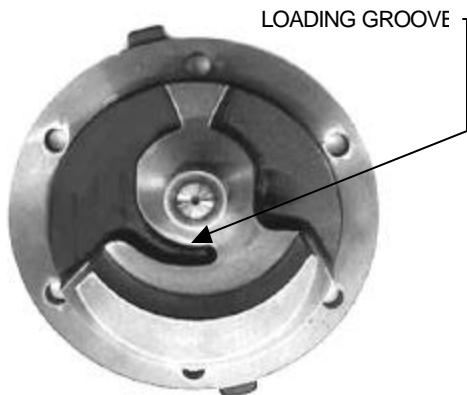
FAILURE TO FOLLOW THE ABOVE LISTED PRECAUTIONARY MEASURES MAY RESULT IN SERIOUS INJURY OR DEATH.

ROTATION:

See FIGURE 3. Viking 4076/4176 pumps are directional due to the loading groove in the head. Standard rotation is clockwise as viewed from the shaft end.

If rotation is to be reversed, the following items need to be changed:

- The head and pin assembly must be replaced.
- Position of the relief valve will have to be changed. Install so the adjusting screw cap points towards the suction side of the pump.
- The flush line must be switched to the opposite port.



(Counter Clockwise Rotation Shown)
FIGURE 3

PRESSURE RELIEF VALVES:

Viking pumps are positive displacement pumps and must be provided with some form 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.

Pumps equipped with relief valves have them mounted on the casing.

If pump rotation is reversed during operation, pressure protection must be provided on both the sides of the pump. The relief valve adjusting screw cap must always point towards the pump suction port.

Pressure relief valves are intended for use as a protection for the pump only and should not be used to control pump flow or regulate discharge pressure.

MAINTENANCE

Viking 4076/4176 pumps are designed for long, trouble-free service life under a variety of application conditions with a minimum of maintenance. The following points will help provide long service life.

LUBRICATION:

External lubrication must be applied slowly with a hand gun to the lubrication fitting every 500 hours of operation with multi-purpose grease, NLGI #2. Do not over-grease. Applications involving very high or low temperatures will require other types of lubrication. Refer to Engineering Service Bulletin ESB-515. Consult factory with specific lubrication questions.

Note that the bushings used in this pump do not require any external lubrication.

CLEANING THE PUMP:

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

STORAGE

If pump is to be stored, or not used for six months or more, pump must be drained and a light coat of 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.

SUGGESTED REPAIR TOOLS:

The following tools must be available to properly repair Viking series 4076/4176 pumps. These tools are in addition to standard mechanics tools such as open end wrenches, pliers and screw drivers. Most items can be obtained from an industrial supply house.

- Soft headed hammer
- Allen wrenches
- Bearing locknut spanner wrench
(Source: #472 J.H. Williams & Co. or equal)
- Spanner wrench, adjustable pin type for use on bearing housing end cap
(Source: J.H. Williams & Co. #482 or equal)
- Brass bar or wood block
- Arbor press

DANGER

BEFORE OPENING ANY VIKING PUMP LIQUID CHAMBER BE SURE:

1. THAT ANY PRESSURE IN THE CHAMBER HAS BEEN COMPLETELY VENTED THROUGH SUCTION OR DISCHARGE LINES OR OTHER APPROPRIATE OPENINGS OR CONNECTIONS.
2. THAT THE DRIVING MEANS (MOTOR, TURBINE, ENGINE, ETC.) HAS BEEN "LOCKED OUT" OR MADE NON-OPERATIONAL SO THAT IT CANNOT BE STARTED WHILE WORK IS BEING DONE ON THE PUMP.
3. TO CHECK THE MATERIAL SAFETY DATA SHEET (MSDS) BEFORE WORKING WITH ANY LIQUID AND FOLLOW ALL THE LISTED PROTECTIVE MEASURES.

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

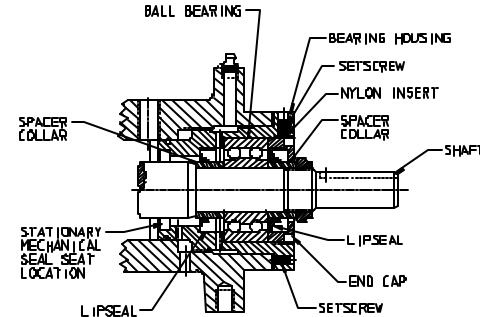


FIGURE 4

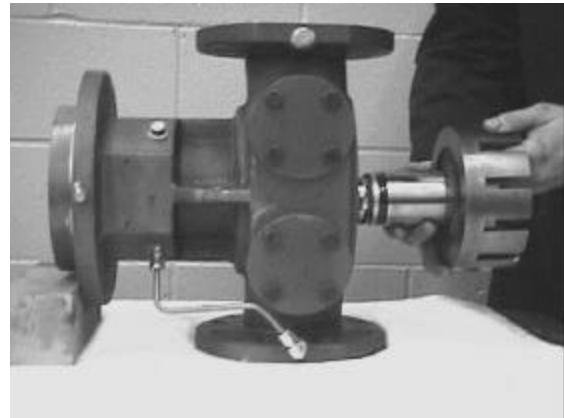


FIGURE 5

DISASSEMBLY

1. Remove head capscrews. Remove the head of the pump. *Do not allow the idler to fall from the idler pin.* To prevent this from happening, tilt the top of the head back when removing. Avoid damaging the head o-ring. If the pump is furnished with a jacketed head plate, it will separate from the head when capscrews are removed. Avoid damaging the jacketed head plate o-ring.
2. Remove the idler and bushing assembly.
3. Insert a length of hardwood or brass through either port opening between the rotor teeth to keep the shaft from turning. Remove the lock nut using a standard open end wrench.
4. Loosen the two setscrews in the face of the bearing housing and unthread the bearing housing assembly from the bracket. The end of the bearing housing contains the mechanical seal seat. Avoid damaging this surface. See FIGURE 4.
5. Remove the rotor and shaft assembly being careful to avoid damaging the mechanical seal face and casing bushing.
6. Remove the rotating member of the mechanical seal from the shaft only if the seal is to be replaced.

ASSEMBLY

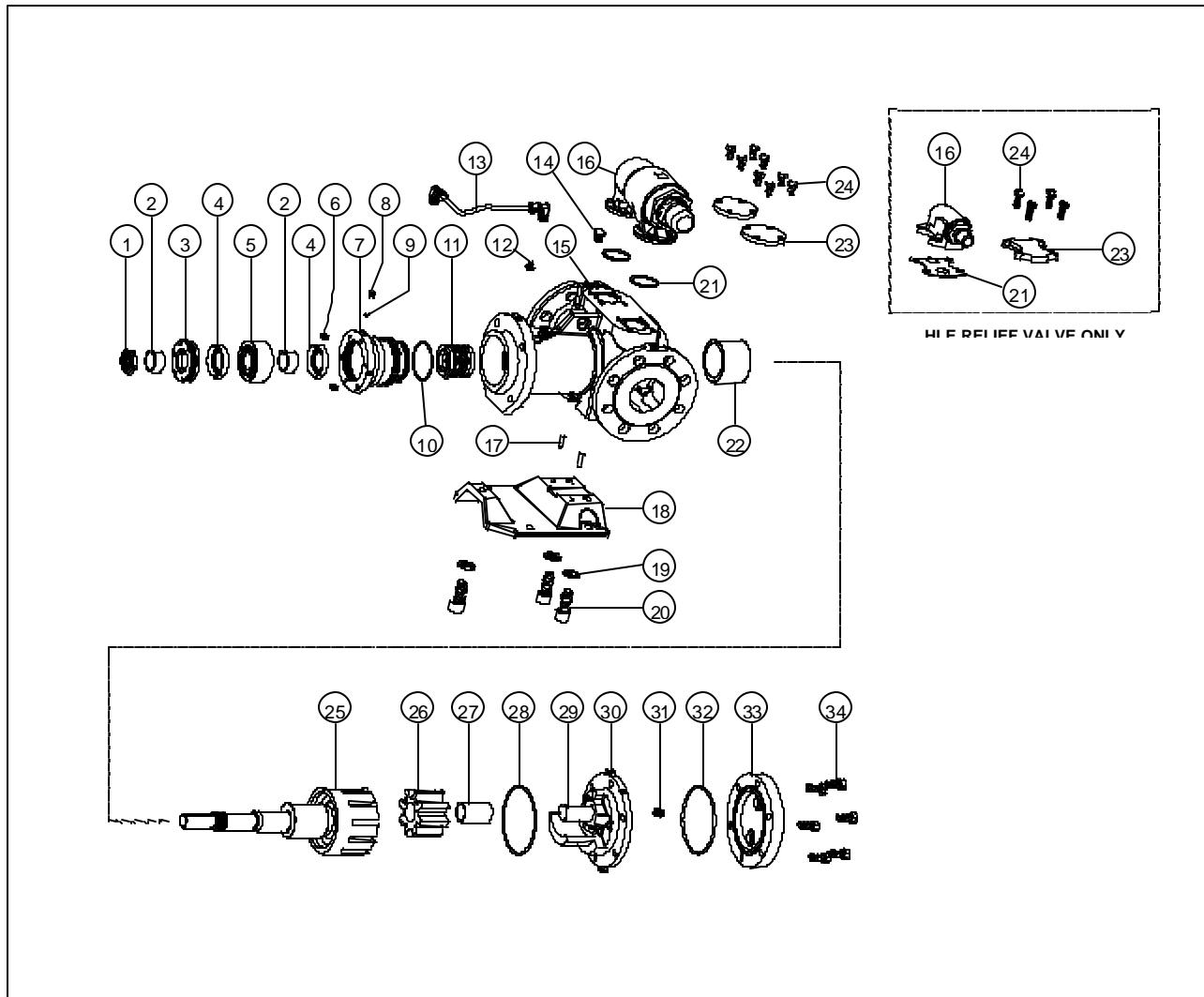
NOTE: To facilitate assembly, place the pump casing so that it is standing on one of its flanges with a block of wood under the mounting flange. See FIGURE 5.

1. Install the casing bushing. See "INSTALLATION OF CARBON GRAPHITE BUSHINGS" on page 6.
2. Apply a light coating of oil onto the shaft in the seal area. Install the rotating member of the mechanical seal onto the rotor and shaft assembly. Slide the seal all the way to the shoulder on the shaft.
3. Slide the rotor and shaft assembly into the casing, taking care not to damage the bushing or the mechanical seal face.

NOTE: When installing a new rotor and shaft assembly, use a file to carefully remove all burrs and sharp edges.

4. Coat the head o-ring with oil or grease and slip it over the head pilot to keep it in place. Apply a coating of light oil onto the bushing inside diameter and the crescent. Place the idler and bushing assembly onto the idler pin.

NOTE: When installing a new head and pin assembly, use a file to carefully remove all burrs and sharp edges, especially around the loading groove.



Exploded View of Viking Series 4076/4176 Pumps
FIGURE 6

VIKING SERIES 4076/4176 PARTS LIST

ITEM	DESCRIPTION	ITEM	DESCRIPTION
1	Locknut	19	Lockwashers for Foot (4176 Series Only)
2	Bearing Spacer Collar (2 Req'd)	20	Capscrews for Foot (4176 Series Only)
3	End Cap	21	Relief Valve Gasket (2 Req'd on ATE & ALE)
4	Lip Seal (2 Req'd)	22	Bushing, Casing
5	Ball Bearing	23	Cover Plate (Pumps Less Valve, 2 Req'd on ATE & ALE)
6	Setscrew (2 Req'd)	24	Capscrews for Relief Valve or Cover Plate
7	Bearing Housing	25	Rotor and Shaft Assembly
8	Setscrew (2 Req'd)	26	Idler and Bushing Assembly
9	Nylon Insert (2Req'd)	27	Bushing, Idler
10	O-Ring For Seal Seat	28	O-ring for Head
11	Mechanical Seal	29	Idler Pin
12	Grease Fitting	30	Head and Lube Idler Pin Assembly
13	Flush Line Assembly	31	Pipe Plug, Hex Head, 1/8" BSP (ALE and ATE)
14	Pipe Plug	32	O-ring for Jacketed Head Plate (Optional)
15	Casing and Bushing Assembly	33	Jacketed Head Plate (Optional)
16	Relief Valve Assembly	34	Capscrews, Head
17	Dowel Pin (2 Req'd 4176 Series Only)	not illus.	Pipe Flange Gasket (2 Req'd)
18	Foot (4176 Series Only)		

TABLE 2

5. Install the head. For proper head positioning, the pin should be at the top *centered* between the two ports. If the pump is equipped with a jacketed head plate, make sure the o-ring is in place and install at this time. Tighten the capscrews evenly.

Refer to FIGURE 4 for bearing housing assembly.

6. Install the lip seal in the bearing housing. See FIGURE 4 for lip orientation.
7. Pack the ball bearing with grease and push or press the bearing into the bearing housing.
8. Install the lip seal in the end cap. See FIGURE 4 for lip orientation. Thread the end cap into the bearing housing along with the outer bearing spacer collar. Tighten the end cap. Lock the end cap in place with two radial setscrews in the flange of the bearing housing.
9. See FIGURE 7 and notes under "MECHANICAL SEAL" on this page. Lubricate the outside diameter of the seat gasket and install the stationary member of the mechanical seal into the end of the bearing housing. Note the shiny side of the seal seat faces out.
10. Slide the inner bearing spacer collar onto the shaft. Thread the bearing housing assembly into the bracket.
11. Insert a length of hardwood or brass through either port opening between the rotor teeth. This will keep the shaft from turning when the lock nut is tightened. Install the lock nut and tighten to 70-95 N·m on HLE pumps and 135-175 N·m on ATE and ALE pumps.
12. Adjust pump end clearance as described in "THRUST BEARING ADJUSTMENT" on this page.
13. Lubricate the grease fitting with multi-purpose grease, NLGI #2.

DANGER

BEFORE STARTING THE PUMP, BE SURE ALL DRIVE EQUIPMENT GUARDS ARE IN PLACE.

FAILURE TO PROPERLY MOUNT GUARDS MAY RESULT IN SERIOUS INJURY OR DEATH.

MECHANICAL SEAL

For disassembly, see "DISASSEMBLY" on page 3.

For assembly, see "ASSEMBLY" on page 3.

NOTE: Never touch the mechanical seal faces with anything except clean hands or a clean cloth. Minute particles can scratch the seal faces and cause leakage.

Always clean the rotor and shaft and seal housing bore before installing the mechanical seal. Make sure surfaces are clean and free of scratches.

There are two available mechanical seals. The standard features a cup type seat. A "pin style" seal is also available that has the seal seat pinned to prevent rotation. This design is used for viscosities higher than 750 cps.

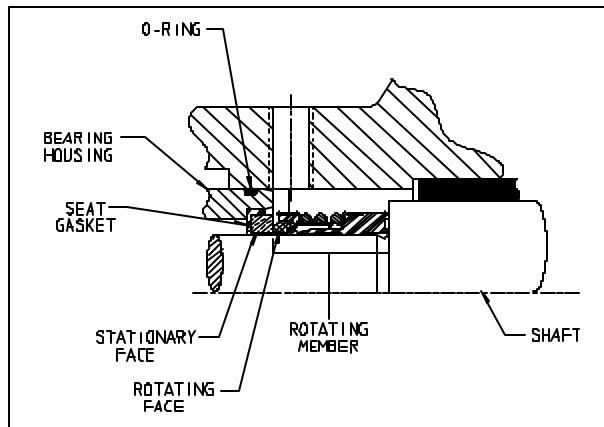


FIGURE 7

THRUST BEARING ADJUSTMENT

See FIGURE 4 on page 3.

1. Loosen the two setscrews in the outer face of the bearing housing and turn the thrust bearing assembly clockwise until it can no longer be turned by hand. Back off counterclockwise until the rotor shaft can be turned by hand with a slight, noticeable drag.
2. For standard end clearance, back off the thrust bearing assembly the required length as measured on the outside diameter of the bearing housing (See Table 3).
3. Tighten the two self locking type "Allen" setscrews in the outboard face of the bearing housing. Tighten each with equal force against the bracket. The pump is now set with standard end clearance.
4. High viscosity liquids require additional end clearances. The amount of extra clearance depends on the viscosity of the liquid pumped. For specific recommendations, consult the factory. Table 3 shows the bearing housing adjustment required for additional end clearance as well as values for standard end clearance.

PUMP SIZE	STANDARD END CLEARANCE (mm)	LENGTH ON OD* (mm) FOR	
		STD.	EACH .025MM ADDITIONAL
HLE	.08	12	4
ATE	.08	15	5
ALE	.08	15	5

* Turn bearing housing CCW this distance to obtain either standard or additional end clearance.

TABLE 3

INSTALLATION OF CARBON GRAPHITE BUSHINGS

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

- A press must be used for installation.
- Be certain the bushing is straight.
- Do not stop the pressing operation until the bushing is in the proper position, starting and stopping will result in a cracked bushing.
- Check the bushing for cracks after installation.

INSTALLATION OF FOOT

Series 4176 pumps come equipped with a removable foot. Removal of the foot is not normally required for maintenance. In cases where the foot needs to be replaced or is being added use the following steps.

1. Insure alignment pins are installed in the top of the foot prior to assembly of the foot to the casing.
2. Match foot to casing by inserting pins into the bottom of the casing.
3. Secure foot to casing using the socket head capscrews and lock washers. Torque capscrews to 100-110 N·m.

PRESSURE RELIEF VALVE INSTRUCTIONS

DANGER

BEFORE OPENING ANY VIKING PUMP LIQUID CHAMBER BE SURE:

1. THAT ANY PRESSURE IN THE CHAMBER HAS BEEN COMPLETELY VENTED THROUGH SUCTION OR DISCHARGE LINES OR OTHER APPROPRIATE OPENINGS OR CONNECTIONS.
4. 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 THE PUMP.
5. TO CHECK THE MATERIAL SAFETY DATA SHEET (MSDS) BEFORE WORKING WITH ANY LIQUID AND FOLLOW ALL THE LISTED PROTECTIVE MEASURES.

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

RELIEF VALVE PRESSURE ADJUSTMENT:

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

1. Carefully remove the valve cap that covers the adjusting screw. Note this cap will most likely contain liquid.
2. Loosen the locknut that keeps the adjusting screw from turning while the pump is in operation.
3. Install a pressure gauge in the discharge line. This will be required for the pressure adjustment operation.
4. Turn the adjusting screw in to increase the pressure and out to decrease the pressure.
5. With the discharge line closed at a point beyond the pressure gauge, the gauge will show the maximum pressure that the valve will allow while the pump is in operation.

IMPORTANT

When ordering parts for a pressure relief valve, always give the model number and serial number of the pump as it appears on the nameplate. Also specify the name of the part(s) wanted. When ordering springs, be sure to give the pressure settings desired.

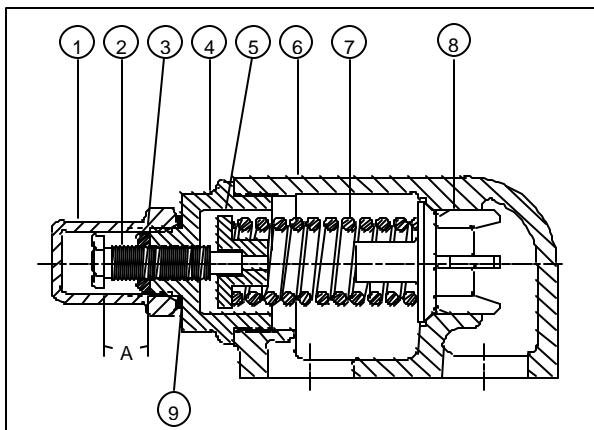


FIGURE 8
Size HLE

LIST OF PARTS

1. Valve Cap	6. Valve Body
2. Adjusting Screw	7. Valve Spring
3. Lock Nut	8. Poppet
4. Bonnet	9. Cap Gasket
5. Spring Guide	

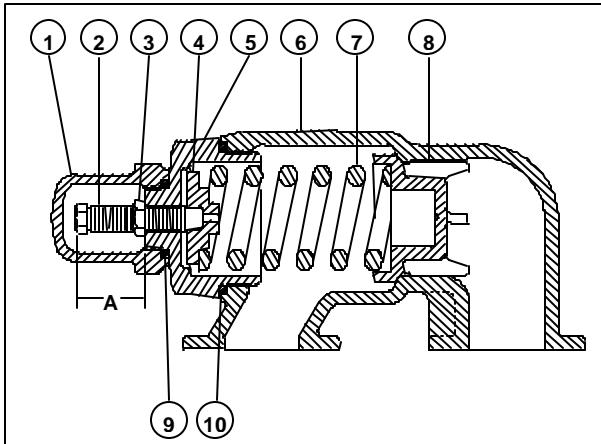


FIGURE 9
Size ATE, ALE

LIST OF PARTS

1. Valve Cap	6. Valve Body
2. Adjusting Screw	7. Valve Spring
3. Lock Nut	8. Poppet
4. Spring Guide	9. Cap Gasket
5. Bonnet	10. Bonnet Gasket



WARRANTY

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

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

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

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

Viking ® - Registered trademark of Viking Pump, Inc.

SECTION TSM 710.1
PAGE 8 of 8
ISSUE A

TECHNICAL SERVICE MANUAL

INDUSTRIAL HEAVY DUTY MOTOR SPEED PUMPS
SERIES 4076 AND 4176
SIZES HLE, ATE AND ALE

**VIKING
PUMP**