



TECHNICAL SERVICE MANUAL

UNIVERSAL SEAL HEAVY DUTY JACKETED PUMPS
 SERIES 124E/EH, 224A/AE/AH, 4224A/AE/AH/B CAST IRON
 SERIES 226A AND 4226A DUCTILE IRON
 SERIES 223A AND 4223A STEEL
 SERIES 227A AND 4227A STAINLESS STEEL
 SIZES H, HL, K, KK, L, LQ, LL

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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 the complete name of the part, part number and material with the model number and serial number of the pump when ordering repair parts. The unmounted pump or pump unit model number and serial number are on the nameplate.

In the Viking model number system, basic size letters are combined with the series number (124E, 124EH, 224A, 4224A, 224AE, 4224AE, 224AH, 4224AH, 4224B, 226A, 4226A, 223A, 4223A, 227A) indicating the basic pump construction material.

This manual deals only with Series 124E, 124EH, 224A, 4224A, 224AE, 4224AE, 224AH, 4224AH, 4224B, 226A, 4226A, 223A, 4223A, 227A, and 4227A Heavy Duty Jacketed Bracket Mounted Pumps. Refer to Figures 1 through 12 for general configuration and nomenclature used in this manual. Pump specifications and recommendations are listed in Catalogue Section 630, Heavy Duty Bracket Mounted Pumps, with Universal Seal Type Bracket.

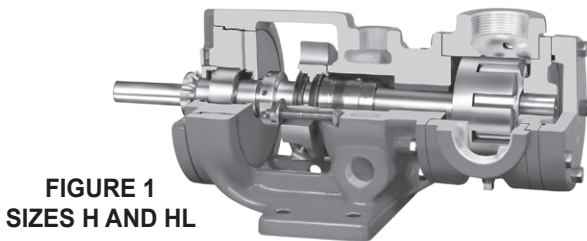


FIGURE 1
SIZES H AND HL

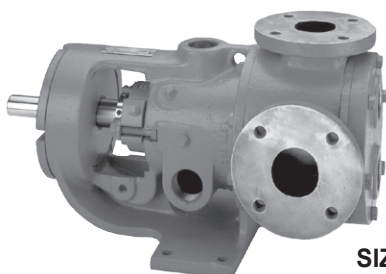


FIGURE 2
SIZES K, KK AND L

UNMOUNTED PUMP		UNITS
PACKED	MECH. SEAL	
H124E H224A	H4224A H4224B	A = Universal Seal Pump B = Universal Seal Pump with mechanical seal behind the rotor
H226A H223A H227A	H4226A H4223A H4227A	AE = Universal Seal Pump with larger rotor shaft E = Universal Seal Pump with electric heating
HL124E HL124EH HL224A	HL4224A HL4224B	EH = High Speed Universal Seal Pump with electric heating
HL224AH HL226A HL223A HL227A	HL4224AH HL4226A HL4223A HL4227A	AH = High Speed Universal Seal Pump Units are designated by the unmounted pump model numbers followed by a letter indicating drive style.
K124E K124EH K224A K224AH	K4224A K4224AH K4224B	V = V-Belt
K226A K223A K227A	K4226A K4223A K4227A	D = Direct Connected R = Viking Speed Reducer P = Commercial Speed Reducer
KK124E KK124EH KK224A KK224AH	KK4224A KK4224AH KK4224B	
KK226A KK223A KK227A	KK4226A KK4223A KK4227A	
L124E L124EH L224A L224AE L224AH	L4224A L4224AE L4224AH L4224B	
L226A	L4226A	
LQ124E LQ124EH LQ224A LQ224AE LQ224AH	LQ4224A LQ4224AE LQ4224AH LQ4224B	
LQ226A LQ223A LQ227A	LQ4226A LQ4223A LQ4227A	
LL124E LL224A LL224AE	LL4224A LL4224AE LL4224B	
LL226A LL223A LL227A	LL4226A LL4223A LL4227A	

SAFETY INFORMATION AND 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.

Symbol Legend :



Danger - Failure to follow the indicated instruction may result in serious injury or death.

WARNING

Warning - In addition to possible serious injury or death, failure to follow the indicated instruction may cause damage to pump and/or other equipment.



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 means (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.

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.



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



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.



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



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.



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 shafts being rotated.



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 Viking Pump's Technical Service Manual TSM 000 and Engineering Service Bulletin ESB-31.

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

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

SPECIAL INFORMATION

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.

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

PRESSURE RELIEF VALVES:

1. Viking pumps are positive displacement pumps and must be provided with some sort of pressure protection. This may be a relief valve mounted directly on the pump, an inline pressure relief valve, a torque limiting device or a rupture disk.
2. There are relief valve options available on those pump models designed to accept a relief valve. Options may include a return to tank relief valve and a jacketed relief valve. Pumps equipped with a jacketed head plate are generally not available with a relief valve.
3. If pump rotation is reversed during operation, pressure protection must be provided on **both** sides of pump.
4. Relief valve adjusting screw cap must **always** point towards suction side of pump. If pump rotation is reversed, remove pressure relief valve and turn end for end.
5. Pressure relief valves cannot be used to control pump flow or regulate discharge pressure.

For additional information on pressure relief valves, Refer to **Technical Service Manual TSM000 and Engineering Service Bulletin ESB-31.**

Jacketing of the bracket and head provide large chambers at both ends of the pumping chamber and around the stuffing box for temperature control of the product in the pump.

SPECIAL MECHANICAL SEALS:

Extra care should be taken in repair of these pumps. Be sure to read and follow all special instructions supplied with your pump.

MAINTENANCE

Series 124E, 124EH, 224A, 4224A, 224AE, 4224AE, 224AH, 4224AH, 4224B, 226A, 4226A, 223A, 4223A, 227A, and 4227A pumps are designed for long, trouble-free service life under a wide variety of application conditions with a minimum of maintenance. The points listed below will help provide long service life.

LUBRICATION: 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. Refer to **Engineering Service Bulletin ESB-515.** Consult factory with specific lubrication questions. Applications involving very high or low temperatures will require other types of lubrication.

PACKING ADJUSTMENT: New packed pumps require initial packing adjustment to control leakage as packing "runs in". Make initial adjustments carefully and do not over-tighten packing gland. After initial adjustment, inspection will reveal need for packing gland adjustment or packing replacement. Refer to instructions under "**Disassembly**" and "**Assembly**", page 7, regarding repacking pump.

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

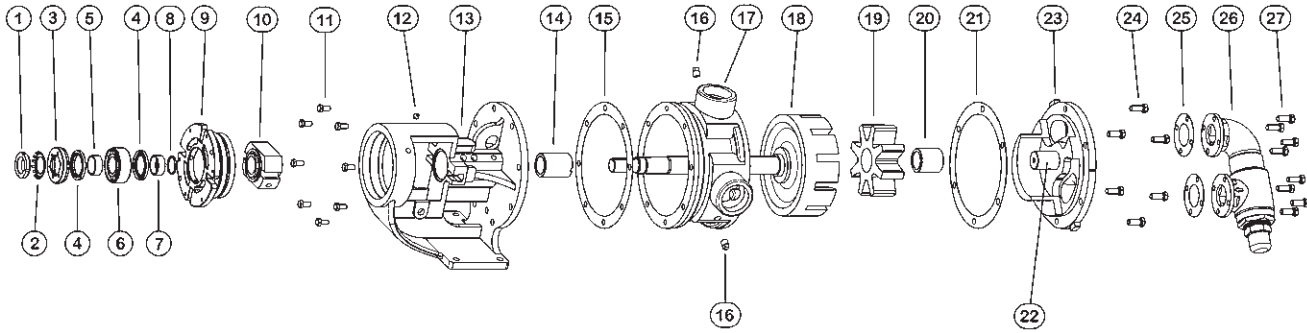
STORAGE: If pump is to be stored, or not used for six months or more, pump must be drained and a light coat of light oil must be applied to all internal pump parts.

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 series 124E, 124EH, 224A, 4224A, 224AE, 4224AE, 224AH, 4224AH, 4224B, 226A, 4226A, 223A, 4223A, 227A, and 4227A pumps. These tools are in addition to standard mechanics' tools such as open-end wrenches, pliers, screwdrivers, etc. Most of the items can be obtained from an industrial supply house.

1. Soft Headed hammer
2. Allen wrenches (some mechanical seals and set collars)
3. Packing hooks, flexible (packed pumps)
4. Mechanical seal installation sleeve
2-751-002-900 for 1.125 inch seal; H-HL pumps.
2-751-003-900 for 1.4375 inch seal; K-LL pumps.
5. Bearing locknut spanner wrench
(Source: #471 J. H. Williams & Co. or equal)
6. Spanner wrench, adjustable pin type for use on bearing housing (Source: #482 J. H. Williams & Co. or equal)
7. Brass bar
8. Arbor press

REPAIR: MODELS H, HL, K, KK, L, LQ AND LL CARTRIDGE MECHANICAL SEAL PUMPS



ITEM	NAME OF PART	ITEM	NAME OF PART	ITEM	NAME OF PART
1	Locknut	10	Cartridge Seal	19	Idler and Bushing Assembly
2	Lockwasher	11	Capscrew for Bracket	20	Idler Bushing
3	End Cap	12	Grease Fitting	21	Head Gasket
4	Lip Seal	13	Bracket and Bushing Assembly	22	Idler Pin
5	Bearing Spacer Collar (Outer)	14	Bracket Bushing	23	Head and Idler Pin Assembly
6	Ball Bearing	15	Bracket Gasket	24	Capscrew for Head
7	Bearing Spacer Collar (Inner)	16	Pipe Plug	25	Relief Valve Gasket
8	Ring, Half Round (Not H, HL)	17	Casing (Tapped or Flanged)	26	Internal Relief Valve
9	Bearing Housing	18	Rotor and Shaft Assembly	27	Capscrew for Valve

EXPLODED VIEW PARTS FOR SERIES 4224A/AE/AH, 4226A, 4223A, AND 4227A MODELS

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.

CARTRIDGE MECHANICAL SEAL REPLACEMENT

MODELS:

H, HL, K, KK, L, LQ, LL4224A, 4224B CAST IRON
 HL, K, KK, L, LQ4224AH CAST IRON
 H, HL, K, KK, L, LQ, LL4226A DUCTILE IRON
 H, HL, K, KK, LQ, LL4223A STEEL
 H, HL, K, KK, LQ, LL4227A STAINLESS STEEL

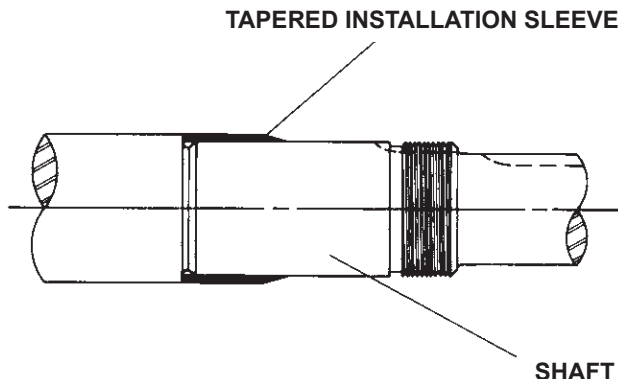
For complete pump disassembly and assembly see pages 7 and 8.

CARTRIDGE MECHANICAL SEAL REMOVAL

1. Bend up tang of lockwasher and with a spanner wrench, remove locknut and lockwasher from shaft.
2. Loosen two set screws in the face of the bearing housing and remove the bearing housing assembly from the bracket.
3. Remove the pair of half round rings under the inner spacer collar from the shaft. There are no half round rings on the "H" and "HL" size pumps.
4. If flush or barrier fluid tubes are connected to the seal gland, disconnect before removing seal. Loosen the set screws on the cartridge seal collar to free the cartridge seal from the shaft. Remove the two gland capscrews and slide cartridge seal out through bearing housing opening.

CARTRIDGE MECHANICAL SEAL INSTALLATION

1. **NOTE:** Burrs left on shaft can damage O-ring on seal sleeve during installation. Inspect shaft for burrs and remove any found with a fine grade of emery cloth.
2. Clean rotor shaft and face of seal chamber.
3. Place tapered installation sleeve on shaft. Coat rotor shaft, tapered installation sleeve, and O-ring in the inside diameter of cartridge seal sleeve with a generous amount of light oil. **Refer to Figure 4.**



COAT ROTOR SHAFT, TAPERED INSTALLATION SLEEVE AND INNER DIAMETER OF MECHANICAL SEAL WITH LIGHT OIL BEFORE ASSEMBLY.

FIGURE 4

4. Slide cartridge seal over installation sleeve on shaft until it contacts the seal chamber face. Remove tapered installation sleeve from shaft.
5. Place pair of half round rings in groove on shaft and turn bearing housing assembly into bracket. There are no half round rings on the "H" and "HL" size pumps.
6. Put lockwasher and locknut on shaft. Tighten locknut and bend one tang of lockwasher into slot of locknut.
7. Adjust pump end clearance as in "**Thrust Bearing Adjustment**", page 10.
8. Insert gland capscrews and secure gland to bracket face. **NOTE:** turn shaft several turns while gland is loose to center seal; then tighten gland tight enough to compress gasket. Tighten only enough to contain leakage and not to distort gland.
9. Lock cartridge seal drive collar to shaft and remove or turn centering clips out of the way so as to clear the drive collar.
10. Turn shaft by hand or jog motor to check drive collar for runout.
11. Connect flush line or vent stuffing box seals without flush line until liquid is present on start up.

NOTE: For maximum seal life, flush line should be used.

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.

ASSEMBLY OPTIONAL MECHANICAL SEAL

MODELS:

H, HL, K, KK, L, LQ, LL4224A, 4224B CAST IRON

HL, K, KK, L, LQ4224AH CAST IRON

L, LQ, LL4224AE CAST IRON

H, HL, K, KK, L, LQ, LL4226A DUCTILE IRON

H, HL, K, KK, LQ, LL4223A STEEL EXTERNALS

H, HL, K, KK, LQ, LL4227A STAINLESS STEEL

This seal type can be installed as an alternate to the cartridge mechanical seal. The seal is setscrew driven, is simple to install and good performance will result if care is taken during installation.

For complete pump disassembly and assembly, **see pages 7 and 8.** For Step 6, disassembly, remove the appropriate nuts, capscrews, seal holder and seal seat. Remove the pipe plug in the bracket and loosen the setscrews holding the mechanical seal rotary member to the shaft. This must be done before the rotor is removed to avoid damage to the seal and the rotor shaft.

The following steps are for mechanical seal assembly.

1. Clean rotor shaft and seal housing bore. Make sure they are free of dirt, grit and scratches. Gently radius leading edge of the shaft diameter over which seal is to be placed.

Never touch mechanical seal faces with anything except clean hands or clean cloth. Minute particles can scratch the seal faces and cause leakage.
2. Place tapered installation sleeve on the shaft. Coat tapered sleeve and inside of the rotary member with a generous quantity of light oil. Grease is not recommended. Start rotary member on shaft and over tapered sleeve. **Refer to Figure 5.**

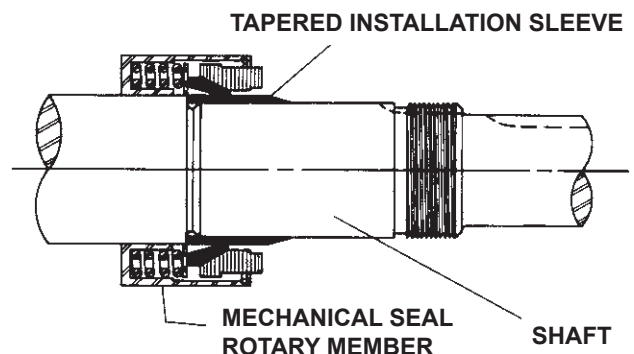


FIGURE 5

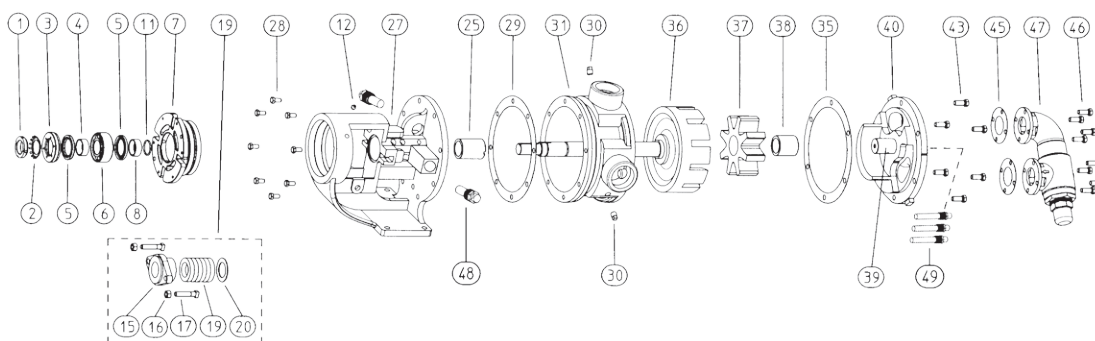
3. Move rotary member so setscrews are directly below seal access holes on side of bracket. Tighten all setscrews securely to shaft. Some seals are equipped with holding clips which compress the seal springs. Remove holding clips to release springs after seal is installed on shaft.
4. **FOR "O-RING" GASKET TYPE MECHANICAL SEAL SEAT:** Lubricate outer diameter of O-Ring seal gasket with oil. Flush sealing faces of both rotary member and seal seat with oil and press seal seat in to bore until back, unlapped face, is flush with bore. Install seal holder, capscrews, and nuts and tighten securely. Remove tapered installation sleeve.

FOR "CLAMPED-IN" TYPE MECHANICAL SEAL SEAT: Flush sealing faces of both rotary member and seal seat with oil and install seal seat and seat gasket over end of shaft against machined bracket face. Install other seal gasket, seal holder, capscrews, and nuts and tighten securely. Remove tapered installation sleeve.

5. Connect flush line or vent stuffing box for seals without flush line until liquid is present on start up.

NOTE: For maximum seal life, flush line should be used.

REPAIR: MODELS H, HL, K, KK, L, LQ AND LL PACKED PUMPS



ITEM	NAME OF PART	ITEM	NAME OF PART	ITEM	NAME OF PART
1	Locknut	16	Packing Gland Nut	36	Rotor and Shaft Assembly
2	Lockwasher	17	Packing Gland Capscrew	37	Idler and Bushing Assembly
3	End Cap	19	Packing	38	Idler Bushing
4	Bearing Spacer Collar (Outer)	20	Packing Retainer Washer	39	Idler Pin
5	Lip Seal	25	Bracket Bushing	40	Head and Idler Pin Assembly
6	Ball Bearing	27	Bracket and Bushing Assembly	43	Capscrew for Head
7	Bearing Housing	28	Capscrew for Bracket	45	Relief Valve Gasket
8	Bearing Spacer Collar (Inner)	29	Bracket Gasket	46	Capscrew for Valve
11	Ring, Half Round (Not H, HL)	30	Pipe Plug	47	Internal Relief Valve
12	Grease Fitting	31	Casing (Tapped or Flanged)	48	Heater Cartridges for Bracket (124E Pumps Only)
15	Packing Gland	35	Head Gasket	49*	Heater Cartridges for Head (124E Pumps Only)

* The number of Heater Cartridges for Head varies by pump size. See Table 2 on Page 13 for the number required by pump size.

EXPLODED VIEW PARTS FOR SERIES 124E/EH, 224A/AE/AH, 223A, 226A, AND 227A MODELS

DISASSEMBLY

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.

1. Mark head and casing before disassembly to insure proper reassembly. The idler pin, which is offset in pump head, must be positioned toward and equal distance between port connections to allow for proper flow of liquid through the pump.

Remove head from pump. Do not allow idler to fall from idler pin. Tilt top of head back when removing to prevent this. Avoid damaging head gasket. If pump is furnished with pressure relief valve, it need not be removed from head or disassembled at this point. **Refer to "Pressure Relief Valve Instructions", page 11.**

If pump has jacketed head plate, it will separate from head when it is removed. The gasket between head and jacket head plate must be totally removed. Use new gasket when assembling pump.

2. Remove idler and bushing assembly.
3. Insert length of hardwood or brass through port opening between rotor teeth to keep shaft from turning. Bend up tang of lockwasher and with a spanner wrench, remove locknut and lockwasher from shaft.
4. Loosen two setscrews in the face of the bearing housing and remove the bearing housing assembly from the bracket. **Refer to Figure 7.**
5. Remove pair of half round rings under the inner spacer collar from the shaft. There are no half round rings on the "H" and "HL" size pumps.

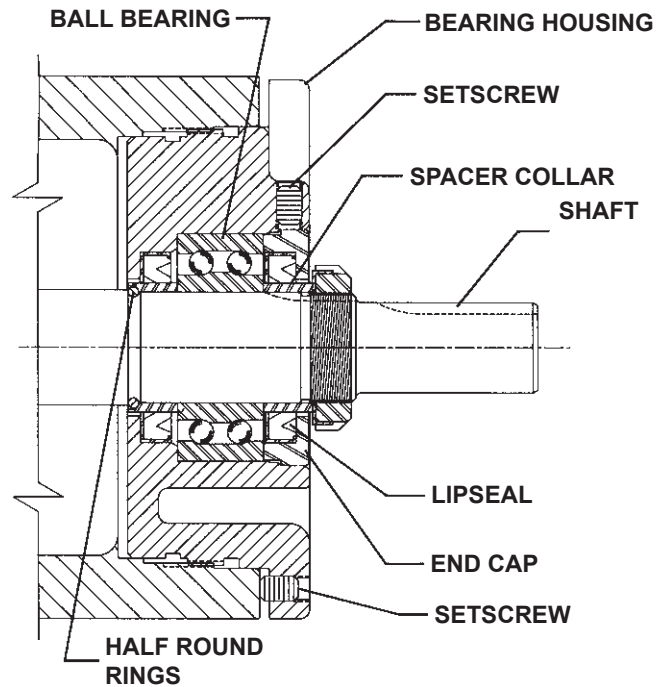


FIGURE 7

6. Remove packing gland capscrews, slide packing gland out of stuffing box, and remove packing.

NOTE: Reference cartridge seal replacement beginning on page 3 when disassembling seal pump.

7. Carefully remove rotor and shaft to avoid damaging bracket bushing.
8. Loosen two radial setscrews in flange of bearing housing and with a spanner wrench remove the outer end cap with closure and outer bearing spacer collar.
9. Remove the double row ball bearing, closure and inner bearing spacer collar from the bearing housing.
10. Clean all parts thoroughly and examine for wear and damage. Check lip seals, ball bearing, bushings, and idler pin and replace if necessary. Check all other parts for nicks, burrs, excessive wear and replace if necessary.

Wash bearings in clean solvent. Blow out bearings with compressed air. Do not allow bearings to spin; turn them slowly by hand. Spinning bearings will damage race and balls. Make sure bearings are clean, then lubricate with light oil and check for roughness. Roughness can be determined by turning outer race by hand.

11. Casing can be checked for wear or damage while mounted on bracket.

ASSEMBLY

1. Install bracket bushing. If bracket bushing has a lubrication groove, install bushing with groove at 6.00 o'clock position in bracket. If carbon graphite, **Refer to "Installation of Carbon Graphite Bushings", page 11.**
2. Coat shaft of rotor shaft assembly with light oil. Start end of shaft in bracket bushing turning from right to left, slowly pushing rotor in casing.

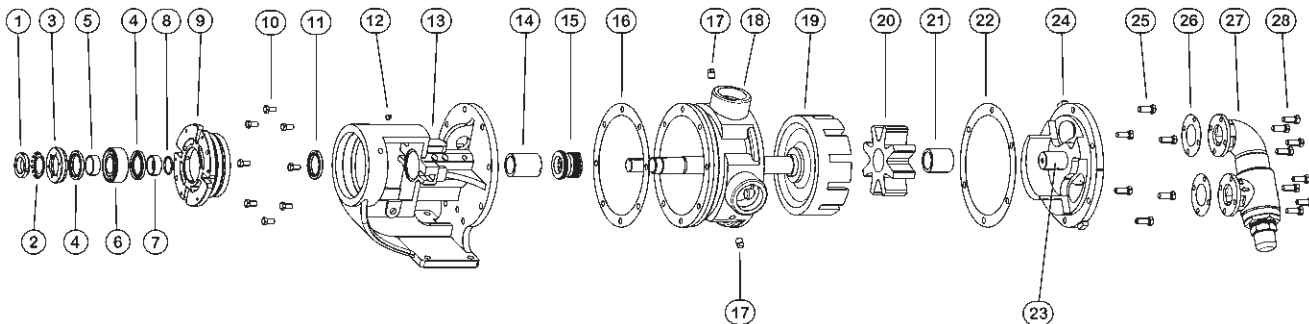
3. Coat idler pin with light oil and place idler and bushing on idler pin in head. If replacing with carbon graphite bushing, Refer to "Installation of Carbon Graphite Bushings", page 11.
4. Using a .010 to .015 inch head gasket, install head and idler assembly on pump. Pump head and casing were marked before disassembly to insure proper reassembly. If not, be sure idler pin, which is offset in pump head, is positioned toward the equal distance between port connections to allow for proper flow of liquid through pump. If pump is equipped with jacketed headplate, install at this time along with new gasket.
Tighten head capscrews evenly.
5. When assembling packed pump, use packing suitable for liquid being pumped. Install packing, staggering the joints from one side of shaft to other. Lubricate packing rings with oil, grease, or graphite to aid assembly. Install packing gland, capscrews, and nuts. Make sure gland is installed square and nuts are tightened evenly. Tighten nuts until packing gland is snug against packing.
6. Slide inner spacer collar over shaft with recessed end facing rotor. H and HL size bearing spacer collars are not recessed.
Place pair of half round rings on shaft and slide inner bearing spacer collar over half round rings to lock them in place. There is no pair of half round rings on the H and HL size pumps.
7. Install the lip seal (lip toward end of shaft) in the bearing housing and turn the bearing housing into the bracket.
8. Pack the ball bearing with grease, place on the shaft and push or drive into place in housing.
9. Install the lipseal (with lip toward end of shaft) and bearing spacer collar in the outer end cap and turn the end cap into the bearing housing until tight against the bearing. Lock in place with two set screws in the flange of the bearing housing.
10. Put lockwasher and locknut on shaft. Insert length of hardwood or brass through port opening between rotor teeth to keep shaft from turning. Tighten locknut to 50-70 ft. – lbs. Torque (H, HL) or 100-130 ft. – lbs. Torque (K, KK, L, LQ, LL). Bend one tang of lockwasher into slot of locknut. If tang does not line up with slot, tighten locknut until it does. Failure to tighten locknut or engage lockwasher tang could result in early bearing failure and cause damage to pump.
Remove length of hardwood or brass from port opening.
11. Adjust pump end clearance as in "Thrust Bearing Adjustment", page 10.
12. 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.

**REPAIR: MODELS H, HL, K, KK, L, LQ AND LL
BEHIND THE ROTOR COMPONENT MECHANICAL SEAL PUMPS**



ITEM	NAME OF PART	ITEM	NAME OF PART	ITEM	NAME OF PART
1	Locknut	11	Lip Seal	21	Idler Bushing
2	Lockwasher	12	Grease Fitting	22	Head Gasket
3	End Cap	13	Bracket and Bushing Assembly	23	Idler Pin
4	Lip Seal	14	Bracket Bushing	24	Head and Idler Pin Assembly
5	Bearing Spacer Collar (Outer)	15	Mechanical Seal	25	Capscrew for Head
6	Ball Bearing	16	Bracket Gasket	26	Relief Valve Gasket
7	Bearing Spacer Collar (Inner)	17	Pipe Plug	27	Internal Relief Valve
8	Ring, Half Round (Not H, HL)	18	Casing (Tapped or Flanged)	28	Capscrew for Relief Valve
9	Bearing Housing	19	Rotor and Shaft		
10	Capscrew for Bracket	20	Idler and Bushing Assembly		

FIGURE 8 - EXPLODED VIEW SERIES 4224B MODELS

DISASSEMBLY

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.

1. Mark head and casing before disassembly to insure proper reassembly. The idler pin, which is offset in pump head, must be positioned toward and equal distance between port connections to allow for proper flow of liquid through the pump.

Remove head from pump. Do not allow idler to fall from idler pin. Tilt top of head back when removing to prevent this. Avoid damaging head gasket. If pump is furnished with pressure relief valve, it need not be removed from head or disassembled at this point. **Refer to "Pressure Relief Valve Instructions", page 11.**

If pump has jacketed head plate, it will separate from head when it is removed. The gasket between head and jacket head plate must be totally removed. Use new gasket when assembling pump.

2. Remove idler and bushing assembly.
3. Insert length of hardwood or brass through port opening between rotor teeth to keep shaft from turning. Bend up tang of lockwasher and with a spanner wrench, remove locknut and lockwasher from shaft.
4. Loosen two setscrews in the face of the bearing housing and remove the bearing housing assembly from the bracket. **Refer to Figure 9.**
5. Remove pair of half round rings under the inner spacer collar from the shaft. There are no half round rings on the "H" and "HL" size pumps.
6. Carefully remove rotor and shaft to avoid damaging bracket bushing.

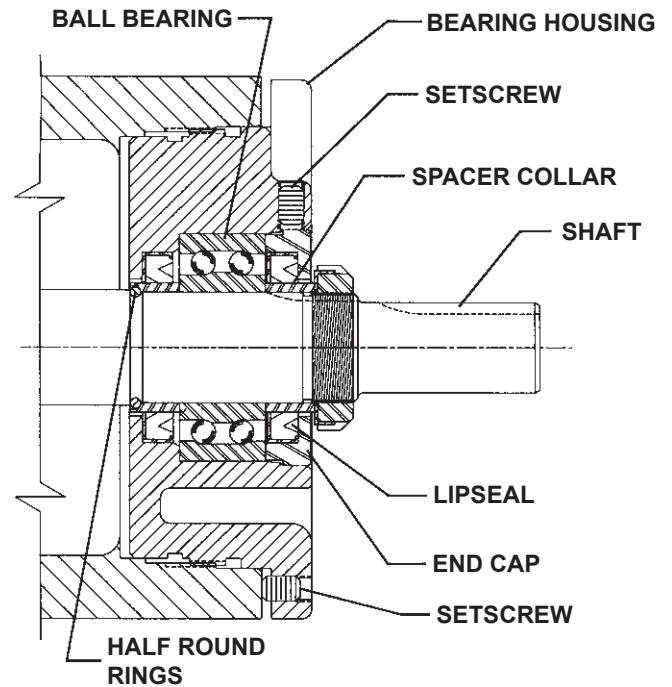


FIGURE 9

7. Loosen two radial setscrews in flange of bearing housing and with a spanner wrench remove the outer end cap with closure and outer bearing spacer collar.
8. Remove the double row ball bearing, closure and inner bearing spacer collar from the bearing housing.
9. Remove the rotary member of the mechanical seal from the rotor shaft. Remove the seal seat from the bracket.
10. Clean all parts thoroughly and examine for wear and damage. Check lip seals, ball bearing, bushings, and idler pin and replace if necessary. Check all other parts for nicks, burrs, excessive wear and replace if necessary.

Wash bearings in clean solvent. Blow out bearings with compressed air. Do not allow bearings to spin; turn them slowly by hand. Spinning bearings will damage race and balls. Make sure bearings are clean, then lubricate with light oil and check for roughness. Roughness can be determined by turning outer race by hand.
11. Casing can be checked for wear or damage while mounted on bracket.

ASSEMBLY

1. Install bracket bushing. If bracket bushing has a lubrication groove, install bushing with groove at 6.00 o'clock position in bracket. If carbon graphite, **Refer to "Installation of Carbon Graphite Bushings", page 11.** Make sure slots in the face of the bushing are towards rotor end of the bracket.
2. Clean rotor shaft and seal housing bore. Make sure they are free of dirt, grit and scratches. Gently radius leading edge of shaft diameter over which seal is to be placed.

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

- Place tapered installation sleeve on the shaft. Coat tapered sleeve and inside of the rotary member with a generous quantity of light oil. Grease is not recommended. Start rotary member on shaft and over tapered sleeve. Refer to Figure 10.

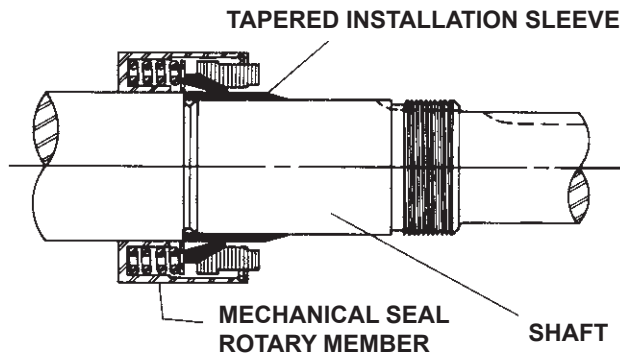


FIGURE 10

- Move rotary member all the way on the rotor shaft until it is against the rotor hub. If the seal uses setscrews to secure the seal to the shaft, tighten the setsecrews once the seal is in place. Some PTFE seals are equipped with holding clips which compress the seal springs. Remove holding clips to release springs after seal is installed on shaft.
- Lubricate outer diameter of seal seat gasket with oil. Press seal seat into bore until back, unlapped face bottoms in bore. Make sure the seat anti-rotation pins are aligned with slots in the bracket bushing.
- Coat rotor shaft and face of mechanical seal with light oil. Start end of shaft in bracket bushing turning from right to left, slowly pushing rotor in casing.
- Coat idler pin with light oil and place idler and bushing on idler pin in head. If replacing with carbon graphite bushing, Refer to "Installation of Carbon Graphite Bushings", page 11.
- Using a .010 to .015 inch head gasket, install head and idler assembly on pump. Pump head and casing were marked before disassembly to insure proper reassembly. If not, be sure idler pin, which is offset in pump head, is positioned toward the equal distance between port connections to allow for proper flow of liquid through pump. If pump is equipped with jacketed headplate, install at this time along with new gasket.
- Tighten head capscrews evenly.
- Slide inner spacer collar over shaft with recessed end facing rotor. H and HL size bearing spacer collars are not recessed.
Place pair of half round rings on shaft and slide inner bearing spacer collar over half round rings to lock them in place. There is no pair of half round rings on the H and HL size pumps.
- Install the lip seal (lip toward end of shaft) in the bearing housing and turn the bearing housing into the bracket.
- Pack the ball bearing with grease, place on the shaft and push or drive into place in housing.
- Install the lipseal (with lip toward end of shaft) and bearing spacer collar in the outer end cap and turn the

end cap into the bearing housing until tight against the bearing. Lock in place with two set screws in the flange of the bearing housing.

- Put lockwasher and locknut on shaft. Insert length of hardwood or brass through port opening between rotor teeth to keep shaft from turning. Tighten locknut to 50-70 ft.- lbs. Torque (H, HL) or 100-130 ft. - lbs. Torque (K, KK, L, LQ, LL) . Bend one tang of lockwasher into slot of locknut. If tang does not line up with slot, tighten locknut until it does. Failure to tighten locknut or engage lockwasher tang could result in early bearing failure and cause damage to pump.

Remove length of hardwood or brass from port opening.

THRUST BEARING ADJUSTMENT SIZE H, HL, K, KK, L, LQ, LL PUMPS

- Loosen the two set screws in the outer face of the bearing housing and turn this 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.
- For standard end clearance, back off the thrust bearing assembly the required length measured on the outside diameter of the bearing housing. See Table 1.
- Tighten the two self-locking type "Allen" set screws, in the outboard face of the bearing housing, with equal force against the bracket. Your pump is now set with standard end clearances and locked.

NOTE: Be sure the shaft can rotate freely. If not, back off additional length on outside diameter and check again.

PUMP SIZE	MODEL	STANDARD END CLEARANCE (Inch)	TURN BRG. HOUSING C.C.W. LENGTH ON O.D. (Inch)	ADDITIONAL LENGTH ON O.D. BRG. HOUSING FOR .001" END CL. (Inch)
H HL	224A/AH 4224A/B/AH 124E/EH 226A 4226A 223A 4223A	0.007	1.5	.22
	227A 4227A	0.013	2.875	
K, KK L, LQ LL	224A/AH/AE 4224A/AE/B/AH 124E/EH 226A 4226A 223A 4223A	0.010	2.5	.25
	227A 4227A	0.018	4.5	

TABLE 1

- High viscosity liquids required additional end clearances. The amount of extra end clearance depends on the viscosity of the liquid pumped. For specific recommendations, consult the factory. Each additional 1/4" turn on the outside diameter of the bearing housing is equivalent to an extra end clearance of .001".

INSTALLATION OF CARBON GRAPHITE BUSHINGS

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

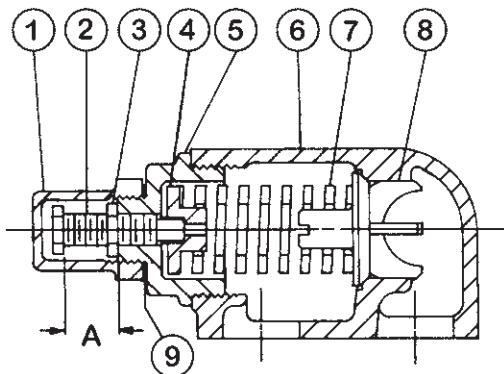
- A press must be used for installation.
- Be certain bushing is started straight.
- Do not stop pressing operation until bushing is in proper position. Starting and stopping will result in a cracked bushing.
- Check bushing for cracks after installation.

Carbon graphite bushings with extra interference fits are frequently furnished for high temperature operation. These bushings must be installed by a shrink fit.

- Heat bracket for idler to 750°F.
- Install cool bushing with a press.
- If facilities are not available to reach 750°F. temperature, it is possible to install with 450°F. temperature; however the lower the temperature the greater the possibility of cracking the bushing.

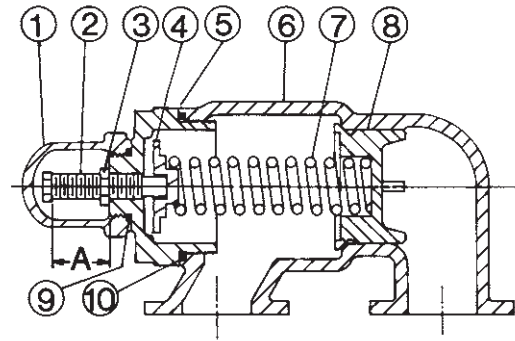
Consult factory with specific questions on high temperature applications. Refer to Engineering Service Bulletin ESB-3.

PRESSURE RELIEF VALVE INSTRUCTIONS



VALVE - 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	

FIGURE 11 - SIZES H AND HL



VALVE - 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

FIGURE 12 - SIZES K, KK, L, LQ AND LL

DISASSEMBLY

DANGER !

Before opening any Viking pump 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.
- 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.
- 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.

Mark valve and head before disassembly to insure proper reassembly.

1. Remove valve cap.
2. Measure and record length of extension of adjusting screw. **Refer to "A" on Figure 11 and Figure 12.**
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 in to increase pressure and out to decrease pressure.
4. With discharge line closed at point beyond pressure gauge, gauge will show maximum pressure valve will allow while pump is in operation.

IMPORTANT

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

HEAT CARTRIDGES

This section applies to 124E Series only.

ASSEMBLY

INSTALLATION INSTRUCTIONS:

WARNING !

The pump needs to be properly grounded before the heat cartridges are installed.

1. Spacers should be installed between the foot of the pump and the base. This will create an air gap between the pump and base to limit heat transfer to the base.
2. Coat the threads of the heat cartridge with an anti-seize compound prior to installation. Install heat cartridges into the tapped ports on the head and bracket in the locations shown in the Figure XX below. Figure XX also shows the minimum clearance around the pump needed to install and remove the heat cartridges as well as the location for the thermocouple. The number of heaters used and the total wattage for each pump size is given in Table XY below. 3/8" heat cartridges should be tightened to 10ft-lbs. 1/2" and 3/4" heat cartridges should be tightened to 20 ft-lbs.
3. Viking recommends installing a closed loop temperature controller with a control algorithm that will minimize or prevent overshooting the set point temperature. The set point temperature needs to be slightly higher than the melting point and significantly lower than the flash point or boiling point of the liquid being pumped. Viking does offer a controller for use with our heat cartridges. Ask your local Viking distributor for details.

WARNING !

Setting the set point temperature higher than necessary will not make the pump heat any faster and will shorten the life of the heat cartridges.

4. Properly insulate the pump to minimize heat loss. The pump will not heat properly if it is not insulated.

DANGER !

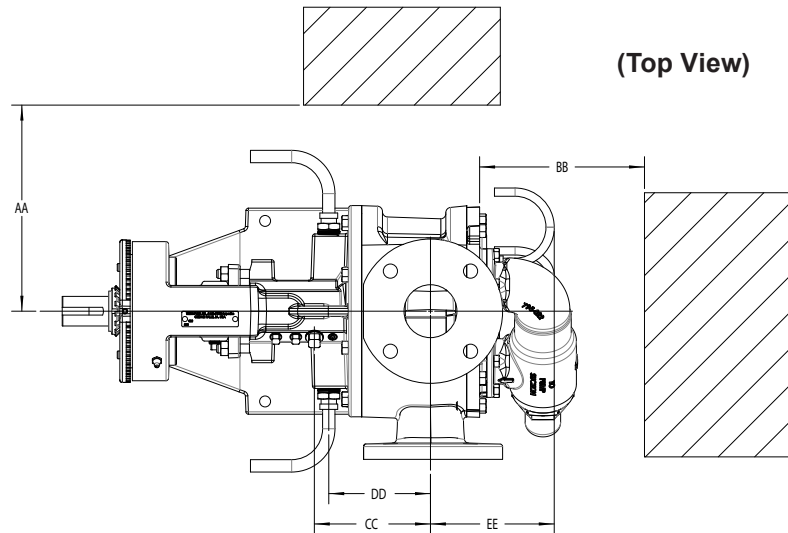
- **Always disconnect, lockout, and tag out supply circuits prior to installing.**
- **The installation must comply with standard and local regulations.**
- **All wiring should be done by a licensed electrician to meet local codes.**
- **Study this manual thoroughly before installing and using the heat cartridges.**
- **Pay special attention to this section and the parts marked "WARNING!" or "DANGER".**
- **Should questions or uncertainties arise, please contact your authorized Viking distributor.**

Failure to follow these instructions may cause an electrical shock and/or sparks, which may result in serious injury or death.

NOTE:

- Heat cartridges, temperature probes, and controllers must be wired by a licensed electrician to meet local codes.
- Heat cartridges require 240VAC, 1 Phase, 60 Hz or 220VAC, 1 Phase, 50 Hz power supply.
- Heat cartridges are UL, CSA, & CE marked, RoHs compliant.
- Heat cartridges and cables are water resistant but not water proof. They need to be installed in a protected area.
- To make sure that the liquid within the pump is melted and to avoid damage to the pump, do not start the pump until the set point temperature has been reached.
- Several factors such as the size of pump, the set point temperature, and the insulation will affect the amount of time it will take for the pump to reach the set point temperature. Typically it will take 3-4 hours for the pump to reach its set point temperature.
- Do not use heat cartridges with different watt densities from those supplied by Viking. Changing watt densities may result in localized over or under heating.
- The thermocouple or temperature probe must be installed in the bracket location shown in Figure XX below. Any other location may result in localized over or under heating.
- Please see TSM 630.4 for technical information on the Viking supplied controller for the heat cartridges.
- The wires for the heat cartridges can be joined together in a junction box, and a single wire from the junction box can be connected to the controller.
- WARNING** Heat cartridges will be hot. Do not touch pump or heat cartridges until they have been allowed to cool.

Dimensions - K through LL Sizes – Electrically Heated – Non Jacketed



Model	Bracket Heater to Port Center Line (DD)		Temp Probe to Port Center Line (CC)		Head Heater to Port Center Line (EE)		Required to Remove Heater			
	Inch	mm	Inch	mm	Inch	mm	(AA)		(BB)	
							Inch	mm	Inch	mm
K124E	4.14	105.16	4.88	123.95	5.66	143.76	8.13	206.50	7.75	196.85
KK124E										
L124E	4.92	124.97	5.62	142.75	5.71	145.03	7.00	177.80	6.25	158.75
LQ124E					5.75	146.05				
LL124E					6.25	158.75				

FIGURE 13 - HEAT CARTRIDGE AND THERMOCOUPLE LOCATIONS

Wattage by Pump Size			
Pump Size	Number of Heaters in Head	Number of Heaters in Bracket	Total Wattage
K	3	2	690
KK	3	2	690
L	2	2	1200
LQ	2	2	1200
LL	2	2	1250

TABLE 2 - NUMBER OF HEAT CARTRIDGES IN EACH PUMP MODEL



TECHNICAL SERVICE MANUAL

UNIVERSAL SEAL HEAVY DUTY JACKETED PUMPS
 SERIES 124E/EH, 224A/AE/AH, 4224A/AE/AH/B CAST IRON
 SERIES 226A AND 4226A DUCTILE IRON
 SERIES 223A AND 4223A STEEL
 SERIES 227A AND 4227A STAINLESS STEEL
 SIZES H, HL, K, KK, L, LQ, LL

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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. The warranty period for Universal Seal series pumps ONLY (Universal Seal models listed below) is three (3) years from date of startup, provided that in no event shall this warranty extend more than forty-two (42) months from the date of shipment from Viking.

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.

THIS WARRANTY IS AND SHALL BE VIKING'S SOLE AND EXCLUSIVE WARRANTY AND SHALL BE 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.

See complete warranty at www.vikingpump.com.

