

TECHNICAL SERVICE MANUAL: INSTALLATION, OPERATION & MAINTENANCE**VIKING
PUMP®**SPUR GEAR PRODUCT LINE: **DUCTILE IRON**

GP-425 SERIES™

TSM 1658

Page 1 of 11

Issue A

TABLE OF CONTENTS

Model Number Chart.....	1
Introduction	1
Safety Information & Instructions.....	2
Component & Unit Lifting Features	3
Special Information	3
Installation	3
General.....	3
Rotation	3
Piping.....	3
Pressure Relief Valves.....	3
Mounting.....	4
Alignment.....	4
Piping/Hose	4
Start Up	4
Repair Parts	5
Maintenance.....	5
Cleaning Pump.....	5
Storage	5
Lubrication.....	5
Suggested Seal Replacement Tools.....	5
Cartridge Mechanical Seal in GP-425 Pumps.....	6
Seal Removal.....	6
Seal Installation.....	6
APPENDIX (Formerly TSM 340)	7
General Installation Notes.....	7
Alignment	8
Piping/Hose.....	8
Start Up	8
Troubleshooting	9
Vacuum Gauge - Suction Port	9
Pressure Gauge - Discharge Port.....	9
Do's & Don'ts	10
Installation.....	10
Operation.....	10
Maintenance.....	10

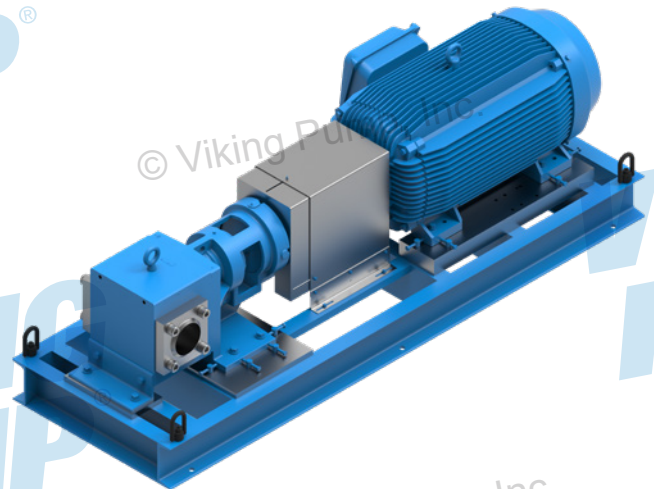
MODEL NUMBER CHART

Mechanical Seal	
Clockwise	Counter-Clockwise
GP-425021-N00	GP-425021-N10
GP-425051-N00	GP-425051-N10
GP-425052-N00	GP-425052-N10
GP-425073-N00	GP-425073-N10
GP-425102-N00	GP-425102-N10

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.

FIGURE 1: GP-425 SERIES™ SHOWN WITH D DRIVE

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.

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

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.

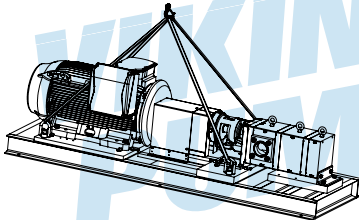
WARNING

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.

COMPONENT & UNIT LIFTING FEATURES

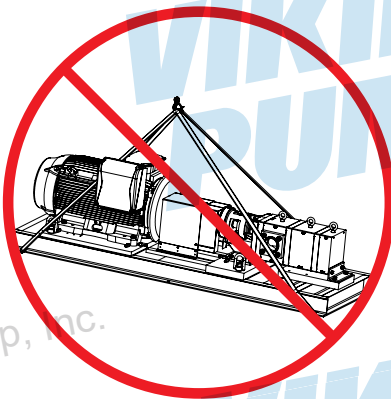
Viking will leave all removable lifting features, such as threaded eye bolts and hoist rings, installed in components (pumps, reducers, motors, etc.) and baseplates. These features are used to safely lift and move the individual components.

FIGURE 2: EXAMPLE OF PROPER LIFTING METHOD



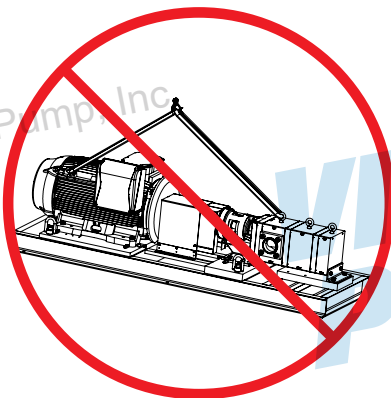
NOTE: Units should be lifted by the base lifting features using two or more lifting slings.

FIGURE 3: 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 4: 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.

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.

INSTALLATION

GENERAL

The following items must be considered prior to pump installation:

1. **Location** - locate the pump as close as possible to supply of liquid being pumped. If possible locate pump below liquid supply. Viking pumps are self-priming; but, the better the suction conditions the better the pump will perform.
2. **Accessibility** - pump must be accessible for inspection, maintenance and repair.
3. **Suction/Discharge** - GP Series pumps are rotation specific (viewed from end of shaft).

ROTATION

Viking external gear pumps can be offered in a clockwise (-N0) or counter clockwise (-N1) rotation. The intended rotation and inlet / outlet port positions are noted on the pump nameplate. Do not run the pump in reverse, or the seal will be exposed to full discharge pressure.

PIPING

The GP Series pumps are high pressure pumps and can have high inlet pressures, as well. Make sure all piping and fittings on both the inlet and discharge side of the pump are rated for the expected pressures!

PRESSURE RELIEF VALVES

Viking pumps are positive placement pumps and must be provided with some sort of pressure protection. This may be an inline pressure relief valve, a torque limiting device or a rupture disk.

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.

MOUNTING

1. Surfaces that the pump mounts against must be clean and flat.
2. For NEMA Mount, use SAE Grade 5 or better capscrews to mount pump.
3. Standard GP Series pumps are designed to be used with spacer type couplings that do not induce axial thrust on the pump shaft. If an improper type of coupling is used, internal damage may result.
4. Do not strike or press the pump drive coupling to install. Internal pump damage will result. If the coupling does not slide onto the shaft, inspect the coupling, shaft and key for nicks or burrs and remove.
5. Once the pump has been mounted and the coupling installed, it is recommended to put lube oil into the suction port and turn the pump by hand to make sure it turns freely.

ALIGNMENT

Check alignment after mounting.

If unit has flexible coupling, remove any coupling guards or covers and check alignment of coupling halves using good laser alignment equipment.

1. Viking recommends an offset misalignment of .0025" or better and an angular misalignment of .003"/10" or better. Consult coupling manufacturer's alignment requirements for acceptability.
2. Make final check on alignment after all piping connections have been made.

PIPING/HOSE

The cause of many pumping problems can be traced to suction piping. It should always be as large in diameter and as short in length as possible.

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

1. Never use piping smaller than pump port connections. Piping larger in diameter than the port connection is sometimes required to reduce suction losses.
2. Be sure the inside of pipe is clean before installing.
3. When approaching an obstacle to the suction line, go around instead of over it. Going over an obstacle can create an air pocket. 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.
4. A strainer on the suction side of the pump should always be considered in any pumping system. The strainer will keep foreign matter from entering the pump. The strainer mesh or perforation size should be large enough so that it does not cause excessive pressure drop, but fine enough to protect the pump.

Use of a strainer is particularly important at start up to help clean the system of weld beads, pipe scale and other foreign objects.

5. A pressure relief valve is required in the discharge line. See "Installation, General" on page 3.
6. The pump must not be used to support the piping. Hangers, supports, stands, etc. must carry the weight of the pipes.

7. When fastening piping to the pump do not 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.
8. All joints of piping system must be tight. Loose joints result in liquid leaks or suction side leaks. Air leaks make the pump noisy and reduce flow.
9. Drive alignment must be checked after piping has been connected to the pump.
10. Provide a pressure relief device in any part of a pump and piping system that can be valved off and, thus, completely isolated. A rise in temperature will cause a 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.



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.

START UP

Before pushing "start" button, check the following:

1. Vacuum and pressure gauges (liquid filled) are mounted on or near the pump. Gauges are the quickest and most accurate way of finding out what is happening in the pump.
2. Pump is correctly aligned using good laser alignment equipment.
3. There is no pipe strain on the pump casing.
4. Rotate the pump shaft by hand to be sure it turns freely.
5. Motor has been jogged and is running in the correct direction. Refer to "Installation, General" on page 3.
6. Pressure relief valve is installed properly in the system.
7. Suction piping is connected and tight, and valves are open.
8. Make sure the discharge piping is properly connected and sealed, valves are open, and there is a place for the liquid to go.
9. Make sure all guards are in place.
10. Seal chamber needs to be vented prior to start up via the square vent plug at the 12 o' clock position above the seal.
11. The above checklist is a general guideline to be used prior to starting the pump. Since Viking Pump cannot foresee every application for our product and possible system design, the final responsibility is with the user. The pump must be utilized within the catalog specifications and the pump system must be designed to provide safe working conditions.



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.

The “start” button may now be pushed.

The pump should begin to deliver liquid within 15 seconds! If not, push the stop button. Do not run the pump without liquid flow longer than 30 seconds or the pump may be ruined.

Review Startup steps 1 through 10. Consider what the suction and discharge gauges may indicate. If everything appears in order, re-prime pump. Refer to “**Mounting**” on page 4.

Push the “start” button. If nothing is flowing within 30 seconds, stop the pump. The pump is not a compressor, it will not build up much air pressure. It may be necessary to vent discharge line until liquid begins to flow.

If pump still does not deliver, consider one or more of the following:

1. The suction line has air leaks.
2. The end of the suction pipe is not submerged deeply enough in the liquid.
3. The 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, the pump still does not deliver liquid, review all points given under **START UP** and read through the **TROUBLESHOOTING** guide and try again. If pump still will not deliver liquid, contact your Viking Pump supplier.

REPAIR PARTS

The only parts recommended for replacement in the pump are the mechanical seal and O-rings, and must be replaced if the pump is disassembled.

Contact your Viking Pump® representative for price and availability on Genuine Viking Pump® seal kits.

The Viking Pump® GP pumps are precision machined with fixed end clearances and assembly tolerances. Viking recommends any repairs beyond seal replacement be facilitated through the Viking Pump Warranty Department.

MAINTENANCE

GP-425 Series™ 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.

CLEANING PUMP

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

STORAGE

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

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.

SUGGESTED SEAL REPLACEMENT TOOLS

The following tools must be available to properly replace the seals in GP-425 Series™ external gear 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 or automobile tool supplier.

1. Soft headed hammer
2. Allen wrenches: 3/16" & 1/8"
3. Hex driver socket for use with torque wrench: 15/16"
4. Mechanical seal installation sleeve
5. Spanner wrench
6. Locknut tool
7. Brass / plastic bar



**DO NOT PLACE
FINGERS HERE**

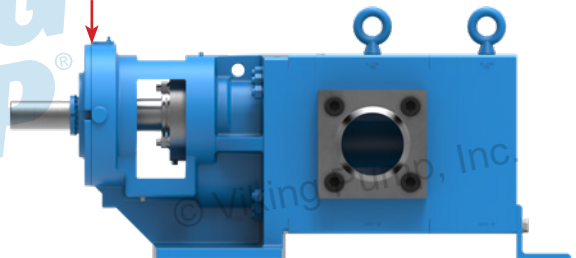
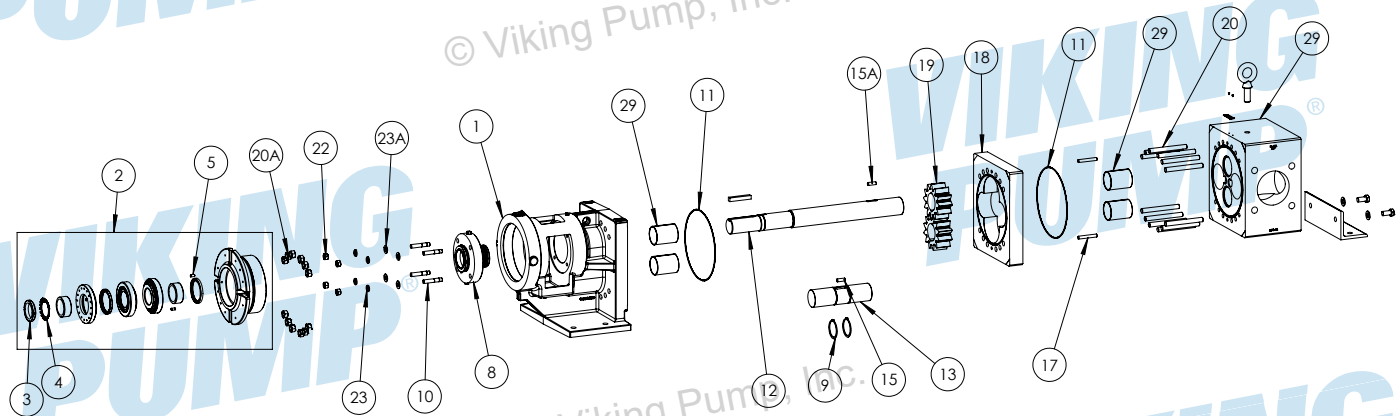


FIGURE 5: EXPLODED VIEW - GP-425 SERIES™ CARTRIDGE MECHANICAL SEAL PUMPS



ITEM	NAME OF PART	ITEM	NAME OF PART	ITEM	NAME OF PART
1	Bracket	11	O-Rings	19	Gear Set
2	Bearing Housing Assembly	12	Driver Shaft	20	Studs
3	Locknut	13	Driven Shaft	22	Seal Nuts
4	Lock Washer	15	Gear Pin (Driven Gear)	23	Lock Washers
5	Set Screws	15A	Gear Pin (Driver Gear)	23A	Flat Washers
8	Mechanical Seal	17	Alignment Pins	29	Head & Bushing Assembly
10	Seal Studs	18	Casing		

CARTRIDGE MECHANICAL SEAL IN GP-425 PUMPS

SEAL REMOVAL

Remove port adaptor on one side of the pump to access the flow port/gears.

Insert brass or plastic bar into one of the pump ports and into the space between gear teeth to prevent the driver from spinning. If removing the seal while pump is installed, lock shaft to prevent spinning. Bend up tang of lockwasher (Item 4) with flat bladed screw driver or small flat punch and a hammer. With a spanner wrench, remove locknut (Item 3) from shaft (Item 12). Remove lockwasher from shaft.

Loosen two set screws in the face of the bearing housing (Item 2), and turn the bearing housing CCW to remove the bearing housing assembly from the bracket (Item 1).

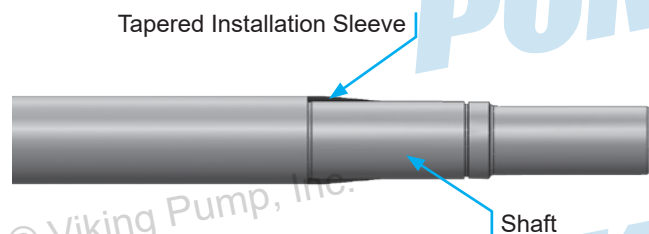
Remove window guard (not shown) from bracket.

If flush plan or barrier fluid tubes are connected to the seal gland (Item 8), turn off and disconnect before removing seal. Also, remove all pipe plugs from seal gland for ease of removal through bearing housing opening. Place set clips on seal. Loosen the set screws on the cartridge seal collar to free the cartridge seal from the shaft. Remove nuts and washers from studs. Remove all fittings and pipe plugs from seal gland. Slide cartridge seal out through bearing housing opening.

SEAL INSTALLATION

- NOTE:** Burrs left on shaft can damage O-rings on seal sleeve during installation. Inspect shaft for burrs and remove any found with a fine grade of emery cloth.
- Clean driver shaft and face of seal chamber on bracket.
- Place tapered installation sleeve on shaft. Coat driver shaft, tapered installation sleeve, and O-rings in the inside diameter of cartridge seal sleeve with a generous amount of light oil. See "Figure 6" on page 6.
- Slide cartridge seal over installation sleeve on shaft until it contacts the seal chamber face. Be sure the flush port opening on the seal gland is at the 12 o' clock position. Remove tapered installation sleeve from shaft.

FIGURE 6



NOTE: Coat rotor shaft, tapered installation sleeve and inner diameter of mechanical seal with P-80® or equivalent before assembly.

P-80® is a registered trademark of International Products Corporation

5. Secure seal gland to bracket face using nuts (Item 22), flat washers (Item 23), and lock washers (Item 23A) onto studs (Item 10). **NOTE:** Tighten nuts on studs to specifications in "Table 1" on page 7.
6. Tighten setscrews on cartridge seal drive collar to shaft and remove or turn seal centering clips so as to clear the seal drive collar.
7. Turn shaft by hand to check seal drive collar for runout.
8. Connect flush plan or barrier fluid lines or vent stuffing box, if no flush plan, until liquid is present in stuffing box. Install pipe plugs in any remaining port openings in the seal gland.
9. Replace window guard on bracket.
10. Insert brass or plastic bar into one of the pump ports and into the space between gear teeth to prevent the driver from spinning.
11. Turn the bearing housing CW to install the bearing housing assembly to the bracket (Item 1) until flush and tighten the two set screws in the face of the bearing housing (item 2).
12. Place lockwasher (item 4) on shaft end. Place locknut (item 3) on shaft and tighten to specs in "Table 2" on page 7 using a spanner wrench. After locknut has been torqued to specification, bend up tang of lockwasher with a flat bladed screw driver or small flat punch and a hammer.
13. Once assembled, remove the inserted brass or plastic bar and turn pump by hand to confirm free movement of the driver shaft.
14. Reinstall port adaptor per torque specs and reattach to piping.

TABLE 1: LOCKNUT TORQUE SPEC

Series	Torque (ft.-lbs.)	Torque (N-m)
GP-425	170 - 190	235 - 255

TABLE 2: FLANGE CAPSCREW TORQUE SPEC

Port Size	Torque (ft.-lbs.)	Torque (N-m)
6" Ports	500 - 550	678 - 746

APPENDIX (FORMERLY TSM 340)

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

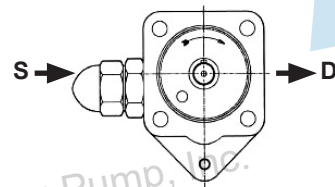
GENERAL INSTALLATION NOTES

The following items must be considered prior to pump installation:

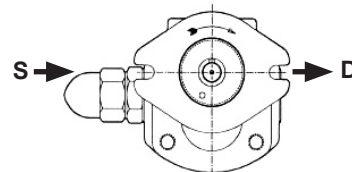
1. **Location** - locate the pump as close as possible to the liquid supply. If possible locate the pump below the liquid supply. Viking pumps are self-priming; but the better the suction conditions, the better the pump will perform.
2. **Accessibility** - the pump must be accessible for inspection, maintenance and repair.
3. **Suction/Discharge** - SG Series pumps are designed for clockwise rotation as standard (viewed from end of shaft). Refer to **Figure A1**.

FIGURE A1: CLOCKWISE ROTATION (VIEWED FROM SHAFT END)

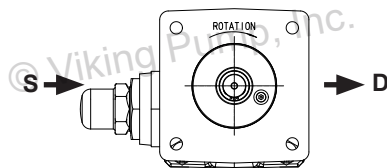
SG-04 Series™ & SG-05 Series™:



SG-07 Series™:



SG-10 Series™ & SG-14 Series™:



4. **Pressure Relief Valve** - the SG Series is a positive displacement pump and requires some form of over pressure protection. Without pressure protection, if the discharge line is blocked or becomes closed, pressure will build up until the motor stalls, drive equipment fails, a pump part breaks, or the piping and/or other equipment in the system bursts. To prevent the possibility of any one or more of the above from occurring, the use of a pressure relief valve is recommended.
5. **Storage** - drain the pump and apply a light coat of non-detergent SAE 30 weight oil to all internal pump parts. Apply grease to the pump shaft extension. Viking suggests rotating the pump shaft by hand one complete revolution every 30 days to circulate the oil.

ALIGNMENT

Check alignment after mounting.

1. If the unit has a flexible coupling, remove any coupling guards or covers and check the alignment of coupling halves. A straight edge (piece of key stock will work) across the coupling must rest evenly on both rims at the top, bottom and sides. See **Figure A2**.

FIGURE A2

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.

2. Make a final check on alignment after piping is hooked up.

PIPING/HOSE

The cause of many pumping problems can be traced to the suction piping. It should always be as large in diameter, and as short in length, as possible.

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

1. Never use piping smaller than the pump port connections. Piping larger in diameter than the port connection is sometimes required to reduce friction losses.
2. Be sure the inside of the pipe is clean before installing.
3. When approaching an obstacle to the suction line, go around instead of over it. Going over an obstacle can create an air pocket. 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.
4. A strainer on the suction side of the pump should always be considered in any pumping system. The strainer will keep foreign matter from entering the pump. The strainer mesh or perforation size should be large enough so that it does not cause excessive pressure drop, but fine enough to protect the pump. Use of a strainer is particularly important at start up to help clean the system of weld beads, pipe scale and other foreign objects.
5. A pressure relief valve is required in the discharge line. See “**Pressure Relief Valve**” under “**General Installation Notes**” item 4.
6. The pump must not be used to support the piping. Hangers, supports, stands, etc. must carry the weight of the pipes.
7. When fastening piping to the pump do not 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.

8. All joints of piping system must be tight; liquid thread sealant will help assure leak free threaded joints. Loose joints result in liquid leaks or suction side leaks. Leaks in the suction line can permit air to be drawn in, and will cause a noisy pump and reduction in capacity. **CAUTION: Be careful not to over tighten fittings as this can cause cracked ports.** Do not use PTFE tape. Reduced friction makes over tightening very easy, and will result in cracked ports.
9. Drive alignment must be checked after piping is connected.
10. Provide a pressure relief device in any part of a pump and piping system that can be isolated by closing a valve. Isolating a part of the system with a pump can cause a rise in liquid temperature, which causes the liquid to expand. Without overpressure protection, it is possible for the pump or piping to rupture.

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.

START UP

Before starting the pump unit, check the following:

1. Ensure vacuum and pressure gauges (liquid filled) are mounted on or near the pump. Gauges are the quickest and most accurate way of finding out what is happening in the pump.
2. Check the pump and drive alignment.
3. Make sure there is no pipe strain on the pump ports.
4. Rotate the pump shaft by hand to be sure it turns freely.
5. Before connecting to the motor, jog it to be sure it is running in the correct direction. Refer to “**General Installation Notes**”.
6. Ensure the pressure relief valve is installed properly.
7. Make sure the suction piping is properly connected and sealed, and that the valves are open.
8. Make sure the discharge piping is properly connected and sealed, the valves are open, and that there is a place for the liquid to go.
9. Make sure all guards are in place.
10. The above checklist is a general guideline to be used prior to starting the pump. Since Viking Pump® cannot foresee every application for our product and possible system design, the final responsibility is with the user. The pump must be utilized within the catalog specifications and the pump system must be designed to provide safe working conditions.

The pump unit may now be started. The pump should begin to deliver liquid within 15 seconds. If not, stop the pump unit. Do not run the pump without liquid flow longer than 30 seconds or the pump may be damaged. Review “**Start Up**” steps 1 through 10. Consider what the suction and discharge gauges may indicate. If everything appears in order, re-prime pump. Refer to “**Mounting**” item 8.

Re-start the pump. If nothing is flowing within 30 seconds, stop the pump. It may be necessary to vent discharge line until liquid begins to flow.

If pump still does not deliver flow, consider one or more of the following:

1. The suction line has air leaks.
2. The end of the suction pipe is not submerged deeply enough in the liquid.
3. The 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 the pump does not deliver liquid after considering these points, review all points under “**Start Up**,” read through the “**Troubleshooting**” guide, and try starting the pump again. If pump still will not deliver liquid, contact your Viking Pump® representative.

TROUBLESHOOTING

A Viking pump that is properly installed and maintained will give long and satisfactory performance. If trouble develops, installing a vacuum gauge on the suction port, and a pressure gauge on the discharge port, will help determine what is occurring. The gauges will assist in determining where to begin investigating.

VACUUM GAUGE - SUCTION PORT

1. High reading would indicate:

- a. The suction line is blocked or pinched, a valve is closed, or a strainer is plugged.
- b. The suction line is too small.
- c. The liquid is too viscous to flow through the piping.
- d. The lift required is too high.

2. Low reading would indicate:

- a. Air leak in the suction line.
- b. The end of the suction pipe is not in the liquid.
- c. Pump is worn.
- d. Pump is dry - should be primed.

3. Fluttering, jumping, or erratic reading:

- a. The liquid is vaporizing.
- b. The liquid is entering the pump in chunks.
- c. There is an air leak, or insufficient liquid head above the end of the suction pipe.
- d. Vibration from cavitation, misalignment, or damaged parts.

PRESSURE GAUGE - DISCHARGE PORT

1. High reading would indicate:

- a. High viscosity and small and/or long discharge line.
- b. The strainer or filter is plugged.
- c. The pressure relief valve is set too high.
- d. A valve in the discharge line is partially closed.
- e. The line is partially plugged from buildup on the inside of the pipe, solidified product, or a foreign object.
- f. Liquid in the pipe is not up to temperature.

2. Low reading would indicate:

- a. The relief valve is set too low.
- b. The relief valve poppet is not seating properly.
- c. Pump mounting capscrews not torqued to specifications (GP-04 and GP-05 Series 12-15 ft.-lbs.).
- d. Pump assembly bolts not torqued into specifications (GP-07 Series 50-55 ft.-lbs.).
- e. The bypass around pump partially open.
- f. Pump is damaged or worn.
- g. The pump has too much internal clearance.

3. Fluttering, jumping, or erratic reading:

- a. Cavitation.
- b. Liquid is entering the pump in chunks.
- c. Air leak in the suction line.
- d. Vibration from misalignment or mechanical problems.

Some of the following may also help pinpoint the problem:

1. Pump does not pump.

- a. Pump has lost its prime due to an air leak or low level in tank.
- b. Suction lift is too high.
- c. Rotating in wrong direction.
- d. The motor does not come up to speed.
- e. The strainer is clogged.
- f. Bypass valve open, relief valve set too low, relief valve poppet stuck open.
- g. The pump is worn out.
- h. 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.
- i. **Mag Drive pumps ONLY:** The magnetic coupling is decoupling. Changes in application (temperature, pressure, viscosity, etc.) may require torque beyond coupling capabilities.

2. Pump starts, then loses its prime.

- a. The supply tank is empty.
- b. Liquid is vaporizing in the suction line.
- c. There are air leaks, or air pockets in the suction line.
- d. The pump is worn out.

3. Pump is noisy.

- a. The pump is cavitating (liquid vaporizing in suction line) or being starved (heavy liquid cannot get to pump fast enough). Increase the suction pipe size, and/or reduce the length, or decrease the pump speed. If the pump is above the liquid, raise the liquid level closer to the center line of the inlet port. If the liquid is above the pump, increase the head of the liquid.
- b. Check alignment.
- c. Anchor the base or piping to eliminate vibration.

4. Pump not delivering up to capacity.

- Pump is starving or cavitating. See 3. Pump is noisy, item 1.
- Strainer partially clogged.
- There is an air leak in the suction line.
- The pump is running too slowly. Check the motor speed and wiring.
- Pressure relief valve is set too low, stuck open or has a damaged poppet seat.
- The bypass line around the pump partially opened.
- The pump is worn out.

5. Pump takes too much power (stalls motor).

- The pump sequence valve set too high.
- Liquid is more viscous than the unit is sized to handle.
- The system pressure relief valve set too high.
- The pump is misaligned.

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

- DO** install the pump as close as possible to the supply tank.
- DO** leave working space around the pumping unit.
- DO** use large, short, and straight suction piping.
- DO** install a strainer in the suction line.
- DO** double check alignment after the unit is mounted and piping is hooked up.
- DO** provide a pressure relief valve for the discharge side of the pump.
- DO** check for proper rotation.
- DO** use a return line filter.
- DO** use an industrial grade hydraulic oil.
- DO** use piping, hose and fittings rated for maximum system pressure.

OPERATION

- DON'T** run the pump at speeds faster than maximum catalog ratings for each model.
- DON'T** allow the pump to develop pressure higher than maximum catalog ratings for each model.
- DON'T** operate pumps at temperatures above or below maximum catalog ratings for each model.
- DON'T** operate unit without all guards in place.
- DON'T** operate the pump without a pressure relief valve in the discharge piping. Be sure the valve is mounted and set correctly.
- DON'T** stick fingers in ports of pump. Fingers may be pinched between gears.
- DON'T** work on the pump unless driver has been "locked out" so it cannot be started while work is being done on the pump.

MAINTENANCE

- DO** record pump model number and serial number, and file for further use.
- DO** have spare parts, pump or standby units available, particularly if pump is an essential part of a key operation process.
- DO** obtain, read and keep all maintenance instructions furnished with the pump.
- DO** make sure any pump that has residual system pressure in it, or that has handled high vapor pressure liquids, has been vented through the suction or discharge lines, or other openings provided for this purpose.
- DO** make sure that if the pump is still connected to the driver while maintenance is being performed, that the driver has been "locked out." This will prevent the driver from being started during pump maintenance.
- 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.

TECHNICAL SERVICE MANUAL: INSTALLATION, OPERATION & MAINTENANCE**VIKING
PUMP®**SPUR GEAR PRODUCT LINE: **DUCTILE IRON**

GP-425 SERIES™

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TSM 1658

Page 11 of 11

Issue A

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#information). 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.

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