

TECHNICAL SERVICE MANUAL: INSTALLATION, OPERATION & MAINTENANCE**VIKING
PUMP®**SPUR GEAR PRODUCT LINE:
COMPOSITE MAG DRIVE PUMPS

CMD SERIES™

MODELS: E02, E05, E12, E25, E75

TSM	1253
Page	1 of 24
Issue	A

TABLE OF CONTENTS

Introduction	1
Safety Information & Instructions	2
Special Information	3
Rotation	3
Pressure Relief Valves	3
Maintenance	3
Cleaning Pump	3
Storage	3
Disassembly / Assembly - E02	9
Disassembly	9
Inspection	10
Assembly	10
Disassembly / Assembly - E05 & E12	12
Disassembly	13
Inspection	14
Assembly	14
Disassembly / Assembly - E25 & E75	16
Disassembly	16
Inspection	17
Assembly	18
Inspection & Wear Limits	20
Bearings	20
Shafts	20
Gears	20
Housing Liner	20
Special Note, Viscosity	20
Service & Replacement Limits	20
Troubleshooting Chart	21
Bolt Torque Recommendations	22
Maximum Flange Loads	23
NPSH Required	23
Solids Handling Capability	23
Maximum Sound Levels	23

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: MODEL E05 WITH MOTOR**FIGURE 2: MODEL E25 WITH MOTOR**

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

DO NOT OPERATE PUMP IF:

- The front cover is not installed correctly.
- Any guards are missing or incorrectly installed.
- The suction or discharge piping is not connected.

DANGER

DO NOT place fingers, etc. 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. Severe injury will occur.

DANGER

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

DANGER

INSTALLATION AND OPERATION OF THE PUMP MUST ALWAYS COMPLY WITH HEALTH AND SAFETY REGULATIONS.

DANGER

Rare earth magnets used in couplings have extremely strong magnetic fields capable of changing performance or damaging items such as: Pacemakers, Metal Implants, Watches, Computers & Disks, and Credit Cards.

Completely assembled magnetic couplings will not affect items listed above - only disassembled components.

There are no known harmful effects of these magnetic fields on the human body.

WARNING

A device must be incorporated into the pump, system, or drive to prevent the pump exceeding its stated duty pressure. It must be suitable for both directions of pump rotation where applicable. Do not allow pump to operate with a closed/blocked discharge unless a pressure relief device is incorporated. If an integral relief valve is incorporated into the pump, do not allow re-circulation through the relief valve for extended periods.

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

DANGER

The mounting of the pump or pump unit should be solid and stable. Pump orientation must be considered in relation to drainage requirements. Once mounted, shaft drive elements must be checked for correct alignment. Rotate pump shaft by at least one full revolution to ensure smoothness of operation. Incorrect alignment will produce excessive loadings and will create high temperatures and increased noise emissions. Do not use any drive arrangements which cause sidelading of the drive shaft.

DANGER

The installation must allow safe routine maintenance and inspection (to check for leakage, monitor pressures, etc) and provide adequate ventilation necessary to prevent overheating.

WARNING

BEFORE Before operating the pump, be sure that it and all parts of the system to which it is connected are clean and free from debris and that all valves in the suction and discharge pipelines are fully opened. Ensure that all piping connecting to the pump is fully supported and correctly aligned with its relevant connections. Misalignment and/or excess loads will cause severe pump damage.

Be sure that pump rotation is correct for the desired direction of flow.

WARNING

DO NOT INSTALL THE PUMP INTO A SYSTEM WHERE IT WILL RUN DRY (I.E. WITHOUT A SUPPLY OF PUMPED MEDIA).

WARNING

Pressure gauges/sensors are recommended, next to the pump suction and discharge connections to monitor pressures.

DANGER

Caution must be taken when lifting the pump. Suitable lifting devices should be used as appropriate. Lifting eyes installed on the pump must only be used to lift the pump, not pump with drive and/or baseplate. If pump is baseplate mounted, the base plate must be used for all lifting purposes. If slings are used for lifting, they must be safely and securely attached. For weights of bare shaft pumps refer to catalog.

DANGER

DO NOT attempt any maintenance or disassembly of the pump or pump unit without first ensuring that:

- The pump is fully isolated from the power source (electric, hydraulic, pneumatic).
- The pumping chamber, relief valve and any shaft seal support system are depressurized and purged.
- Any temperature control devices (jackets, heat-tracing, etc) are fully isolated, that they are depressurized and purged, and components are allowed to reach a safe handling temperature.

DANGER

DO NOT attempt to dismantle a pressure relief valve which has not had the spring pressure relieved or is mounted on a pump that is operating. Serious personal injury or death and/or pump damage may occur.

DANGER

DO NOT loosen or undo the front cover, any connections to the pump, shaft seal housings, temperature control devices, or other components, until sure that such action will not allow the unsafe escape of any pressurized media.

DANGER

Pumps and/or drives can produce sound power levels exceeding 85 dB(A) under certain operating conditions. When necessary, personal protection against noise must be taken.

DANGER

Avoid any contact with hot parts of pumps and/or drives which may cause injury. Certain operating conditions, temperature control devices (jackets, heat-tracing, etc.), bad installation, or poor maintenance can all promote high temperatures on pumps and/or drives.

SPECIAL INFORMATION

ROTATION

Shaft rotation determines which port is suction and which is discharge. Viewed from shaft end, with clockwise rotation, the right port is suction and left port is discharge. With counterclockwise rotation, the left port is suction and right port is discharge.

PRESSURE RELIEF VALVES

1. Viking pumps are positive displacement 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.
NOTE: Pump can be operated in reverse direction for short duration at low differential pressure to clean/flush out lines.
2. If pump rotation is reversed during operation, pressure protection must be provided on **both** sides of pump.
3. Pressure relief valves cannot be used to control pump flow or regulate discharge pressure.

DO NOT operate the pump without a pressure relief valve in the discharge piping. Be sure the valve is installed and set correctly.

MAINTENANCE

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

Pumps that are mounted directly to the motor will need to be removed from the mounting bracket to perform mechanical seal maintenance or replacement.

CLEANING PUMP

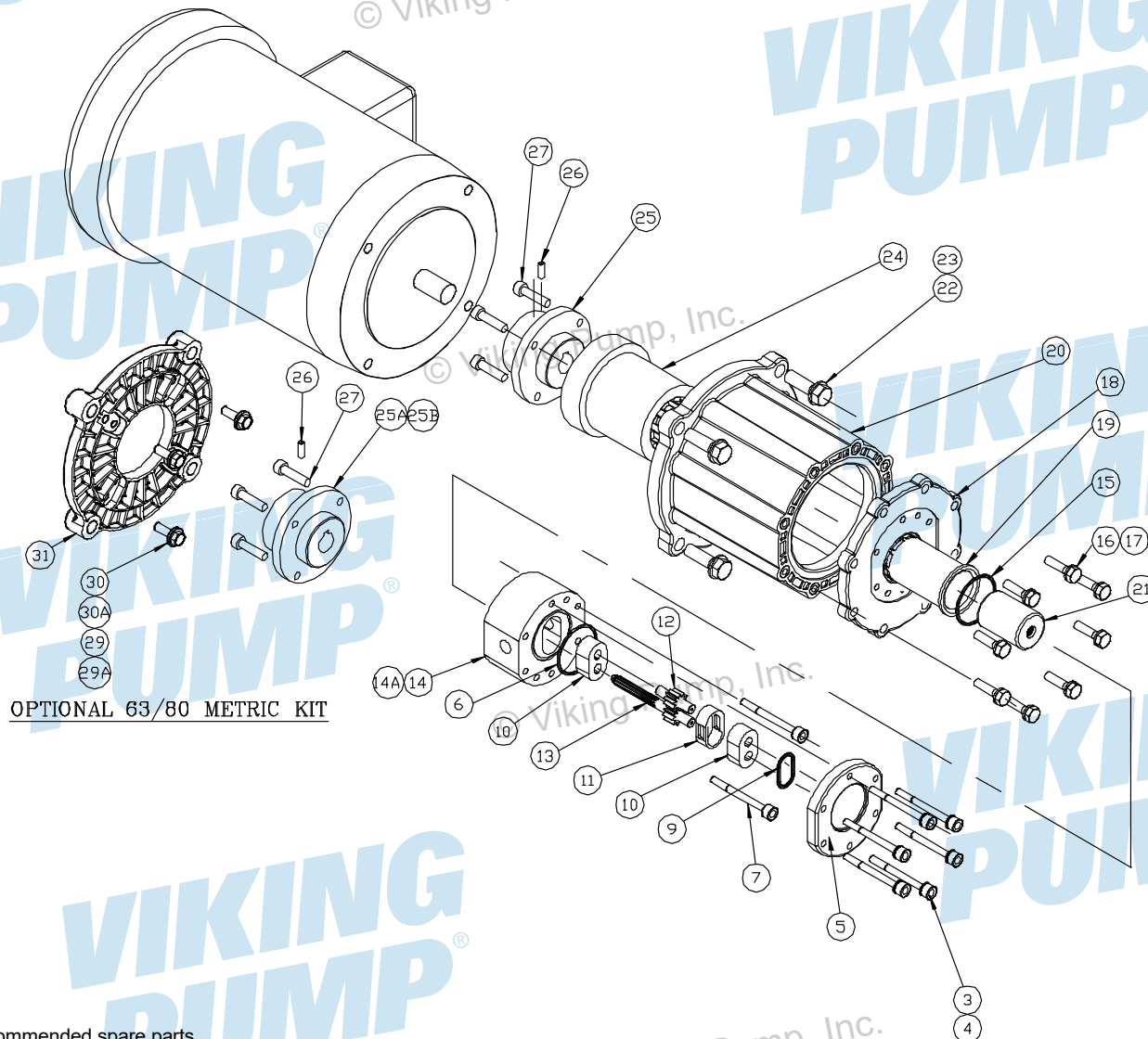
Keep the pump as clean as possible. This will facilitate inspection, adjustment, and repair work.

STORAGE

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

Apply grease to the 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 the pump in service after being stored.

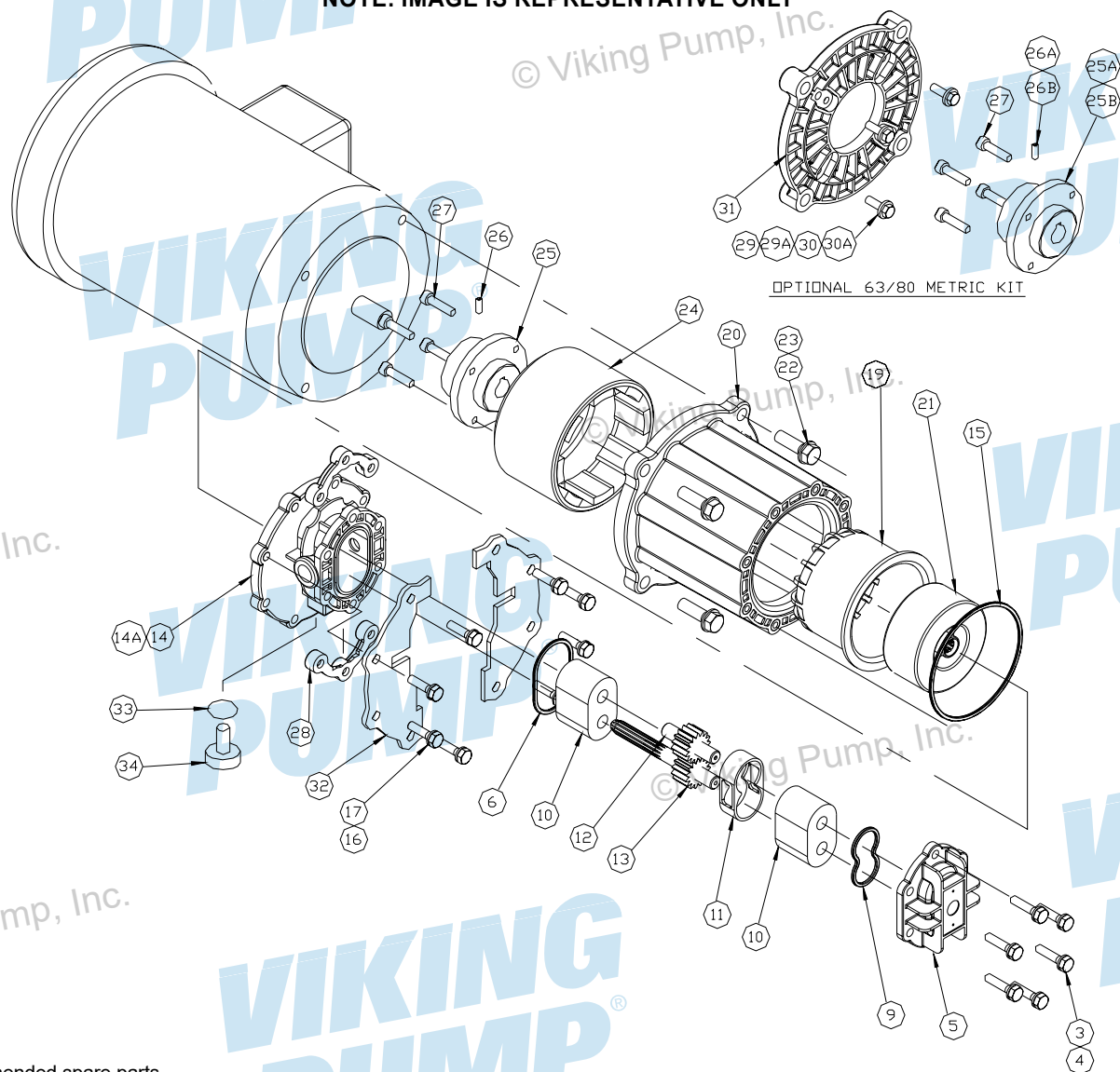
FIGURE 3: EXPLODED VIEW E02 PUMP (TYPICAL)
NOTE: IMAGE IS REPRESENTATIVE ONLY



* Recommended spare parts.

Item	Name Of Part	Item	Name Of Part	Item	Name Of Part
2	Drive Screw	13	Drive Gear Assembly *	23	Washer
3	Bolts	14	Center Housing	24	Drive Magnet
4	Washers	15	O-Ring, Containment Canister *	25	Coupling Hub
5	Front Cover	16	Bolts	26	Set Screw
6	O-Ring, Cover *	17	Washers	27	Screws
7	Bolts	18	Adapter, Canister	29	Bolts
9	O-Ring, Compression *	19	Containment Canister	30	Washer
10	Bearing *	20	Adapter, Spool	31	Adapter, Motor
11	Housing Liner *	21	Driven Magnet Assembly		
12	Idler Gear Assembly *	22	Bolts		

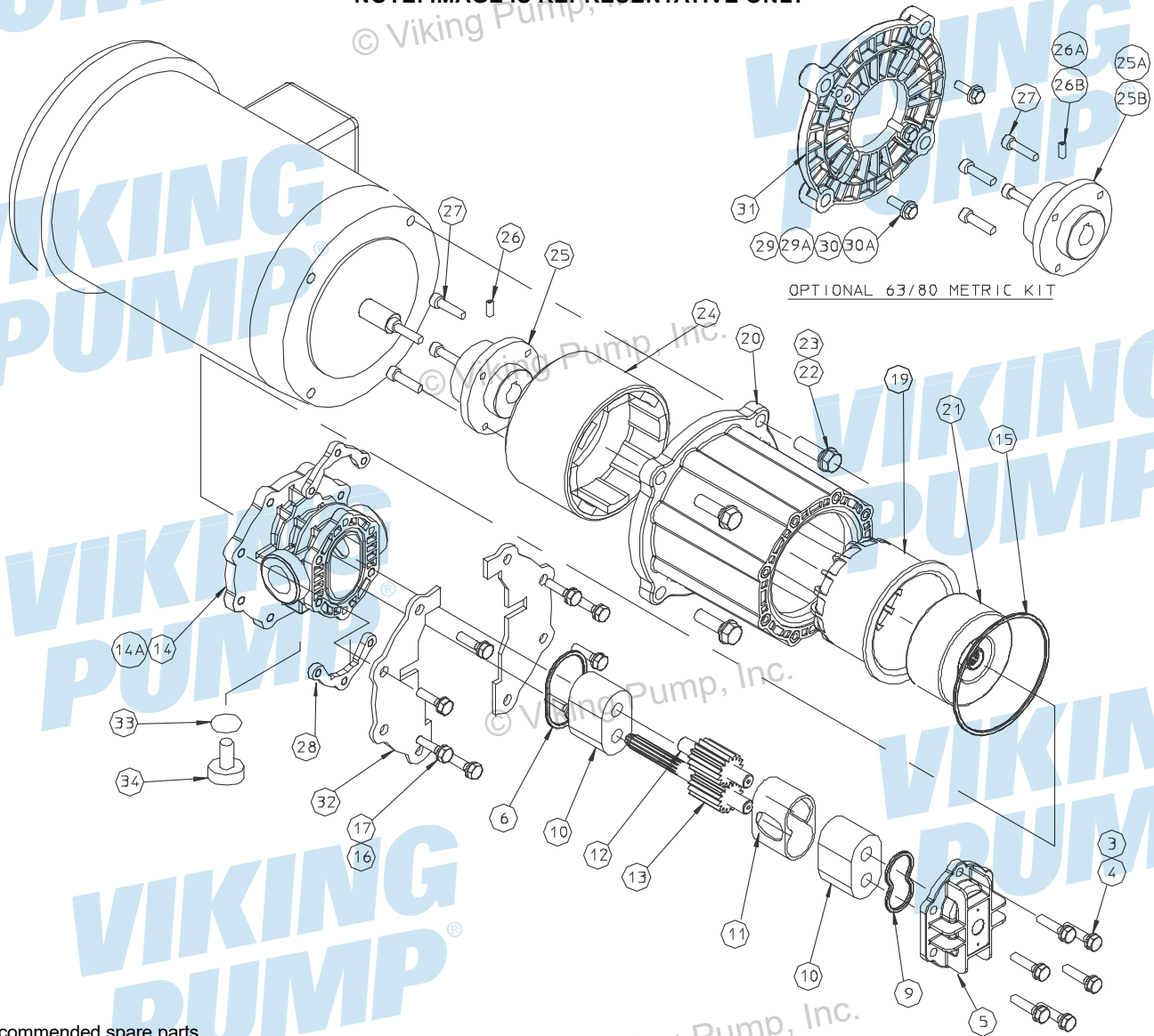
FIGURE 4: EXPLODED VIEW E05 PUMP (TYPICAL)
NOTE: IMAGE IS REPRESENTATIVE ONLY



* Recommended spare parts.

Item	Name Of Part	Item	Name Of Part	Item	Name Of Part
2	Drive Screw	14	Center Housing	25	Coupling Hub
3	Bolts	15	O-Ring, Containment Canister *	26	Set Screw
4	Washers	16	Bolts	27	Screws
5	Front Cover	17	Washers	28	Nut Plate
6	O-Ring, Cover *	19	Containment Canister	29	Bolts
9	O-Ring, Compression *	20	Adapter, Spool	30	Washer
10	Bearing *	21	Driven Magnet Assembly	31	Adapter, Motor
11	Housing Liner *	22	Bolts	32	Retaining Plate
12	Idler Gear Assembly *	23	Washer	33	O-Ring, Drain Plug *
13	Drive Gear Assembly *	24	Drive Magnet	34	Drain Plug

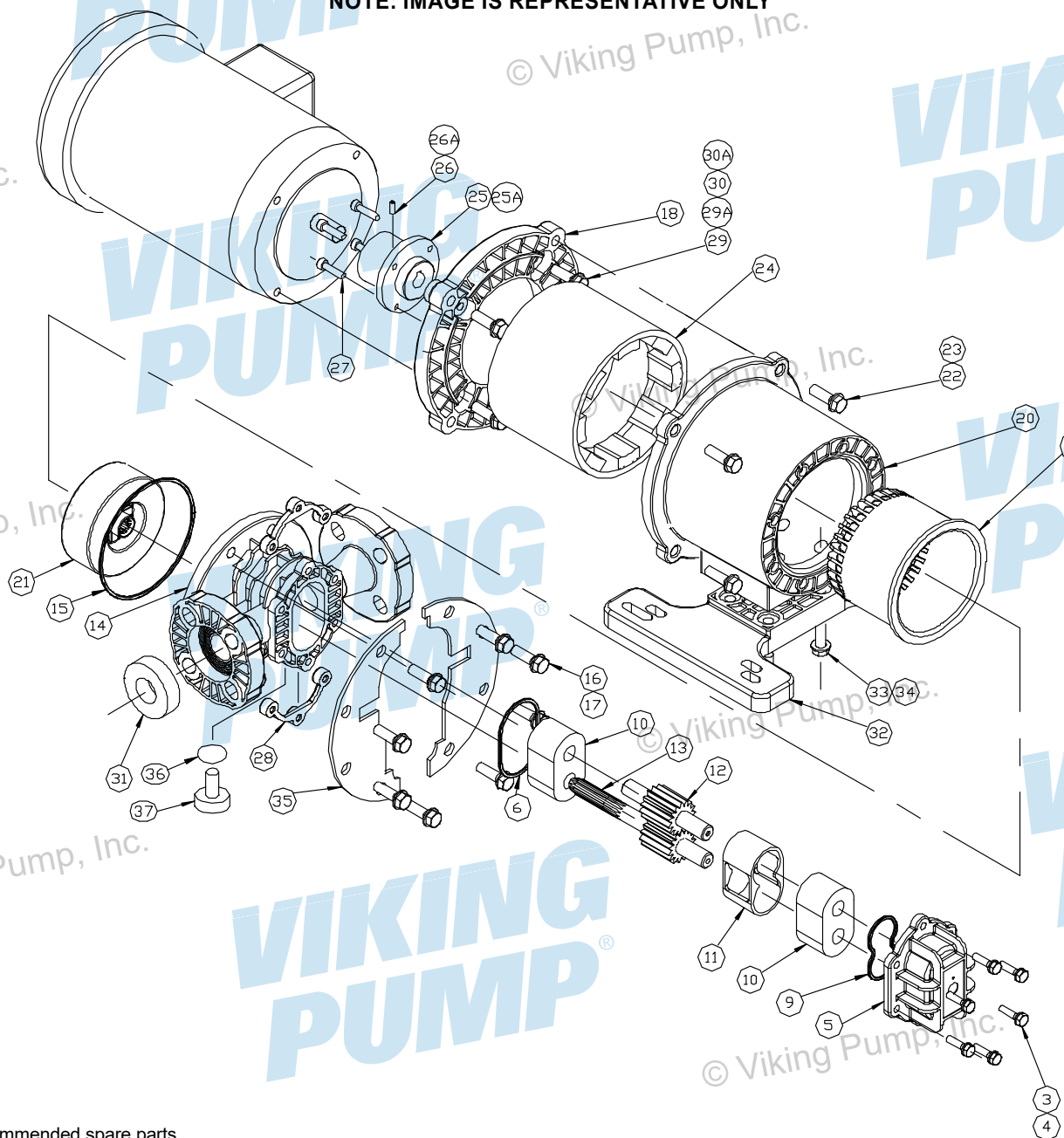
FIGURE 5: EXPLODED VIEW E12 PUMP (TYPICAL)
NOTE: IMAGE IS REPRESENTATIVE ONLY



* Recommended spare parts.

Item	Name Of Part	Item	Name Of Part	Item	Name Of Part
2	Drive Screw	14	Center Housing	25	Coupling Hub
3	Bolts	15	O-Ring, Containment Canister *	26	Set Screw
4	Washers	16	Bolts	27	Screws
5	Front Cover	17	Washers	28	Nut Plate
6	O-Ring, Cover *	19	Containment Canister	29	Bolts
9	O-Ring, Compression *	20	Adapter, Spool	30	Washer
10	Bearing *	21	Driven Magnet Assembly	31	Adapter, Motor
11	Housing Liner *	22	Bolts	32	Retaining Plate
12	Idler Gear Assembly *	23	Washer	33	O-Ring, Drain Plug *
13	Drive Gear Assembly *	24	Drive Magnet	34	Drain Plug

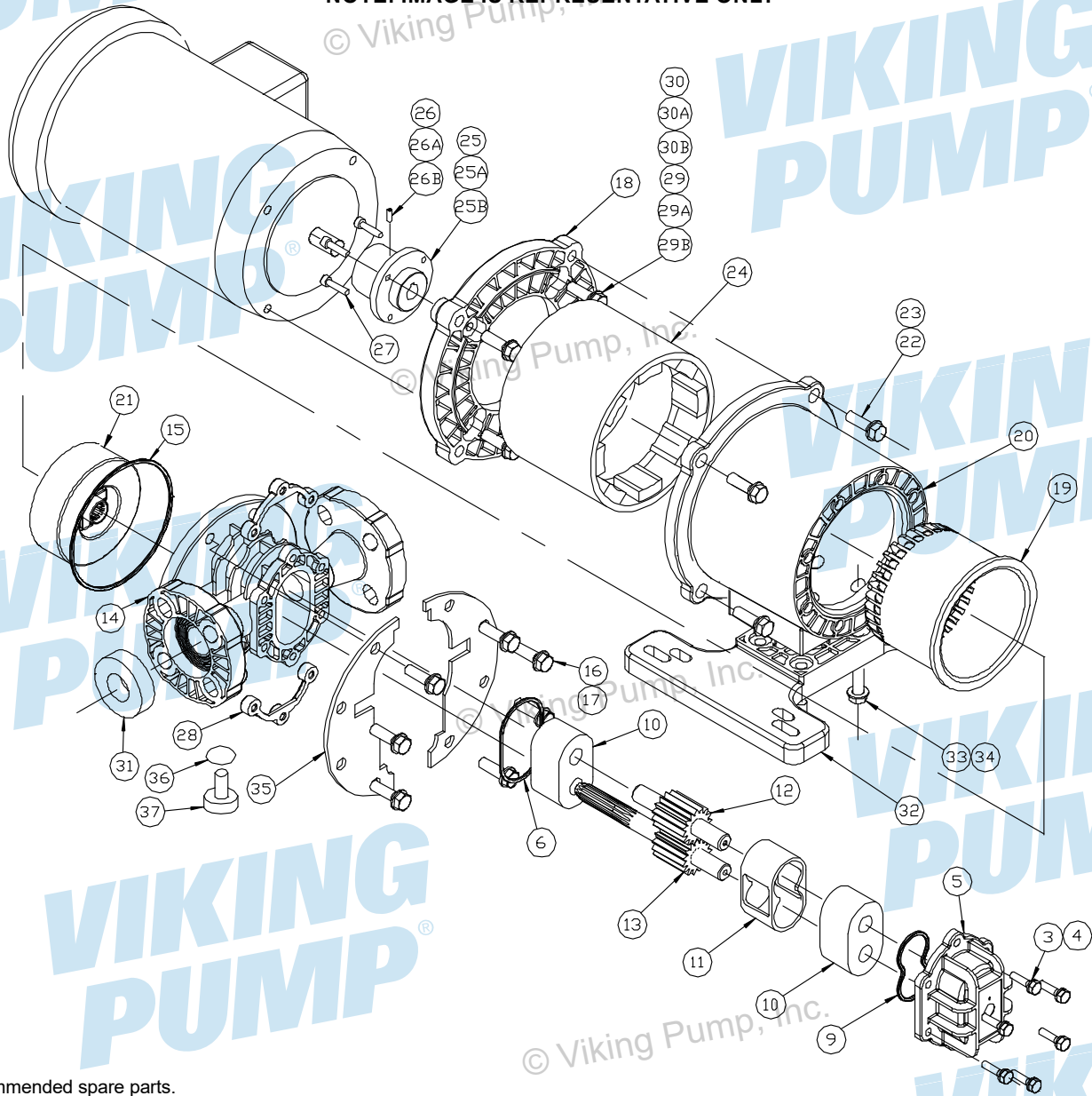
FIGURE 6: EXPLODED VIEW E25 PUMP (TYPICAL)
NOTE: IMAGE IS REPRESENTATIVE ONLY



* Recommended spare parts.

Item	Name Of Part	Item	Name Of Part	Item	Name Of Part
2	Drive Screw	16	Bolts	28	Nut Plates
3	Bolts	17	Washers	29	Bolts
4	Washers	18	Adapter, Motor	30	Washer
5	Front Cover	19	Containment Canister	31	Flange Gaskets
6	O-Ring, Cover *	20	Adapter, Spool	32	Mounting Base
9	O-Ring, Compression *	21	Driven Magnet Assembly	33	Bolt
10	Bearing *	22	Bolt	34	Washer
11	Housing Liner *	23	Washer	35	Retaining Plate
12	Idler Gear Assembly *	24	Drive Magnet	36	O-Ring, Drain Plug *
13	Drive Gear Assembly *	25	Coupling Hub	37	Drain Plug
14	Center Housing Flange	26	Set Screw		
15	O-Ring, Containment Canister *	27	Screws		

FIGURE 7: EXPLODED VIEW E75 PUMP (TYPICAL)
NOTE: IMAGE IS REPRESENTATIVE ONLY



* Recommended spare parts.

Item	Name Of Part	Item	Name Of Part	Item	Name Of Part
2	Drive Screw	16	Bolts	28	Nut Plates
3	Bolts	17	Washers	29	Bolts
4	Washers	18	Adapter, Motor	30	Washer
5	Front Cover	19	Containment Canister	31	Flange Gaskets
6	O-Ring, Cover *	20	Adapter, Spool	32	Mounting Base
9	O-Ring, Compression *	21	Driven Magnet Assembly	33	Bolt
10	Bearing *	22	Bolt	34	Washer
11	Housing Liner *	23	Washer	35	Retaining Plate
12	Idle Gear Assembly *	24	Drive Magnet	36	O-Ring, Drain Plug *
13	Drive Gear Assembly *	25	Coupling Hub	37	Drain Plug
14	Center Housing Flange	26	Set Screw		
15	O-Ring, Containment Canister *	27	Screws		

DISASSEMBLY / ASSEMBLY - E02

⚠ WARNING !

Before performing any maintenance requiring pump disassembly, be sure to relieve pressure from the piping system and, where hazardous process materials are involved, render the pump safe to personnel and the environment by cleaning and chemically neutralizing as appropriate. Wear protective clothing and equipment as appropriate.

⚠ CAUTION !

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

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

Completely assembled magnetic couplings will not affect items listed above - only disassembled components.

There are no known harmful effects of these magnetic fields on the human body.

⚠ DANGER !

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

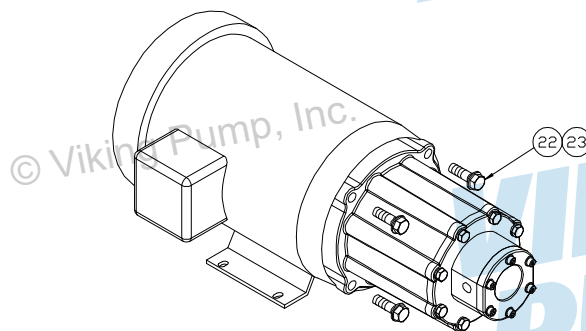
1. That any pressure in the chamber has been completely vented through the suction or discharge lines, or other appropriate openings or connections.
2. That the driving means (motor, turbine, engine, etc.) has been "locked out" or made non-operational, so that it cannot be started while work is being done on pump.
3. That you know what liquid the pump has been handling and the precautions necessary to safely handle the liquid. Obtain a material safety data sheet (MSDS) for the liquid to be sure these precautions are understood.

Failure to follow above listed precautionary measures may result in serious injury or death.

DISASSEMBLY

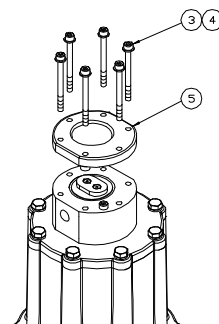
- Close all suction and discharge valves.
 - Disconnect the power source to the motor.
 - Flush and drain the pump.
 - Remove the piping (optional for repair kit).
 - **NOTE:** The canister area will not fully drain and will contain some process fluid.
1. Remove the four motor bolts and washers (items 22, 23) and slide the entire pump straight off the motor.

FIGURE 8



2. Place the pump assembly (motor spool down) on the work surface.
3. Remove the six bolts and flat washers (items 3, 4) and remove the front cover (item 5) as shown.

FIGURE 9



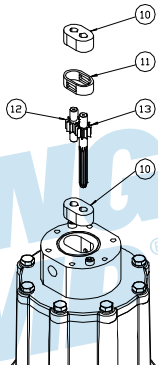
4. Remove the bearings (item 10), gear/shaft assemblies (items 12, 13) and housing liner (item 11) as shown. These parts, along with the three O-Rings make up a standard CMD Series™ repair kit. Check the parts for wear and replace with a repair kit as required.
5. Remove the two remaining bolts (item 7) to detach the center housing (item 14).
6. Remove all O-Rings from the center housing and front cover. There are two in the center housing (items 6 and 15) and one in the front cover (item 9) as shown.
7. Remove the eight mounting bolts and washers (items 16, 17) holding the adapter plate (item 18) to the motor spool (item 20) and detach the adapter plate.

⚠ CAUTION !

Once the magnets are removed from the bracket, be careful setting them down, as they will attract any iron object.

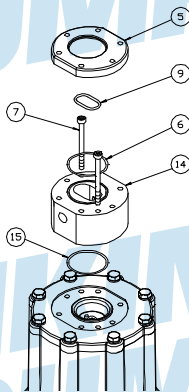
8. Remove the driven magnet assembly (item 21) and containment canister (item 19) from the adapter plate as shown.

FIGURE 10



9. Remove the drive magnet assembly (item 24) from the motor by loosening the setscrew (item 26) in the magnet hub and slide off the motor shaft. Retain the key from the motor shaft.
10. If required, the magnet hub (item 25) canister be separated from the drive magnet (item 24) by removing the four screws (item 27) and detaching.

FIGURE 11



INSPECTION

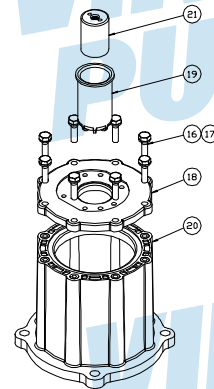
Refer to **Inspection and Wear Limits** on page 20 for details.

ASSEMBLY

1. Place the motor spool (item 20) flat on the work surface. Align “molded-in” flats on the spool adapter plate (item 18) with any two of the motor mounting bolt holes on the motor spool as shown.
2. Set in place and install eight mounting bolts and washers (items 16, 17). Tighten these bolts to the torque specified on page 20. Always tighten fasteners in a progressive “crisscross” pattern.
3. Install the containment canister (item 19) into the spool adapter plate until it is properly seated into the assembly.
4. Inspect and remove any debris or foreign materials that may have attached to the magnet.

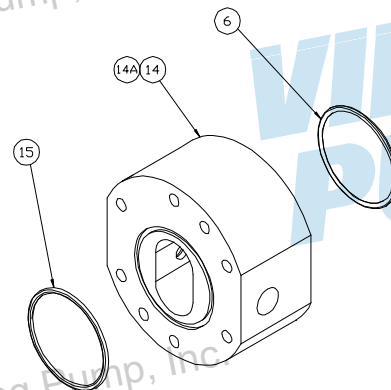
Install the driven magnet assembly (item 21) into the containment canister. The driven magnet is symmetrical and can be inserted with either end facing out (orientation does not matter).

FIGURE 12



5. Inspect all O-Rings to be sure there is no damage such as pinching prior to assembly.
6. Install O-Rings (items 6, 15) into grooves on both sides of the center housing. Some O-Ring lubricant may help keep the O-Rings in place during assembly. Be sure both O-Rings are fully seated into housing grooves.

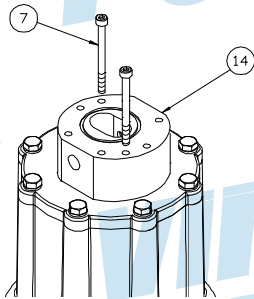
FIGURE 13



7. Place the center housing (item 14) with O-Rings installed onto the spool adapter plate (open bore facing out), aligning the flat sides on the center housing to the flat sides on the spool adapter plate as shown. If the center housing does not sit flat, rotate 180° until it seats into place.

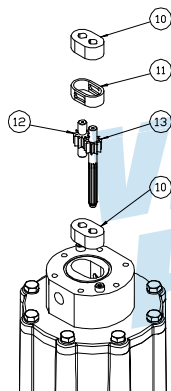
8. Secure the center housing using 2 bolts (item 7) in holes as shown. Tighten these bolts to the torque specified on page 20. Always tighten fasteners in a progressive “crisscross” pattern.

FIGURE 14



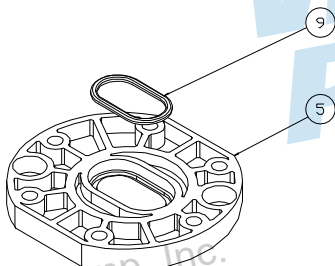
9. Insert a bearing (item 10) into the center housing (item 14) and slide to the bottom of the housing. Bearings are symmetrical and orientation does not matter.
10. Install the housing liner (item 11) and slide until it seats against the first bearing. Install the idler gear (item 12) into the top hole in the bearing until the gear seats against the first bearing.
11. Install the drive gear (item 13), splined-end first, into the assembly until it bottoms out against the bearing. The shaft may have to be rotated slightly to properly fit the splined-end into the drive magnet and gear to the idler gear assembly.
12. Insert the second bearing (item 10) into the housing bore until it rests against the housing liner. Bearings are symmetrical and orientation does not matter.

FIGURE 15



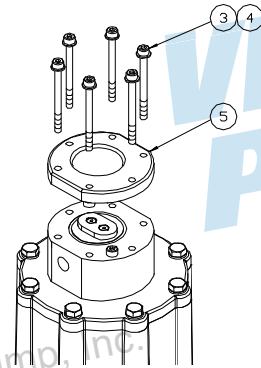
13. Install the spacer O-Ring (item 9) into the front cover as shown. Some O-Ring lubricant may help keep the O-Rings in place during assembly.

FIGURE 16



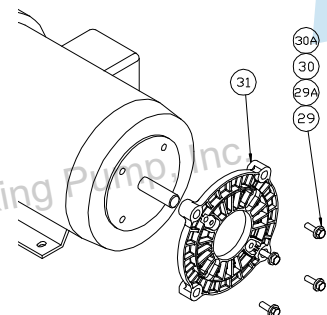
14. Install the front cover with spacer O-Ring using the six bolts and washers. Tighten these bolts to the torque specified on page 20. Always tighten fasteners in a progressive “crisscross” pattern.

FIGURE 17



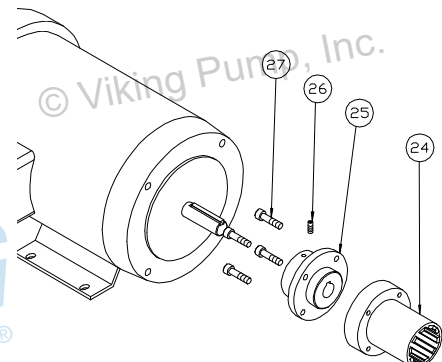
15. For IEC frame motors only, if it was removed, install the motor adaptor plate (item 31) onto the motor face using the four bolts and washers (items 29 and 30). Always tighten fasteners in a progressive “crisscross” pattern.

FIGURE 18



16. Secure the magnet hub (item 25) to the drive magnet (item 24) using the four screws (item 27). Always tighten fasteners in a progressive “crisscross” pattern.

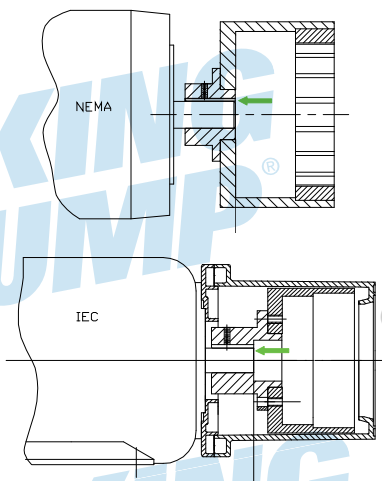
FIGURE 19



17. Align the keyway, and slide the drive magnet onto the motor shaft until the end of the motor shaft aligns with faces of the drive magnet motor hub, as shown below. Secure with the setscrew (item 26). Application of a no-seize compound on the shaft and key will make future maintenance easier.

18. Complete the assembly by replacing the assembled pump onto the motor, using care not to allow fingers to get pinched when the magnets attract. Secure the pump to the motor with the four bolts and washers (items 22, 23). Always tighten fasteners in a progressive "crisscross" pattern.

FIGURE 20



DISASSEMBLY / ASSEMBLY - E05 & E12

⚠ WARNING !

Before performing any maintenance requiring pump disassembly, be sure to relieve pressure from the piping system and, where hazardous process materials are involved, render the pump safe to personnel and the environment by cleaning and chemically neutralizing as appropriate. Wear protective clothing and equipment as appropriate.

⚠ CAUTION !

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

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

Completely assembled magnetic couplings will not affect items listed above - only disassembled components.

There are no known harmful effects of these magnetic fields on the human body.

⚠ DANGER !

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

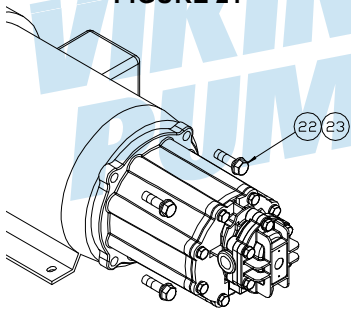
1. That any pressure in the chamber has been completely vented through the suction or discharge lines, or other appropriate openings or connections.
2. That the driving means (motor, turbine, engine, etc.) has been "locked out" or made non-operational, so that it cannot be started while work is being done on pump.
3. That you know what liquid the pump has been handling and the precautions necessary to safely handle the liquid. Obtain a material safety data sheet (MSDS) for the liquid to be sure these precautions are understood.

Failure to follow above listed precautionary measures may result in serious injury or death.

DISASSEMBLY

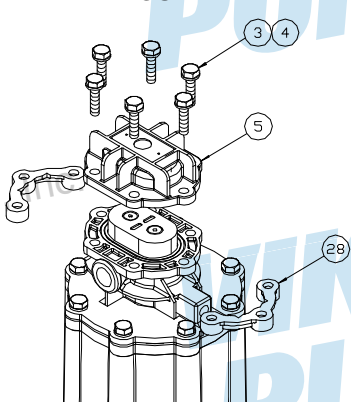
- Close all suction and discharge valves.
 - Disconnect the power source to the motor.
 - Flush and drain the pump.
 - Remove the piping (optional for repair kit).
 - **NOTE:** The canister area will not fully drain and will contain some process fluid.
1. Remove the four motor bolts and washers (items 22, 23) and slide the entire pump straight off the motor.

FIGURE 21



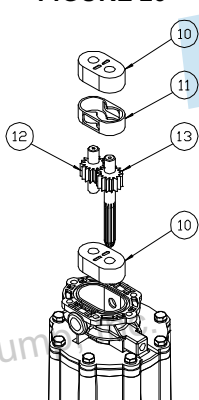
2. Place the pump assembly (motor spool down) on the work surface.
3. Remove the six bolts and washers (items 3, 4), remove front cover (item 5) and nut plates (item 28) as shown.

FIGURE 22



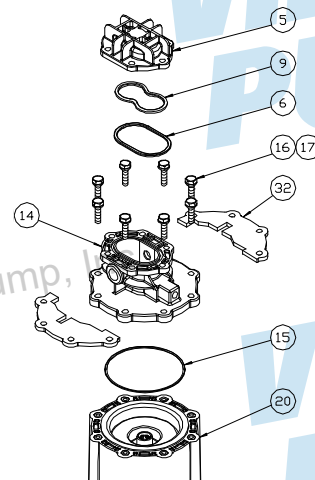
4. Remove the bearings (item 10), gear/shaft assemblies (items 12, 13) and housing liner (item 11) as shown. These parts, along with the four O-Rings make up a standard CMD Series™ repair kit. Check parts for wear and replace with a repair kit as required.

FIGURE 23



5. Remove the eight mounting bolts and washers (items 16, 17) holding the center housing (item 14) to the motor spool (item 20). Remove the center housing and retaining plates (item 32).
6. Remove all O-Rings from the center housing and front cover. There are two O-Rings in the center housing (items 6, 15) and one in the front cover (item 9) as show.

FIGURE 24

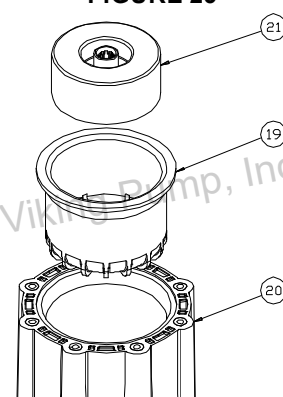


⚠ CAUTION !

Once the magnets are removed from the bracket, be careful setting them down, as they will attract any iron object.

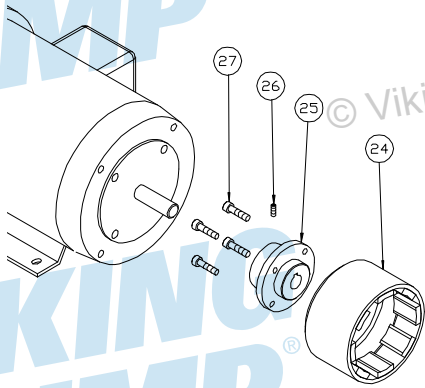
7. Remove the eight mounting bolts and washers (items 16, 17) holding the adapter plate (item 18) to the motor spool (item 20) and detach the adapter plate.

FIGURE 25



8. Remove the drive magnet assembly from the motor by loosening the setscrew (item 26) in the magnet hub (item 25) and slide off the motor shaft. Retain the key from the motor shaft.
9. If required, the magnet hub (item 25) can be separated from the drive magnet (item 24) by removing the four screws (item 27) and detaching.

FIGURE 26



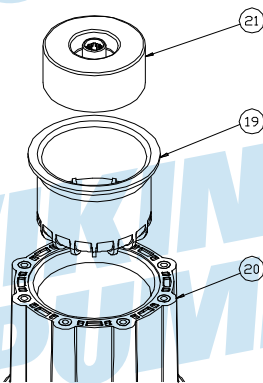
INSPECTION

Refer to **Inspection and Wear Limits** on page 20 for details.

ASSEMBLY

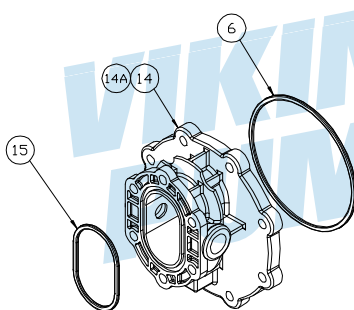
1. Place the motor spool (item 20) flat on the work surface.
2. Insert the containment canister (item 19) and driven magnet (item 21) into the motor spool as shown. The driven magnet is symmetrical and orientation does not matter.

FIGURE 27



3. Inspect all O-Rings to be sure there is no damage such as pinching prior to assembly.

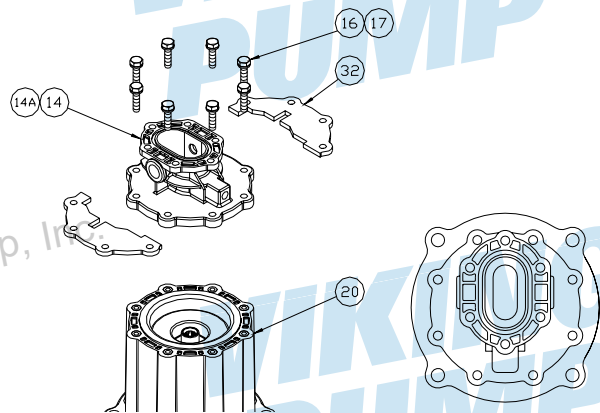
FIGURE 28



4. Install O-Rings (items 6, 15) into each side of the center housing (item 14) as shown. Some O-Ring lubricant may help keep the O-Rings in place during assembly. Be sure both O-Rings are fully seated into housing grooves.

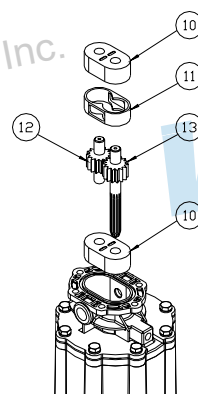
5. Place the center housing, with O-Rings, onto the motor spool, aligning the port connections between any set of motor spool bolt holes as shown. Add the retaining plates (item 32). Secure with eight bolts and washers (items 16, 17). Tighten these bolts to the torque specified on page 20. Always tighten fasteners in a progressive "crisscross" pattern.

FIGURE 29



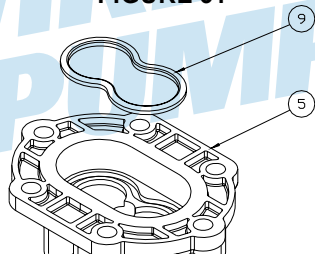
6. Insert a bearing (item 10) into the center housing and slide to bottom of bore. Bearings are symmetrical and orientation does not matter. Install the housing liner (item 11) and slide until it seats against the first bearing. Install the idler gear (item 12) into the top hole in the bearing until the gear seats against the first bearing.
7. Install the drive gear (item 13), splined-end first, into the assembly until it bottoms out against the bearing. The shaft may have to be rotated slightly to properly fit the splined-end into the drive magnet and mesh gear teeth with the idler gear.
8. Insert the second bearing (item 10) into the housing bore until it rests against the housing liner. Bearings are symmetrical and orientation does not matter.

FIGURE 30



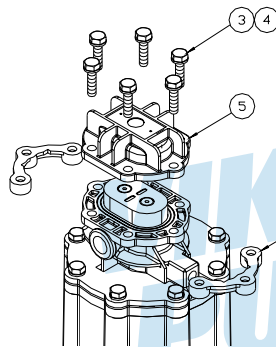
9. Install the spacer O-Ring (item 9) into the front cover (item 5) as shown. Some O-Ring lubricant may help keep the O-Rings in place during assembly.

FIGURE 31



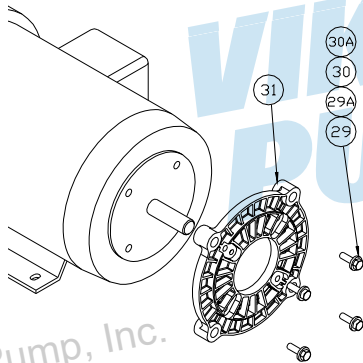
- 10.** Place the front cover (item 5) with O-Ring onto the assembled pump. Secure the front cover using the six bolts and washers (items 3, 4) and two nut plates (item 28) as shown. The flat side of the nut plates mate against the back of the center housing flange. Tighten these bolts to the torque specified on page 20. Always tighten fasteners in a progressive “crisscross” pattern.

FIGURE 32



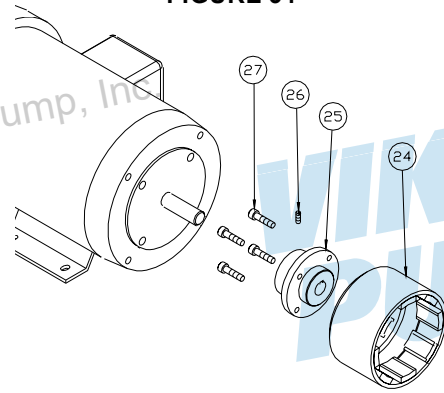
- 11.** For IEC frame motors only, if it was removed, install the motor adaptor plate (item 31) onto the motor face using the four bolts and washers (items 29 and 30). Always tighten fasteners in a progressive “crisscross” pattern.

FIGURE 33



- 12.** Secure the magnet hub (item 25) to the drive magnet (item 24) using the four screws (item 27). Always tighten fasteners in a progressive “crisscross” pattern.

FIGURE 34

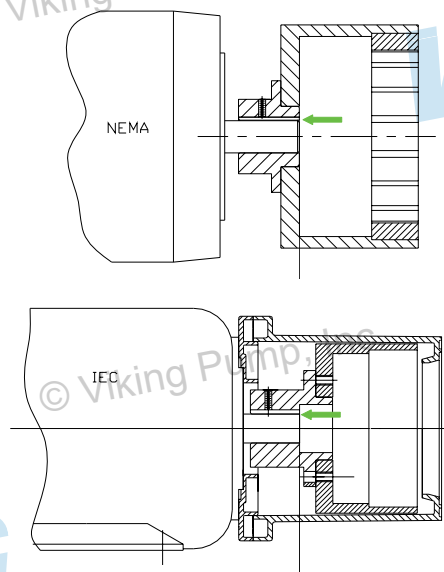


- 13.** Inspect and remove any debris or foreign materials that may have attached to the magnet.

Align the keyway, and slide the drive magnet onto the motor shaft until the end of the motor shaft aligns with faces of the drive magnet motor hub as shown below. Secure with the setscrew (item 26). Application of a no-seize compound on the shaft and key will make future maintenance easier.

- 14.** Complete the assembly by replacing the assembled pump onto the motor, using care not to allow fingers to get pinched when the magnets attract. Secure the pump to the motor with the four bolts and washers (items 22, 23). Always tighten fasteners in a progressive “crisscross” pattern.

FIGURE 35



DISASSEMBLY / ASSEMBLY - E25 & E75

⚠ WARNING !

Before performing any maintenance requiring pump disassembly, be sure to relieve pressure from the piping system and, where hazardous process materials are involved, render the pump safe to personnel and the environment by cleaning and chemically neutralizing as appropriate. Wear protective clothing and equipment as appropriate.

⚠ CAUTION !

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

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

Completely assembled magnetic couplings will not affect items listed above - only disassembled components.

There are no known harmful effects of these magnetic fields on the human body.

⚠ DANGER !

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

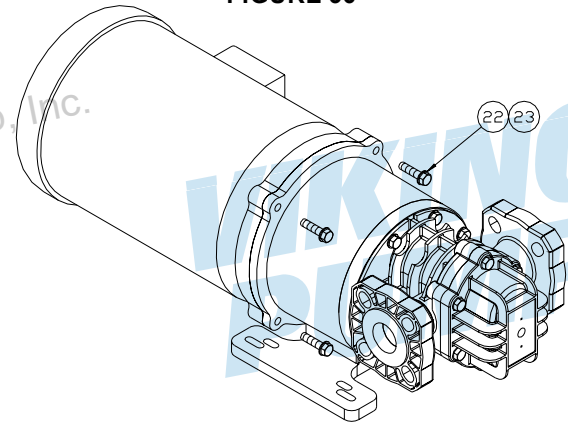
1. That any pressure in the chamber has been completely vented through the suction or discharge lines, or other appropriate openings or connections.
2. That the driving means (motor, turbine, engine, etc.) has been "locked out" or made non-operational, so that it cannot be started while work is being done on pump.
3. That you know what liquid the pump has been handling and the precautions necessary to safely handle the liquid. Obtain a material safety data sheet (MSDS) for the liquid to be sure these precautions are understood.

Failure to follow above listed precautionary measures may result in serious injury or death.

DISASSEMBLY

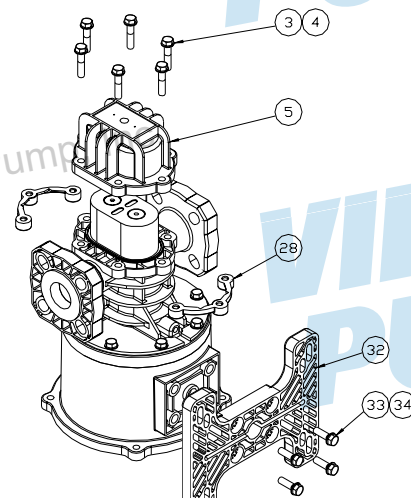
- Close all suction and discharge valves.
 - Disconnect power source to motor.
 - Flush and drain pump.
 - Remove piping (optional for repair kit).
 - **NOTE:** The canister area will not fully drain and will contain some process fluid.
1. Remove the four motor bolts and washers (items 22, 23) and slide the entire pump straight off the motor.

FIGURE 36



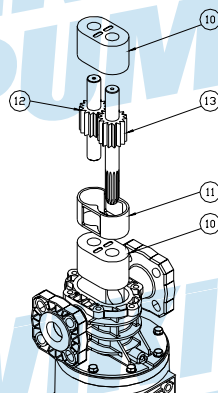
2. Place the pump assembly (motor spool down) on the work surface.
3. Remove the six bolts and washers (items 3, 4), remove front cover (item 5) and nut plates (item 28) as shown.
4. If required, the mounting base (item 32) can be detached by removing the four bolts and washers (items 33, 34) as shown.

FIGURE 37



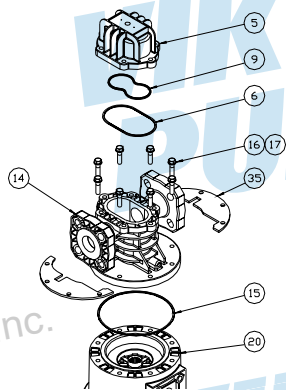
5. Remove the bearings (item 10), gear/shaft assemblies (items 12, 13) and housing liner (item 11) as shown. These parts, along with the four O-Rings make up a standard CMD Series[™] repair parts kit. Check parts for wear and replace with a repair kit as required.

FIGURE 38



6. Remove the eight mounting bolts and washers (items 16, 17) holding the center housing (item 14) to the motor spool (item 20). Detach the center housing and retaining plates (item 35).
7. Remove all O-Rings from the center housing and front cover. There is one O-Ring in the center housing (item 15) and two in the front cover (items 6, 9) as shown.

FIGURE 39

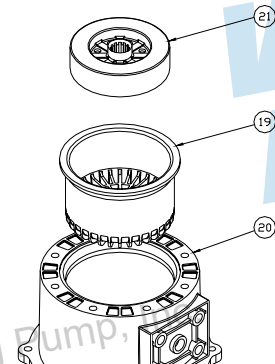


CAUTION !

Once the magnets are removed from the bracket, be careful setting them down, as they will attract any iron object.

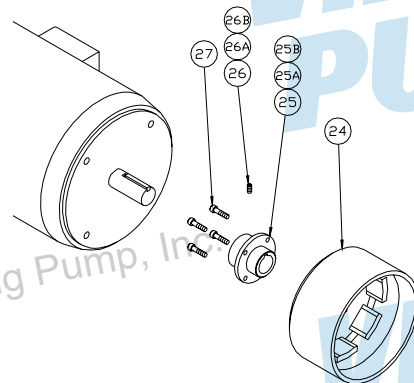
8. Remove driven magnet assembly (item 21) and containment canister (item 19) from the motor spool (item 20) as shown.

FIGURE 40



9. Remove drive magnet assembly from the motor by loosening the setscrew (item 26) in the magnet hub (item 25) and slide off the motor shaft. Retain the key from the motor shaft.
10. If required, the magnet hub (item 25) can be separated from the drive magnet (item 24) by removing the four screws (item 27) and detaching.

FIGURE 41



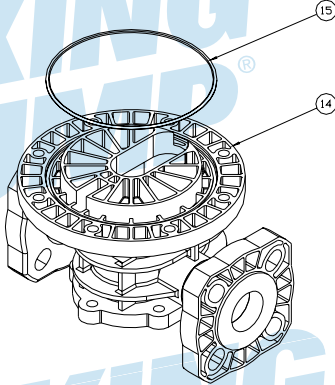
INSPECTION

Refer to **Inspection and Wear Limits** on page 20 for details.

ASSEMBLY

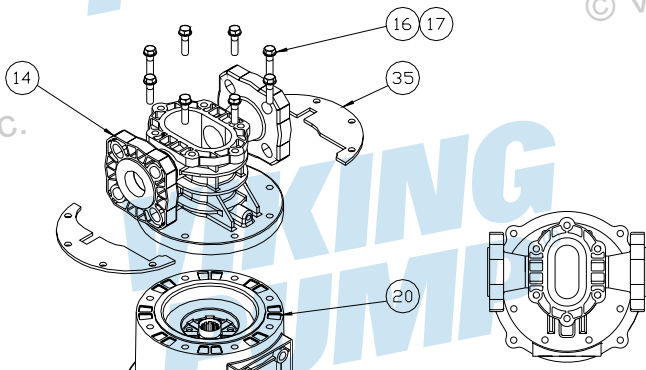
1. Place the motor spool flat on the work surface.
2. Insert containment canister (item 19) and driven magnet (item 21) into motor spool (item 20) as shown. The driven magnet is symmetrical and orientation does not matter. Refer to Figure 38.
3. Inspect all O-Rings to be sure there is no damage such as pinching prior to assembly.

FIGURE 42



4. Install O-Ring (item 15) into the back side of the center housing (item 14) as shown. Some O-Ring lubricant may help keep the O-Rings in place during assembly. Be sure the O-Ring is fully seated into housing groove.

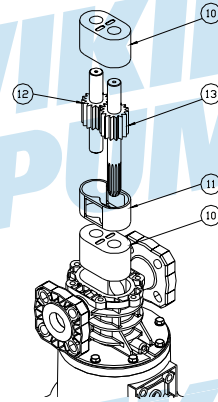
FIGURE 43



5. Place the center housing (item 14) onto the motor spool, aligning the port connections with the pump baseplate as shown. Place the two retaining plates (item 35) onto the center housing and secure with eight bolts and washers (items 16, 17). Tighten bolts to the torque specified on page 20. Always tighten fasteners in a progressive "crisscross" pattern.
6. Insert a bearing (item 10) into center housing (item 14) and slide to bottom of bore. Bearings are symmetrical and orientation does not matter. Install the housing liner (item 11) and slide until it seats against the first bearing. Install idler gear (item 12) into the top hole in the bearing until the gear seats against the first bearing.
7. Install the drive gear (item 13), splined-end first, into the assembly until it bottoms out against the bearing. The shaft may have to be rotated slightly to properly fit the splined-end into the drive magnet and mesh gear teeth with the idler gear.

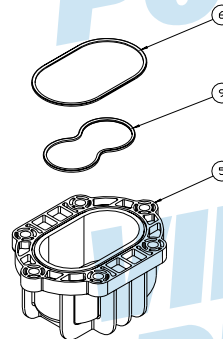
8. Insert the second bearing into the housing bore until it rests against the housing liner. Bearings are symmetrical and orientation does not matter.

FIGURE 44



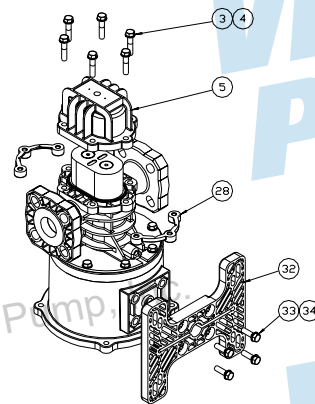
9. Install the two O-Rings (items 6, 9) into the front cover (item 5) as shown. Some O-Ring lubricant may help keep the O-Rings in place during assembly.

FIGURE 45



10. Place the front cover (item 5) with O-Ring onto the assembled pump. Secure the front cover using the six bolts and washers (items 3, 4) and two nut plates (item 28) as shown. The flat side of the nut plates mate against the back of the center housing flange. Tighten bolts to the torque specified on page 20. Always tighten fasteners in a progressive "crisscross" pattern.

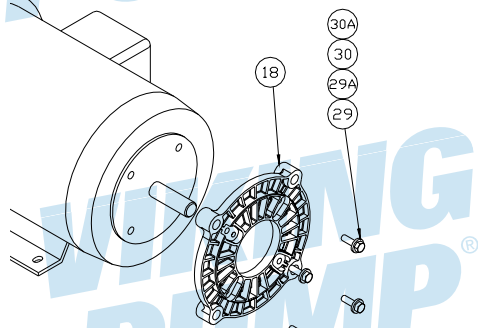
FIGURE 46



11. Secure the mounting base (item 32) to the motor spool (item 20) using the four bolts and washers (items 33, 34) as shown. Always tighten fasteners in a progressive "crisscross" pattern.

12. If it was removed, install the motor adaptor plate (item 18) onto the motor face using the four bolts and washers (items 29 and 30). Always tighten fasteners in a progressive “crisscross” pattern.

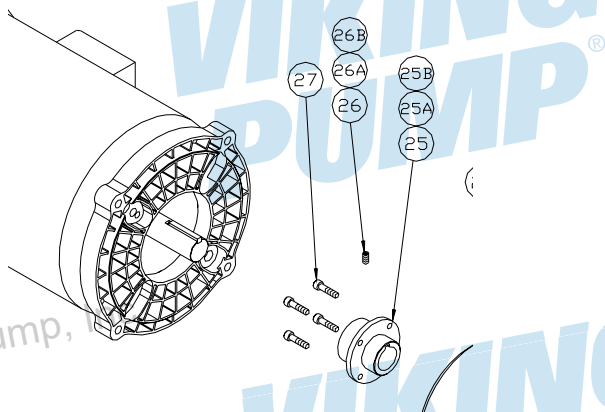
FIGURE 47



13. Inspect and remove any debris or foreign materials that may have attached to the magnet.

Secure the magnet hub (item 25) to the drive magnet (item 24) using the four screws (item 27). Always tighten fasteners in a progressive “crisscross” pattern.

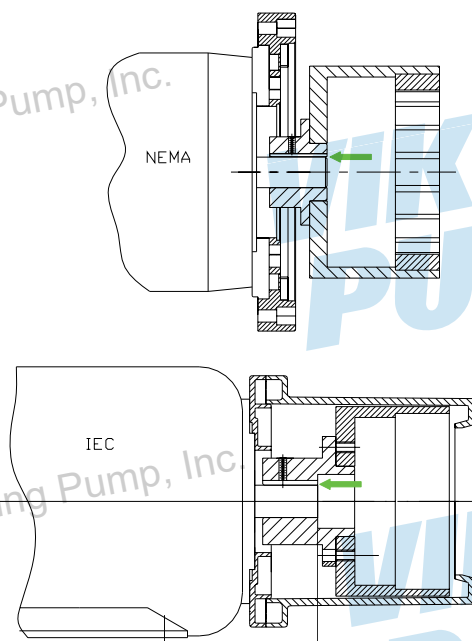
FIGURE 48



14. Align the keyway, and slide the drive magnet onto the motor shaft until the end of the motor shaft aligns with faces of the drive magnet motor hub as shown below. Secure with the setscrew (item 26). Application of a no-seize compound on the shaft and key will make future maintenance easier.

15. Complete the assembly by replacing the assembled pump onto the motor, using care not to allow fingers to get pinched when the magnets attract. Secure the pump to the motor with the four bolts and washers (items 22, 23). Always tighten fasteners in a progressive “crisscross” pattern.

FIGURE 49



INSPECTION & WEAR LIMITS

Inspect internal pump components as follows:

BEARINGS

Inspect bearing bores (2) and end surfaces for wear and scoring. If wear or scoring is present on the end surface of the bearing, the bearing can be flipped to expose the undamaged face to the gear side. Bearing should be replaced when both ends show wear and/or scoring, or when the bores have reached the replacement limit (see chart).

SHAFTS

Both the idler and the drive shaft should be inspected carefully for scoring, wear, and any signs of cracking or chips in the surface of the ceramic material. No cracks or chips are allowed. Shafts should be replaced if they show signs of cracks or chips anywhere on the surface, if they are deeply scored, or if they have reached their replacement limit (see chart).

GEARS

Gears can be measured for dimensional change to their length and outside diameter. Gear teeth should also be visually inspected for wear and damage. Gear teeth can be damaged due to solids moving through the pump, which will affect only some teeth, or excessive pressure, which will distort the outside tips of all teeth. Gears that have reached their replacement limits (see chart) or show signs of physical damage or distortion should be replaced. Backlash can be checked by temporarily inserting the two gear/shaft assemblies into known good bearings and observing gear tooth mesh and backlash.

HOUSING LINER

The housing liner should be visually inspected for scoring, wear, and steps on the ID of the two gear bores. See chart for specific limits.

SPECIAL NOTE, VISCOSITY

The viscosity of the pumped product will affect the service limits of your CMD Series™ pump. Fluids with higher viscosities will usually be more tolerant of wear and allow longer maintenance intervals. Fluids with low viscosities will usually require more frequent maintenance, as they are less tolerant of clearances between the pump's internal surfaces. Each application is different, and only regular inspection and good records will determine what the correct maintenance interval is for your application.

SERVICE & REPLACEMENT LIMITS

Part	Pump Model	New Spec Dimension	Serviceable Limit	Replacement Limit
Bearings	E02	ID 0.293"	0.0025 bore wear	0.005 bore wear
		Length 0.499"	end wear – flip over	both ends worn
	E05 & E12	ID 0.439"	0.003 bore wear	0.006 bore wear
	E25	ID 0.627"	end wear – flip over	both ends worn
			0.004 bore wear	0.008 bore wear
	E75	ID 1.002"	end wear – flip over	both ends worn
Shafts	E02	OD 0.2916"	0.001 smooth wear	0.001 deep or rough scoring
	E05 & E12	OD 0.437"		
	E25	OD 0.625"		
	E75	OD 1.000"		
	NOTE: no cracks or chips in shaft surface are allowed			
Gears	E02	Length 0.4055"	0.0005 wear – length	0.001 wear – length
		OD 0.600"	0.003 wear – OD	0.006 wear – OD
			0.010 Backlash	0.020 Backlash
	E05	Length 0.624"	0.001 wear – length	0.002 wear – length
		OD 1.063"	0.004 wear – OD	0.008 wear – OD
			0.015 Backlash	0.030 Backlash
	E12	Length 1.249"	Same as E05 above	Same as E05 above
		OD 1.063"		
	E25	Length 1.499"	0.002 wear – length	0.004 wear – length
		OD 1.417"	0.005 wear – OD	0.010 wear – OD
			0.020 Backlash	0.040 Backlash
	E75	Length 1.998"	0.003 wear – length	0.006 wear – length
		OD 2.125"	0.006 wear – OD	0.012 wear – OD
0.025 Backlash			0.050 Backlash	
Housing Liner	E02	n/a	0.002 wear or step	0.004 wear or step
	E05 & E12	n/a	0.003 wear or step	0.006 wear or step
	E25	n/a	0.004 wear or step	0.008 wear or step
	E75	n/a	0.005 wear or step	0.010 wear or step

TROUBLESHOOTING CHART

Symptom	Probable Cause	Remedy
No Liquid Delivered	Pump not primed.	Prime pump. Ensure suction piping and any strainers are clean and clear of any obstructions.
	Motor Incorrectly wired.	Check wiring diagram.
	Air leak in suction.	Locate and repair leak.
	Rotation direction incorrect.	Reverse motor wiring.
	Suction and/or discharge valves closed.	Open valves.
	Suction lift too high.	Do not exceed published limits.
	Magnetic coupling decoupled.	Stop motor, eliminate blockage or jamming and restart. If no blockage exists verify that operating conditions do not exceed capabilities of the pump.
Low Liquid Delivery	Discharge head higher than calculated.	Reduce discharge restrictions e.g.: open throttle valve or back-pressure valve.
	Air leak in suction.	Locate and repair leak.
	Rotational speed incorrect.	Check speed and wiring. Adjust as required.
	Suction pipe restrictions.	Ensure suction valve is fully open and strainer is clean.
	Pressure relief valve open.	Reset PRV to proper setting based on system pressure.
	Pump components worn.	Inspect and repair as required.
Low Discharge Pressure	Rotational speed incorrect.	Check speed and adjust as required.
	Air leak in suction.	Repair leak.
	Air or gas in liquid.	Eliminate air or gas that can be caused by obstructions in suction piping, leak in suction pipe, or cavitation and/or boiling of pumped fluid.
	Pump components worn.	Inspect and repair as required.
Pump Gradually Loses Prime	Air pocket in suction line.	Eliminate pocket.
	Air entering suction line.	Keep suction inlet submerged at all times.
Pump Noisy	Pump worn or damaged.	Inspect and repair as required.
	Air or gas in liquid.	Eliminate air or gas.
Motor Runs Hot or Overloads	It is normal for motors to feel hot even when not overloaded.	Check the actual temperature of the motor housing with suitable instrumentation. Verify the figures with the motor manufacturer.
	Motor wired incorrectly.	Check wiring diagram.
	Voltage or frequency low.	Correct condition.
	Motor not sized correctly for the flow.	Higher pressures may require more power than the motor is capable of.
	Heavy or viscous liquid being pumped.	Pumping fluids heavier or more viscous than water requires a properly sized, higher powered motor.
	Binding internal pump parts.	Inspect and correct condition.

BOLT TORQUE RECOMMENDATIONS

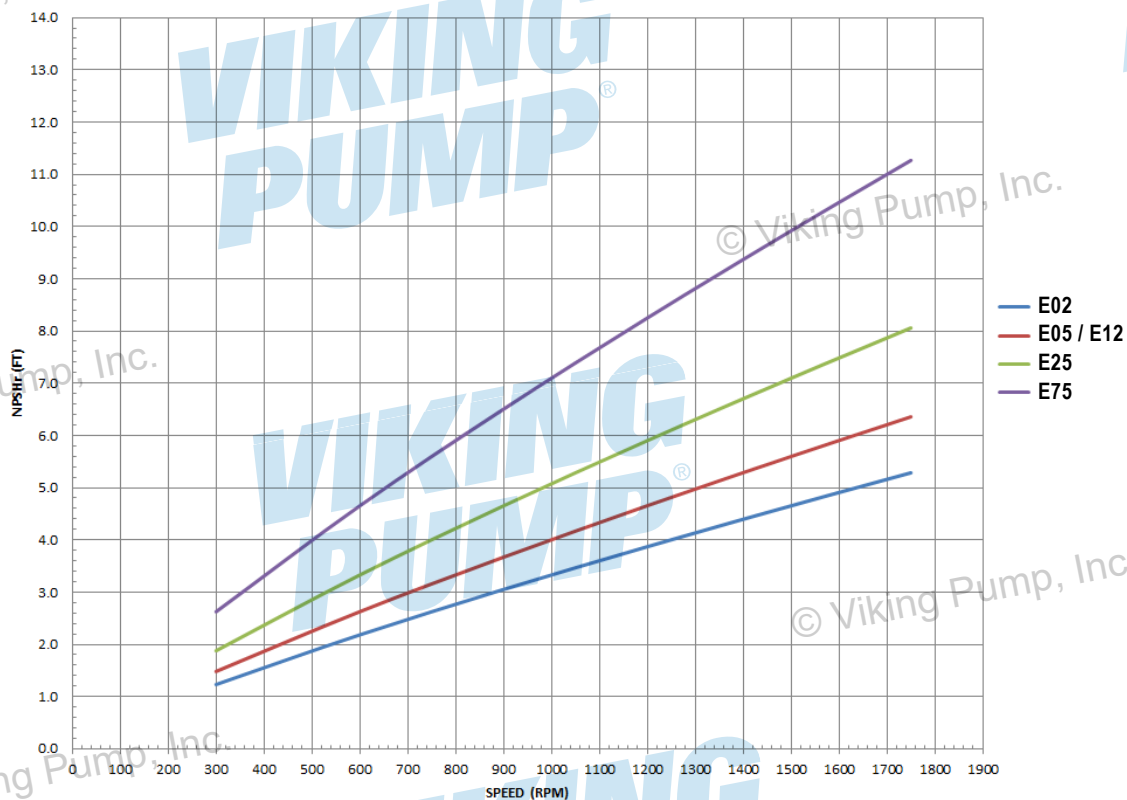
Pump Size	Bolt Position	Bolt Size	Recommended Torque	
			in-lbs	N-m
E02	Front Cover / Housing	10 - 32	15	1.7
	Housing Adaptor -to- Spool	1/4 - 20	48	5.4
	Spool -to- Motor Adaptor or Motor	3/8 - 16	72	8.1
	Motor Adaptor -to- Motor			
	56C	3/8 - 16	72	8.1
	63 B14	M5 - 0.80	24	2.7
	80 B14	M6 - 1.00	48	5.4
E05 & E12	143TC - 182C	3/8 - 16	120	13.6
	Front Cover	1/4 - 20	60	6.8
	Housing -to- Spool	1/4 - 20	60	6.8
	Spool -to- Motor Adaptor or Motor	3/8 - 16	72	8.1
	Motor Adaptor -to- Motor			
	56C	3/8 - 16	72	8.1
	143TC - 182C	3/8 - 16	72	8.1
E25	63 B14	M5 - 0.80	24	2.7
	80 B14	M6 - 1.00	48	5.4
	Front Cover	1/4 - 20	72	8.1
	Housing -to- Spool	3/8 - 16	120	13.6
	Spool -to- Motor Adaptor	3/8 - 16	120	13.6
	Base Mount -to- Spool	3/8 - 16	120	13.6
	Flange Bolts (min. to seal)	Varies	120	13.6
	Motor Adaptor -to- Motor			
	56C		72	8.1
	143TC - 182C	3/8 - 16	120	13.6
E75	90 B14	M8 - 1.25	120	13.6
	100 - 112 B14	M8 - 1.25	120	13.6
	Front Cover	3/8 - 16	120	13.6
	Housing -to- Spool	3/8 - 16	120	13.6
	Spool -to- Motor Adaptor	3/8 - 16	120	13.6
	Base Mount -to- Spool	3/8 - 16	120	13.6
	Flange Bolts (min. to seal)	Varies	120	13.6
	Motor Adaptor -to- Motor			
	143TC - 182C	3/8 - 16	120	13.6
	182TC - 184TC	1/2 - 13	120	13.6
	213TC - 215TC	1/2 - 13	120	13.6
	100 - 112 B14	M8 - 1.25	120	13.6

MAXIMUM FLANGE LOADS

Pump Size	Flange Loads: lb. (N)	Flange Loads: ft-lb (Nm)
E02	25 (111)	10 (13.5)
E05	25 (111)	20 (27)
E12	25 (111)	25 (33)
E25	30 (133)	20 (27)
E75	50 (222)	25 (34)

NPSH REQUIRED

RPM	NPSH Required, Ft				
	E02	E05	E12	E25	E75
1750	5.3	6.4	6.4	8.1	11.3
1500	4.7	5.6	5.6	7.1	9.9
1200	3.9	4.7	4.7	5.9	8.2
900	3.1	3.7	3.7	4.7	6.5
600	2.2	2.6	2.6	3.3	4.7
300	1.2	1.5	1.5	1.9	2.6



SOLIDS HANDLING CAPABILITY

- **Size:** 70 Microns / 0.003 inches / 0.07 mm
- **Maximum Concentrations:** 10%
- 200 Mesh strainer recommended

MAXIMUM SOUND LEVELS

Pump Size	Sound Level (dB)
E02	80
E05	81
E12	82
E25	83
E75	85

VIKING PUMP®

TECHNICAL SERVICE MANUAL: INSTALLATION, OPERATION & MAINTENANCE

SPUR GEAR PRODUCT LINE:
COMPOSITE MAG DRIVE PUMPS
CMD SERIES™
MODELS: E02, E05, E12, E25, E75

TSM	1253
Page	24 of 24
Issue	A

⚠ CAUTION !

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

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

VIKING PUMP®

WARRANTY

Viking pumps, strainers and reducers are warranted to be free of defects in material and workmanship under normal conditions of use and service. The warranty period varies by type of product. A Viking product that fails during its warranty period under normal conditions of use and service due to a defect in material or workmanship will be repaired or replaced by Viking. At Viking's sole option, Viking may refund (in cash or by credit) the purchase price paid to it for a Viking product (less a reasonable allowance for the period of use) in lieu of repair or replacement of such Viking product. Viking's warranty is subject to certain restrictions, limitations, exclusions and exceptions. A complete copy of Viking's warranty, including warranty periods and applicable restrictions, limitations, exclusions and exceptions, is posted on Viking's website (www.vikingpump.com/warranty#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.

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

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

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