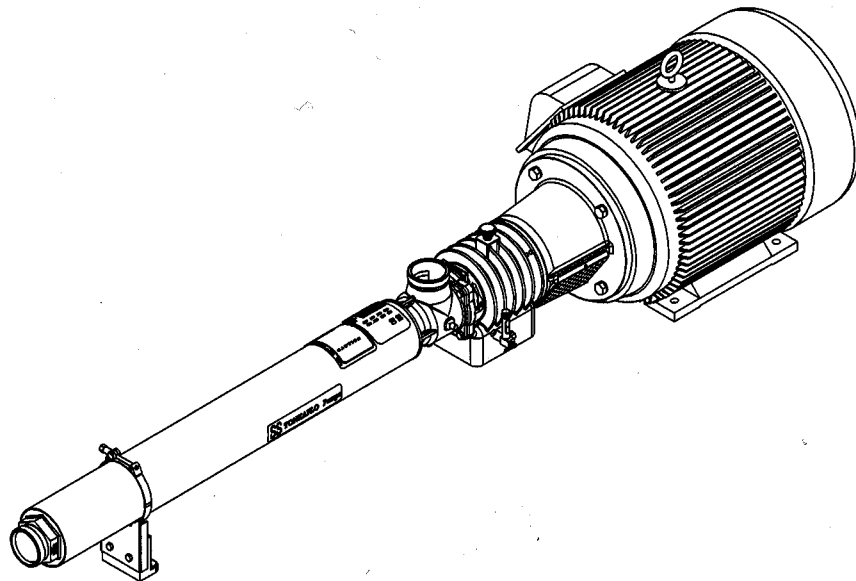


OSMONICS TONKAFLO[®] PUMPS SS SERIES

INSTALLATION, OPERATION, AND MAINTENANCE MANUAL



FOR SS5500, SS8500, SS12500, and
SS24000 SERIES HIGH-PRESSURE
TONKAFLO CENTRIFUGAL PUMPS
WITH KZ-BEARING FRAMES

GE Infrastructure
Water & Process Technologies



INSTALLATION, OPERATION, AND MAINTENANCE MANUAL

FOR SS5500, SS8500, SS12500, AND SS24000 SERIES HIGH-PRESSURE TONKAFLO® CENTRIFUGAL PUMPS WITH TYPE KZ-BEARING FRAMES

TABLE OF CONTENTS

	<u>Page</u>
1.0 INTRODUCTION	1
2.0 TONKAFLO SPECIFICATIONS	2
2.1 Pump Capacities.....	2
2.2 Maximum Developed Boost Pressure.....	3
2.3 Maximum Recommended Operating Temperature	3
2.4 Standard Materials of Construction	3
2.5 Special Materials of Construction	3
2.6 Pump Nomenclature Example.....	4
2.7 Special Liquids	4
3.0 PUMP INSTALLATION	5
3.1 Check Upon Arrival.....	5
3.2 Location.....	5
3.3 Foundation	5
3.4 Flexible Coupling Installation.....	5
3.5 Coupling Guard.....	6
3.6 Piping.....	6
3.7 Bypass Piping for Multi-Stage Pumps.....	8
3.8 Suction Screen (Strainer).....	8
3.9 Discharge Screen (Strainer).....	9
3.10 Pump Piping Connections.....	9
3.11 Lubrication of KZ-Bearing Frame Pumps	10
3.11.1 Setting Oil Level	10
3.11.2 Maintaining the Oil Level.....	11
3.11.3 Oil Change/Maintenance	11
4.0 TONKAFLO PUMP START-UP.....	12
4.1 Pump Priming	12
4.2 Pump Rotation.....	12
4.3 Initial Operation.....	13

	<u>Page</u>
5.0 GENERAL TROUBLESHOOTING AT START-UP	14
5.1 Troubleshooting Chart	14
5.2 Bearing Frame Temperature	14
6.0 TONKAFLO FIELD MAINTENANCE	15
6.1 Mechanical Seal Leakage	15
6.2 Removal and Installation of Liquid End Assembly	15
6.2.1 Removal of Liquid End Assembly	15
6.2.2 Installation of Liquid End Assembly	16
6.3 Mechanical Seal Replacement	16
6.4 High-Pressure Mechanical Seal Replacement	18
6.5 Bearing Frame Maintenance for KZ-Bearing Frame Pumps	19
6.5.1 Disassembly of KZ-Bearing Frame	19
6.5.2 Bearing Frame Overhaul	19
6.5.3 Assembly of KZ-Bearing Frame	20
6.5.4 Check End Play of KZ-Bearing Frame Pumps	20
6.5.5 Install Liquid End and Remount Pump	22
6.6 Oil Seal Replacement	23
6.6.1 Replacement of Oil Seal #2	23
6.6.2 Replacement of Oil Seal #1	23
6.6.3 Replacement of Oil Chamber Bulkhead	24
7.0 TONKAFLO SERVICE POLICY - LIQUID END	25
8.0 RETURN GOODS AUTHORIZATION (RGA) PROCEDURE	26
8.1 Motor Warranty	26
8.2 In-Warranty Pump Failure	26
8.3 Out-of-Warranty Pump Failure	26
8.4 Shipping Charges	26
8.4.1 In-Warranty	26
8.4.2 Out-of-Warranty When New Pump is Purchased	26
9.0 DIMENSIONAL DRAWING	27

	<u>Page</u>
10.0 REPLACEMENT PARTS	28
10.1 Cutaway Drawing Drawing	28
10.2 Standard Model Parts List	29
10.3 Pump Accessories	30
10.4 Recommended Spare Parts List for Standard Tonkaflo Pumps with KZ-Bearing Frame	31
10.5 Complete Set of Bearing Frame Replacement Parts	32
10.6 Bearing Frame Overhaul Tools	33
10.7 Mechanical Seal Change-Out Tools	33
10.8 Ordering Parts	34
11.0 WARRANTY	35

LIST OF FIGURES

<u>Figure</u>	<u>Title</u>	
3.1	Gap Between Flanges	6
3.2	Coupling Guard Installation	6
3.3	Suction Lift Piping	7
3.4	Installation of Discharge Screen	9
3.5	Initial Cold Setting of Oil Level for KZ-Bearing Frame Pumps	11
6.6	Separation of Liquid End Assembly From Bearing Frame	15
6.7	Removal of Mechanical Seal	17
6.8	KZ-Bearing Frame Overhaul	18
6.9	Setting Bearing Frame Shaft End Play	21
9.10	Mounting Dimensions	27
10.11	Pump Cutaway Drawing	28

LIST OF TABLES

<u>Figure</u>	<u>Title</u>	
2.1	Pump Capacities	2
2.2	Maximum Developed Boost Pressure	3
3.3	Typical Heavy-Duty Hydraulic and Lubricating Oils	10

1.0 INTRODUCTION

This manual contains information important to the installation, operation, and maintenance of your GE Tonkaflo[®] multi-stage centrifugal pump. The Tonkaflo pump has been designed for reliable service in many types of pumping applications. Proper installation and normal maintenance will help ensure extended pump life and prevent costly downtime.

Before installing and operating your Tonkaflo pump, read these instructions carefully and keep the manual handy for future reference. This manual is intended for general maintenance only.

Further information may be obtained by contacting your local Tonkaflo distributor or GE. Contact GE at:

GE Infrastructure
Water & Process Technologies
5951 Clearwater Drive
Minnetonka, MN 55343-8995
USA

Phone: 952 - 933 - 2277
Fax: 952 - 933 - 0141
Toll Free: (800) 848-1750

This manual is not intended for repair or overhaul of the Tonkaflo pump liquid ends.

Only the factory or those who have successfully completed the Factory Service School and have been certified are authorized to repair, service or overhaul Tonkaflo pump liquid ends.

Your new Tonkaflo multi-stage centrifugal pump is designed for quiet, smooth running, and highly efficient operation. The materials of construction make Tonkaflo suitable for many chemical and pure water applications.

Tonkaflo pumps unique modular design allows the user to choose the number of stages which most closely match the desired performance and, thereby, achieve the highest pumping efficiency. Unlike many other pump manufacturers, Tonkaflo will produce pumps to fit your particular applications should a standard model pump not suit your requirements.

NOTE: This manual, along with all other GE Infrastructure manuals, is available at www.gewater.com.

2.0 TONKAFLO SPECIFICATIONS

The Tonkaflo pumps covered in this instruction manual are the higher capacity SS5500, SS8500, SS12500, and SS24000 Series pumps. These pumps cover a flow range of 20 - 300 gpm (4.5 - 68 m³/h) with single unit pressure up to 650 psig (44.8 barg). The capacity and discharge pressure can be increased by operating pumps in parallel or series, respectively. There is no maximum limit on capacity when operating Tonkaflo pumps in parallel. When operating pumps in series, a maximum discharge pressure of 1000 psig (69 barg) may be achieved with optional high-pressure construction on the downstream pump. With inlet pressures greater than 200 psig (13.8 barg), optional high-pressure mechanical seals should be used.

2.1 Pump Capacities

**Table 2.1
Pump Capacities**

Series	3500 rpm 60 Hertz Min - Max gpm (m ³ /h)	Maximum Number of Stages (60 Hz)	2900 rpm 50 Hertz Min - Max gpm (m ³ /h)	Maximum Number of Stages (50 Hz)	Maximum Efficiency
SS5500	20 - 75 (4.5 - 17)	24	15 - 65 (3.4 - 14.8)	36	60%
SS8500	30 - 100 (6.8 - 22.7)	27	20 - 90 (4.5 - 20.4)	36	64%
SS12500	40 - 190 (9.1 - 43.1)	22	35 - 160 (7.9 - 36.3)	30	62%
SS24000	80 - 300 (18.2 - 68.1)	16	65 - 250 (14.8 - 56.8)	18	61%

NOTE: There must be adequate flow at all times through the pump to prevent excessive heat build-up.

2.2 Maximum Developed Boost Pressure

**Table 2.2
Maximum Developed
Boost Pressure**

SS Series	Maximum Developed Pressure psig (barg)		Number of Centrifugal Stages	
	60 Hertz	50 Hertz	60 Hertz	50 Hertz
5500	225 (15.5)	235 (16.2)	8	12
8500	200 (13.8)	210 (14.9)	8	12
12500	115 (7.9)	120 (8.3)	4	6
24000	100 (6.9)	95(6.6)	4	4

2.3 Maximum Recommended Operating Temperature

The maximum recommended operating temperature range is 125°F (55°C). The maximum operating temperature is dependent upon the operating pressure. For high temperature applications, consult your local distributor or the factory for the available materials of construction.

2.4 Standard Materials of Construction

Wetted castings and pump shaft are 316 stainless steel (SS). The pump casing is 316SS. Impellers and diffusers are Noryl except SS24000 Series diffusers which are 316SS. The mechanical seal has a carbon rotating face and a ceramic stationary face. The secondary sealing element of the mechanical seal is Buna-N. The O-rings and diffuser bearings are Buna-N.

2.5 Special Materials of Construction

Optional ethylene propylene (EPDM), Viton*, and Teflon* elastomers are available. Contact the factory.

* Viton and Teflon are trademarks of E.I. DuPont de Nemours and Company, Inc.

2.6 Pump Nomenclature Example

Model SS 5 5 1 8 K Z B	Model SS 5 5 3 0 K Z C - 5 0
SS = Materials of Construction 55 = Series 5500 18 = Number of Stages KZ = Bearing Frame B = Motor Adapter	SS = Materials of Construction 55 = Series 5500 30 = Number of Stages KZ = Bearing Frame C = Motor Adapter 50 = 50 Hz Operation Only

2.7 Special Liquid

For liquids other than water, aqueous solutions at elevated temperatures or corrosive solutes, consult the factory for compatibility.

3.0 PUMP INSTALLATION

3.1 Check Upon Arrival

Your pump was inspected at the factory prior to shipment to assure meeting the requirements of your order. It is suggested the pump be checked upon receipt for possible damage due to shipping. Any damage should be reported immediately to the carrier.

3.2 Location

Install the pump as close as possible to the source of the liquid to be pumped. If the liquid source is remote or located several feet away from the pump, a transfer pump at the source will be needed to transfer liquid to the pump. It is ideal for the pump to be fed from a reservoir above the pump or from a supply line under positive pressure.

3.3 Foundation

The foundation for the motor and pump must be rigid and substantial to prevent any significant vibration of the pump. KZA-Bearing frame pumps should be rigidly mounted at the bearing frame base to a steel skid or concrete pad. KZB-, KZC-, KZE- and KZF-Bearing frame pumps should be rigidly mounted at the motor base to a steel skid or concrete pad.

The bracket at the discharge end of the pump should be adjusted so the pump case is supported in a strain-free manner.

The pump mounting is to be horizontal and the pump leveled withing 1/16-inch/foot (4.5 mm/meter) both in the axial and side-to-side directions. The pump case and flat boss on the bearing frame are the best reference for leveling. Level the pump by shimming the bearing frame base (KZA-Bearing frame) or the motor base (KZB-through KZF-Bearing frames). Do not force the pump case into a horizontal position.

3.4 Flexible Coupling Installation

If the pump has been supplied with the motor installed, the coupling is properly installed.

If the pump has not been supplied as an assembled unit, install the coupling flange on the motor shaft. Do not tighten the set screws on the motor-shaft coupling flange until after the pump and motor are assembled.

Install the flexible coupling sleeve into the pump coupling flange and assemble the pump and motor. Adjust the gap between the coupling flanges to the values shown in Figure 3.1 (Gap Between Flanges) within +1/16 - 0-inch (+1.5 - 0 mm).

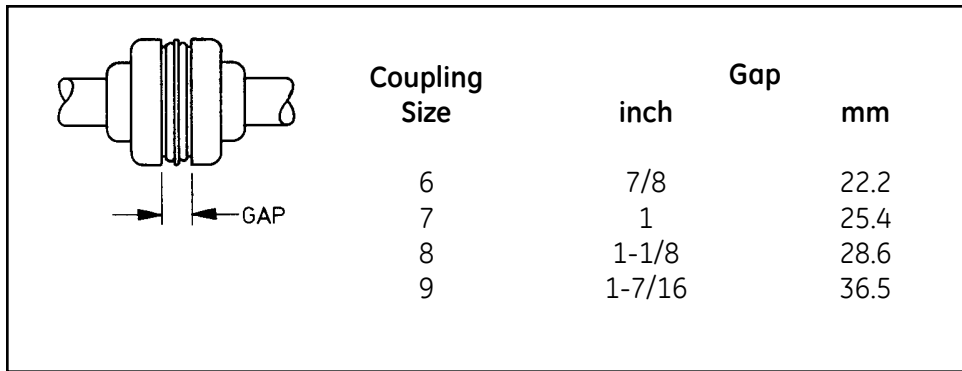


Figure 3.1
Gap Between Flanges

3.5 Coupling Guard

Coupling guards are available for all Tonkaflo Pumps (Section 10.3, Pump Accessories). Ge recommends a coupling guard. Check your plant safety requirements.

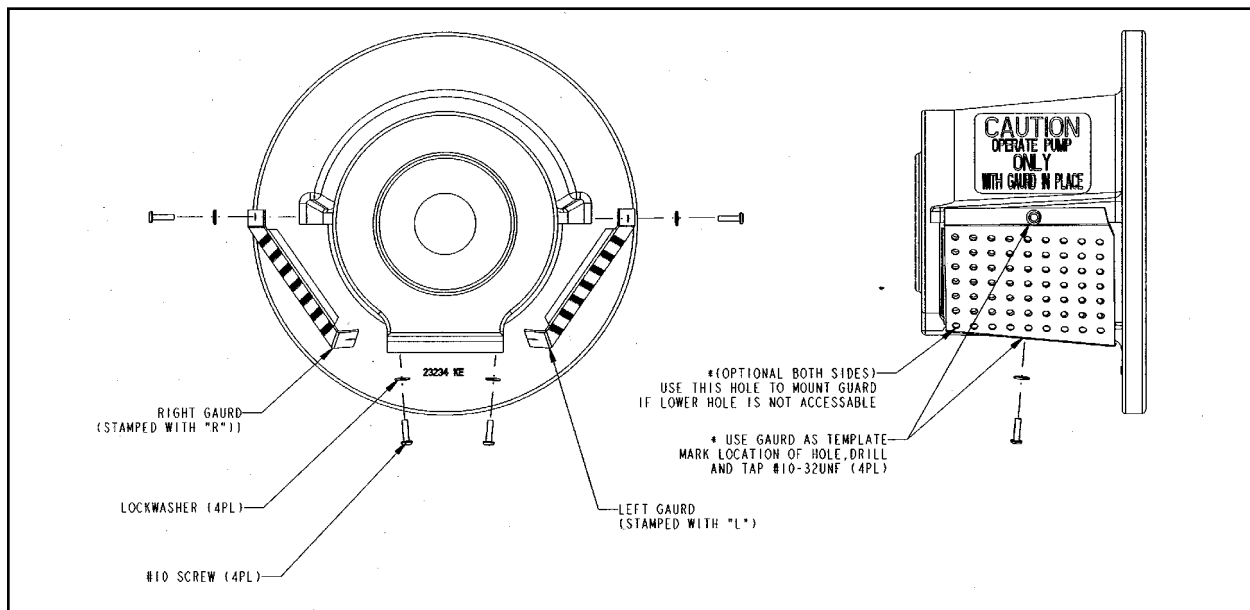


Figure 3.2
Coupling Guard Installation

3.6 Piping

The pump inlet housing has been designed for either upright or left or horizontal positioning. For left or right position, remove the four (4) bolts holding the suction (inlet) housing to the liquid end adapter. Rotate the suction housing 90° and replace the 4 bolts and tighten. For left or right position, a pipe plug in the top of the pump inlet housing can be removed to vent off any air in the top of the pump inlet housing should "venting" be required for pump priming and start-up at installation.

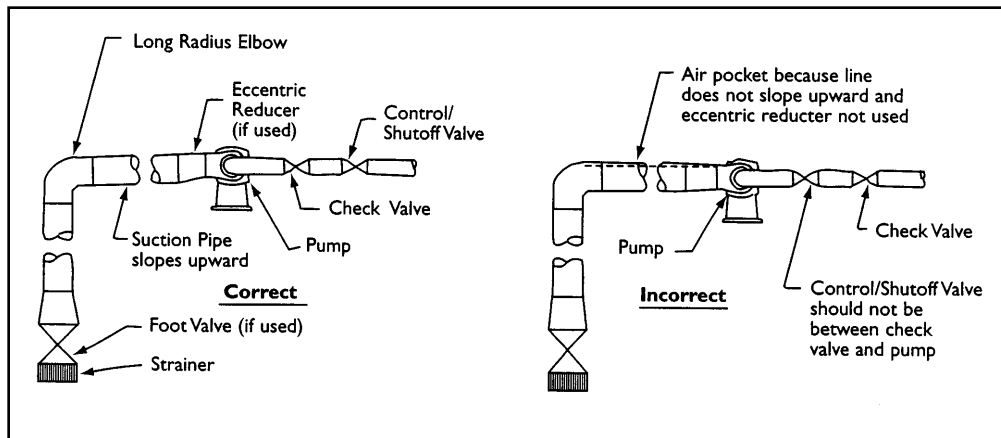


Figure 3.3
Suction Lift
Piping

Suction (pump inlet) piping should be of ample size, installed in direct runs, and have a minimum of bends to minimize pressure loss and to help ensure sufficient suction pressure. When possible, keep the suction pipe short.

The suction (inlet) pipe size, immediately ahead of the pump inlet, should be sufficiently sized so that the pressure available at the pump suction (inlet) exceeds the Net Positive Suction Head ($NPSH_p$) required by the pump. Generally, the suction (inlet) piping should be 4-inches (10.2 cm) for flows greater than 170 gpm (38.6 m^3/h), 3-inches (7.6 cm) for 100 - 170 gpm (22.7 - 38.6 m^3/h), 2-1/2-inches for 60 - 100 gpm (13.6 - 22.7 m^3/h), and 2-inches (51 cm) or greater for 60 gpm (13.6 m^3/h) or less (see frictional loss and pressure loss, discussed below).

For most pump applications, it is recommended the pipe size selected result in frictional line loss of 3 psi/100-feet (0.21 bar/100 meter) or less for suction lines and 10 psi/100-feet (0.69 bar/100 meter) or less for discharge lines. A larger pipe size will reduce the frictional line loss.

The pump inlet piping should be designed to avoid areas where air may be trapped and accumulate. Keep suction pipe free of high points and thus air pockets which tend to disrupt pump priming and start-up. Suction pump changes just ahead of the pump should be tapered. Reducers should be eccentric to avoid air pockets.

The discharge piping should be sized and constructed to properly handle the maximum flow and pressure developed by the pump.

When the pump operates with a suction lift, the suction pipe should slope upward to the pump from the source of supply (Figure 3.3, Suction Lift Piping). Provisions must be made for priming the pump. To maintain pump prime, a foot valve can be used with an opening at least as large as the inlet piping. An alternate method would be to use a shut-off valve on the discharge line and a vacuum pump to draw air out of the pump and suction line.

When pumping liquid from a tank, the suction line must be submerged enough so air is not drawn into the suction line to form a vortex. Increasing the size of the inlet pipe to reduce the velocity will help to prevent the vortex from forming. If necessary, consult the pump curve to reference the Net Positive Suction Head (NPSH_r).

Hot liquids within the temperature range of the pump must have sufficient positive head pressure to prevent vaporization at the impeller inlet. Consult the factory or your local Tonkaflo distributor for NPSH_r requirements of the pump for your application.

The pump must never be throttled on the suction side.

After installation, test the suction line with water and at least 30 psig (21 barg) to detect any leaks.

3.7 Bypass Piping for Multi-Stage Pumps

Sufficient flow must be maintained through a multi-stage pump to prevent the pump from overheating. Low flow rates result in excessive energy accumulation and heat build-up in the pump. Minimum recommended flows are shown in Table 2.0 (Tonkaflo Specifications).

A bypass pipe, that is, a pipe from the discharge piping back to the source of liquid supply or suction line, may be needed for your installation to ensure that the pump operation is within the specified flow range. It is recommended that the connection of a bypass pipe to the suction line be at least 24-inches (61 cm) away from the pump inlet.

3.8 Suction Screen (Strainer)

This is a precision multi-stage centrifugal pump with close tolerances to provide maximum efficiency.

It is good practice to install a 30 mesh or finer screen (available as an accessory) or a cartridge filter in the suction line to collect any foreign objects or large particles.

The pump must not be operated with restricted suction line (inlet) flow.

Positive gauge pressure must be maintained at the pump inlet (downstream from the filter or screen). A clogged screen or filter will result in a greater pressure drop. A low pressure alarm or shut-off switch located between the screen or filter and the pump should always be used in conjunction with a suction line screen or filter.

3.9 Discharge Screen (Strainer)

A 30 mesh screen (Section 10.3, Pump Accessories) located in the discharge piping will protect your process fluid should the pump be damaged due to improper operation or other causes. The installation of the discharge screen is shown in Figure 3.4 (Installation of Discharge Screen).

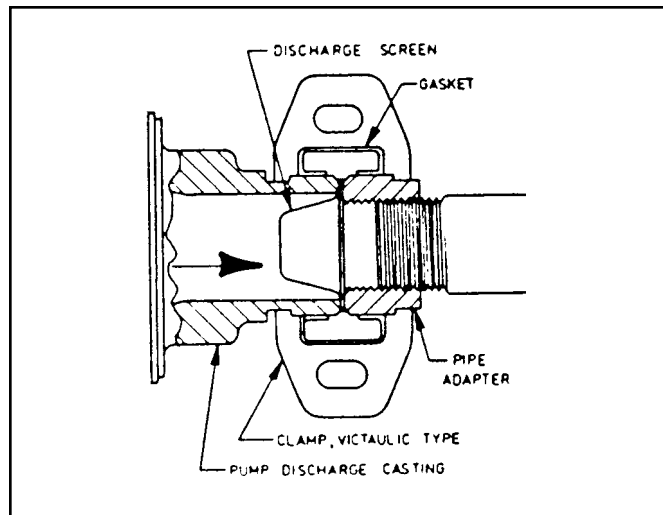


Figure 3.4
Installation of
Discharge Screen

3.10 Pump Piping Connections

The standard model Tonkaflo SS5500, SS8500, SS12500, and SS40000 Series pumps have grooved ends as shown in Figure 3.4 (Installation of Discharge Screen) to accept Victaulic-type couplings. The couplings with 1000 psig (69 barg) working pressure rating are available as an accessory and include a Buna-N gasket (standard). Other gasket materials such as Viton or ethylene propylene (EPDM) are available. Consult the factory.

The coupling gasket should be thoroughly lubricated before installation. Silicone grease is recommended.

Petroleum grease is suitable for most gasket materials, but is not compatible with ethylene propylene (EPDM).

3.11 Lubrication of KZ-Bearing Frame Pumps

WARNING: BEARING FRAME IS SHIPPED WITHOUT OIL.

Two quarts (1.9 L) of oil are provided with each new Tonkaflo pump. Additional oil can be purchased by the quart or case (Table 3.3, Typical Heavy-Duty Hydraulic and Lubricating Oils).

The bearings are lubricated by maintaining a static oil level within the bearing frame. Oil circulates from the reservoir through the bearings. An oil level sight gauge, with a "FULL" line is provided so the oil level may be viewed and maintained (Figure 3.5, Initial Cold Setting of Oil Level for KZ-Bearing Frame Pumps).

A heavy-duty premium lubricating oil (anti-wear, non-detergent, rust, oxidation, and foam inhibit) should be used. Reference Table 3.3 (Typical Heavy-Duty Hydraulic and Lubricating Oils).

**Table 3.3
Typical Heavy-Duty
Hydraulic and Lubricating Oils**

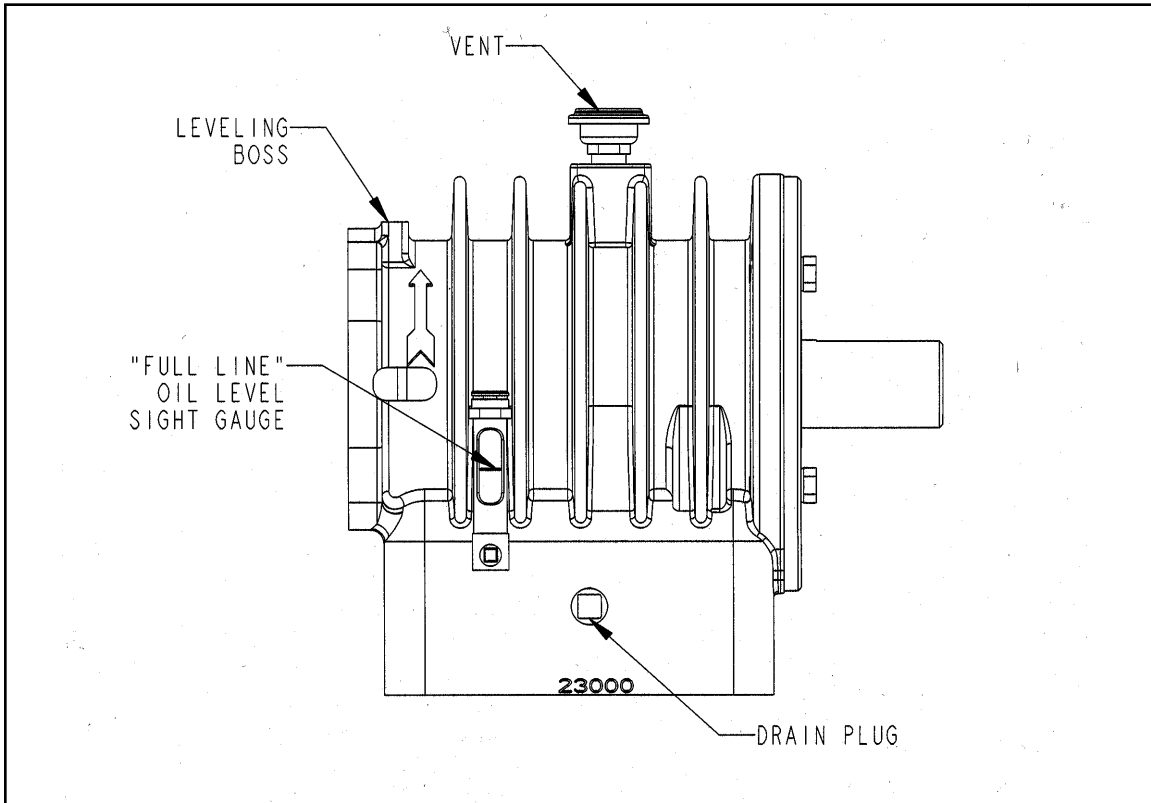
Manufacturer	Description
Tonkaflo Pumps	Anti-Wear Hydraulic Oil 1 Quart P/N 1120693 12 Quart Case P/N 1120682
Shell or Other Brands	Heavy-Duty Premium Anti-Wear Hydraulic Oil which meets ISO-VG GRADE 100 Specifications*
* ISO-Vg GRADE 100 has a viscosity of 465 SSU at 100°F (38°C).	

3.11.1 Setting the Oil Level

The bearing frame oil reservoir capacity is approximately 37 ounces [1 quart, 5 ounces (1.1 L)]. Remove the vent located on the top of the bearing frame and pour in the oil. Continue adding oil until the "FULL" level line is reached on the sight gauge (Figure 3.5, Initial Cold Setting of Oil Level for KZ-Bearing Frame).

DO NOT OVERFILL THE BEARING FRAME. Setting the initial cold oil level higher than specified will result in higher oil operating temperatures and reduced oil life and possible leakage from the top of the sight gauge due to expansion.

The vent is provided to balance the pressure inside the bearing frame with the surrounding environment. Install vent after filling bearing frame. Never replace the vent with a solid plug.



**Figure 3.5
Initial Cold Setting of Oil Level
for KZ-Bearing Frame Pumps**

3.11.2 Maintaining the Oil Level

When cold, maintain the oil level at the “FULL” line on the sight gauge (Figure 3.5, Initial Cold Setting of Oil Level for KZ-Bearing Frame).

WARNING: THE BEARING FRAME SHOULD NOT BE RUN IF THE OIL LEVEL IS BELOW THE “FULL” LINE.

The oil level may rise above the “FULL” line by approximately 0.25-inch (6.4 mm) during continuous operation due to expansion.

3.11.3 Oil Change/Maintenance

THE RECOMMENDED OIL CHANGE LEVEL IS 2000HOURS OF PUMP OPERATION OR 6 MONTHS, WHICHEVER OCCURS FIRST. Under extreme temperature variations, high humidity, or dust/dirty conditions oil changes should be mor frequent. Clean breather vent between oil changes.

Before starting, check the static oil level on the sight gauge (Figure 3.5, Initial Cold Setting of Oil Level for KZ-Bearing Frame Pumps).

4.0 TONKAFLO PUMP START-UP

4.1 Pump Priming

THE INLET PIPING AND PUMP MUST BE FILLED WITH LIQUID (i.e., PRIMED) BEFORE START-UP.

If the pump is above the liquid source, fill the pump and supply line with liquid from an external source.

The pump should be shut-off immediately if prime is lost to avoid overheating and possible damage to the internals of the liquid end.

The pump should not run with a closed discharge for more than one (1) minute as the liquid can heat up very quickly and exceed the maximum operating temperatures causing irreversible damage to the wetted internal parts of the liquid end.

WARNING: NEVER RUN PUMP DRY.

4.2 Pump Rotation

When initially connecting to the power source, be certain that the motor wiring and available line voltage are the same. Connect the wires as shown on the motor wiring diagram located on the inside of the motor junction box cover or on the nameplate label.

CAUTION: If a three-phase motor is wired incorrectly, it will cause the pump shaft to rotate in the wrong direction. This will result in low pressure (about 1/4 to 1/2 of normal) and flow (about 1/2 of normal).

A motor starter is required for all three-phase motors.

BEFORE STARTING THREE-PHASE MOTORS

STEPS

1. Prime pump before applying power to avoid damage to pump.
2. Apply power for ONE SECOND to check direction of motor shaft rotation. The motor shaft should turn in a clockwise direction as viewed from the motor end. The direction of rotation for three-phase motors may be reversed by interchanging any two leads.

4.3 Initial Operation

With the oil level set (when cold, oil level is maintained at the "FULL" line on the sight gauge), pump primed, and pump rotation checked. Your pump is ready to operate.

Upon start-up, check to see that the correct boost pressure is obtained at design flow.

If prime was not achieved, reprime as necessary.

5.0 GENERAL TROUBLESHOOTING AT START-UP

5.1 Troubleshooting Chart

LOW FLOW	MOTOR RUNS HOT OR STOPS
<ol style="list-style-type: none"> 1. Restrictions in inlet or discharge 2. Foot valve operating improperly 3. Air leak in inlet piping 4. Air leak in mechanical seal 5. Inlet suction lift to high 6. Reverse rotation of pump shaft 7. Pump not primed adequately 8. Inlet strainer/filter plugged 	<ol style="list-style-type: none"> 1. Motor wired improperly 2. Bad connection 3. Motor exceeded rated amp draw 4. Excessive ambient temperature 5. Heater size too small in motor heater 6. Binding rotation in the pump shaft 7. Bearings not adequately lubricated 8. Specific gravity or viscosity of liquid higher than design conditions
MOTOR DOES NOT RUN	LOW PRESSURE
<ol style="list-style-type: none"> 1. Blown fuse or tripped circuit breaker or overload heater 2. Motor too hot - allow to cool 3. Motor voltage connection and line voltage different 4. Bad connection 5. Motor wired improperly 	<ol style="list-style-type: none"> 1. Pump not adequately primed 2. Air leak in inlet piping 3. Excessive flow 4. Clogged suction line filter or screen 5. Reverse rotation of pump shaft 6. Foot valve operating improperly
PUMP VIBRATION	PUMP LEAKING
<ol style="list-style-type: none"> 1. Bent pump shaft 2. Improper mounting 3. Starved suction (cavitation) 4. Worn bearings 5. Motor out of balance 	<ol style="list-style-type: none"> 1. Mechanical seal needs replacing 2. O-rings in pump casing damaged 3. Oil seals need replacing 4. Piping not sealed properly 5. Vent dirty or plugged

5.2 Bearing Frame Temperature

The operating temperature of the oil lubricated KZ-Bearing frame utilized on high-pressure Tonkaflo pumps will vary depending on the boost pressure of the pump. As a general rule, the KZ-Bearing frame will operate within a temperature range of 130° - 203°F (54° - 95°C). During operation, the bearing frame will feel hot to the touch.

A new bearing frame will run cooler after 24 hours of operation. Bearing frame temperatures will typically decrease further after a few weeks as the bearing frame breaks in. Pumps operating on 50 Hz power (2875 rpm) will operate cooler.

6.0 TONKAFLO FIELD MAINTENANCE

6.1 Mechanical Seal Leakage

If liquid is leaking from the hole on the bottom or the holes on either side of the bearing frame near the inlet, the mechanical seal may need to be replaced. With new pumps, pumps with new mechanical seals, or pumps which have been dormant for long periods, the seal faces may not be completely seated and a slight leakage will occur. If this leakage continues for more than sixty (60) seconds, remove discharge piping and tap pump shaft using a wooden dowel to seat the seal. Be careful not to damage the pump shaft.

WARNING: POWER MUST BE DISCONNECTED BEFORE MAINTENANCE.

6.2 Removal and Installation of Liquid End Assembly

6.2.1 Removal of Liquid End Assembly

Removal of the liquid end assembly is required for replacement of the mechanical seal or for maintenance work on the pump bearing frame as described in Sections 6.3 - 6.6. The liquid end may be removed from the bearing frame without removing the bearing frame from the bedplate or other mounting.

STEPS

1. Remove the four (4) 3/8-inch bolts and lock washers connecting the liquid end assembly to the liquid end adapter (Figure 6.6, Separation of Liquid End Assembly From Bearing Frame).
2. Insert a 3/16-inch Allen (hex) wrench in one of the access holes on either side of the bearing frame toward the liquid end (Figure 6.6). Rotate the pump shaft until the Allen wrench slips into the set screw. Remove the set screw.

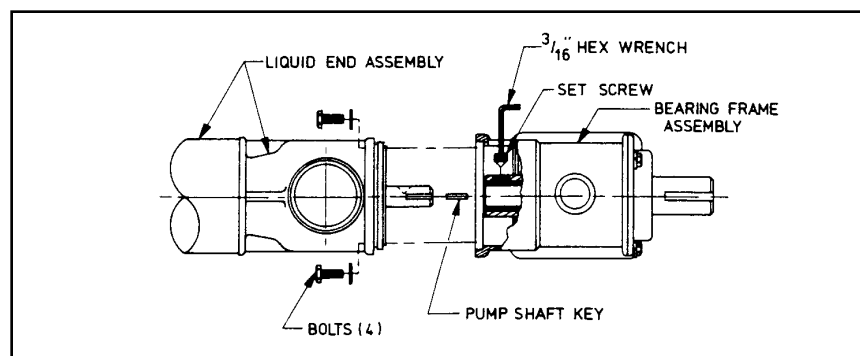


Figure 6.6
Separation of Liquid End
Assembly from Bearing Frame

3. Loosen the clamp on the discharge end of the pump case.
4. Remove the liquid end assembly (i.e., liquid end of the pump shaft) by pulling the liquid end away from the bearing frame. Be sure the discharge end of the liquid end assembly is supported so the pump shaft is not bent upon removal.

6.2.2 Installation of Liquid End Assembly

STEPS

1. Place the shaft key in the pump shaft key way and be sure it is fully seated.
2. Check to see that anti-seize compound is on the exposed pump shaft where it engages with the bearing frame shaft. If not, coat the pump shaft with a small amount of an anti-seize compound (i.e., Never-Seez or Anti-Seize). The anti-seize compound is used to prevent corrosion, galvanic pitting, rust, and seizure. These compounds are available from the factory or local industrial supply house.
3. Align the keyed pump shaft with the bore of the bearing frame shaft and insert the pump shaft such that the key on the pump shaft fits into the key way on the bearing frame shaft. Then push until castings come together.
4. Fasten together the inlet casting, mechanical seal holder, and bearing frame assembly with the four (4) 3/8-inch bolts and lock washers. Reference Figure 6.6 (Separation of Liquid End Assembly from Bearing Frame) and Figure 6.7 (Removal of Mechanical Seal) for correct placement of parts.
5. After fastening the inlet casting to the bearing frame assembly, line up the set screw hole in the bearing frame shaft with the access hole in the bearing frame by rotating the flexible coupling. Place the set screw in the bearing frame shaft.
6. Through the opening in the discharge casting, push on the end of the pump shaft with a wooden dowel to seat the shaft in the bearing frame and then tighten the set screw.

6.3 Mechanical Seal Replacement

STEPS

1. Remove the liquid end assembly (Section 6.2.1, Removal of Liquid End Assembly).

2. Remove the pump shaft key and slide the mechanical seal holder off the pump shaft (Figure 6.7, Removal of Mechanical Seal).
3. Remove the rotary portion (spring, washer, and face assembly) of the seal assembly from the pump shaft by rotating and pulling the rotary portion until it slides off the pump shaft. If prying is required, do not damage the pump shaft or inlet housing where the seal holder seals (Figure 6.7, Removal of Mechanical Seal).
4. When installing new mechanical seal, do not cut the rubber bellows over the shaft key way. One method is to wrap thin plastic tape over the shaft key way to protect the rubber bellows from damage. Wrap 1-1/4 turns to cover the end of the key way opposite the shaft end. With some overlap, continue to wrap the tape until the end way is covered to the end of the pump shaft.

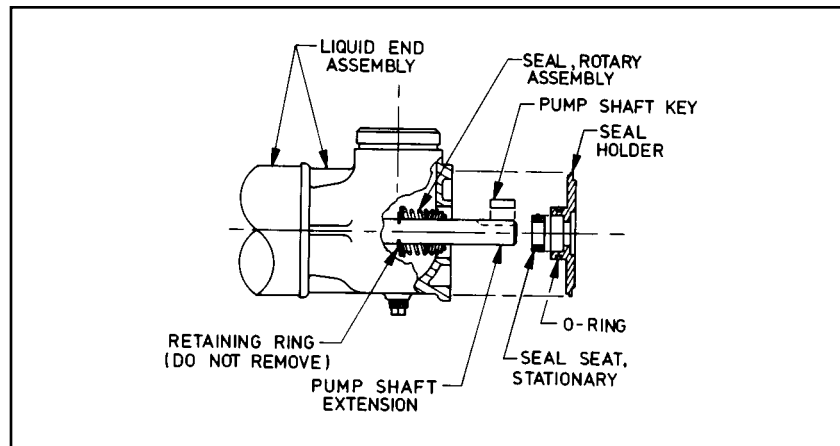


Figure 6.7
Removal of
Mechanical Seal

5. Lubricate the round surface of the pump shaft with oil, petroleum grease, or silicone grease.
6. After lubrication, install the rotary portion of the new seal by placing it onto the pump shaft and carefully rotating and pushing the rotary portion down the pump shaft until it is lightly seated against the spring. Remove tape.
7. Remove the stationary portion of the mechanical seal from the cavity in the seal holder (Figure 6.7).
8. Lubricate the O-ring on the outside of the new stationary seat. Lubricate with petroleum or silicone grease. Install the stationary portion into the seal holder cavity. When installing a new mechanical seal, do not cut the rubber bellows when sliding. Make sure the stationary portion is fully seated. Lightly lubricate the ground surface of the stationary seat with grease or oil.

9. Examine the O-ring on the mechanical seal holder and, if the O-ring is damaged, replace it with a new one. A new O-ring is included with the factory-supplied mechanical seal kit. Be sure to lubricate before installing.
10. Place the mechanical seal holder containing the new stationary seat onto the pump shaft and slide it down the shaft until fully engaged with the inlet casing.

CAUTION: Care must be taken not to damage the new stationary set when sliding the assembly over the pump shaft.

11. Install the liquid end assembly onto the bearing frame assembly (Section 6.2.2, Installation of Liquid End Assembly).

6.4 High-Pressure Mechanical Seal Replacement

High-pressure mechanical seals have the same basic design as standard mechanical seals. Replace them using the same procedure denoted in Section 6.3 (Mechanical Seal Replacement).

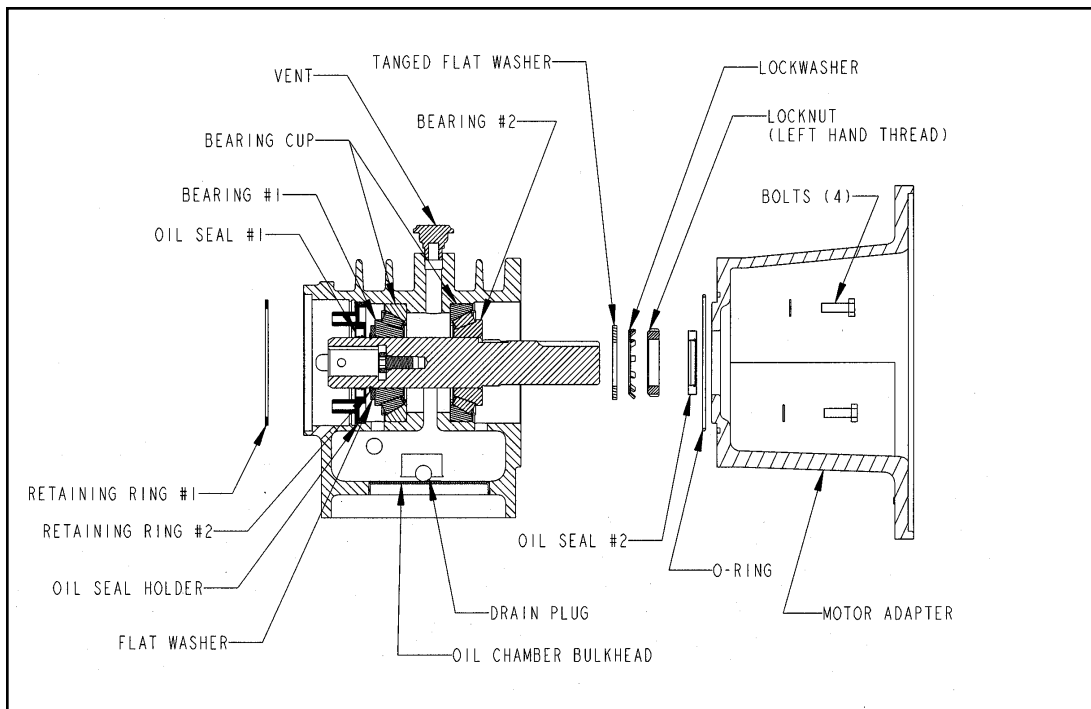


Figure 6.8
KZ-Bearing
Frame Overhaul

6.5 Bearing Frame Maintenance for KZ-Bearing Frame Pumps

6.5.1 Disassembly of KZ-Bearing Frame Pumps

STEPS

1. Remove the liquid end assembly (Section 6.2.1, Removal of Liquid Assembly).
2. Drain the oil from the bearing frame by removing the oil drain plug on the lower portion of the bearing frame and then remove the bearing frame from the motor.

6.5.2 Bearing Frame Overhaul

Refer to Figure 6.8 (KZ-Bearing Frame Overhaul) for construction of KZ-Bearing frames.

STEPS

1. Remove the four (4) bolts and lock washers that fasten the motor adapter to the motor side of the bearing frame. Separate the adapter from the bearing frame.
2. Remove retaining ring #1 from the bearing frame as shown on Figure 6.8.
3. Remove the lock nut, lock washer, and flat washer from the bearing frame shaft.
4. Place the bearing frame in a press. Simultaneously press out on the oil seal holder and remove bearing cone #2 from the shaft by pressing on the motor end of the bearing frame shaft. After the oil seal holder is removed, continue pressing to remove the shaft assembly from the bearing frame. Bearing cone #1 will remain on the shaft. Removal of bearing cone #1 from the shaft should be done only when replacement is necessary.
5. Inspect the bearing cups and cones for any rough surface conditions and replace both cup and cone when necessary. Pitted and galled rollers and/or bearing cap indicates replacement is necessary. Very light marks around roller may occur during "break-in-period" from the bearing cage. This is not a problem and bearing replacement is not necessary.
6. To remove the bearing cup(s) from the bearing frame, use a brass or soft steel rod and hammer to knock them out.
7. Inspect both oil seals and replace if the seals are no longer pliable or if they are leaking.

6.5.3 Assembly of Pumps with KZ-Bearing Frames

STEPS

1. If removed, press new bearing cup(s) into the bearing frame, making sure they are fully seated.
2. If removed, press bearing cone #1 (Figure 6.8, KZ-Bearing Frame Overhaul) onto the shaft, holding the bearing square with the shaft while starting. Make sure the washer behind bearing cone #1 has been replaced.

The correct set-up may be checked by placing the shaft into the bearing frame and measuring 2.772 ± 0.010 -inch (7.04 ± 0.25 mm) recess. Refer to Figure 6.9 (Setting Bearing Frame Shaft End Play).

Apply only enough press force to fully seat the bearing against the washer and retaining ring. Do not apply excess force, which would distort the retaining ring.

3. With the shaft in the bearing frame, press on the second bearing cone, holding it square with the shaft while starting. Press until the bearing cone is fully seated against the bearing cup and there is not end play.
4. Reinstall the tanged flat washer, lock washer, and nut. Hand tighten the lock nut (left-handed thread) and lightly set a tang o the lock washer into a slot on the lock nut. If desired, a 3/8-16NC x 3 bolt may be inserted through a side port in the bearing frame and into the set screw hole in the end of the bearing frame shaft (Figure 6.8, KZ-Bearing Frame Overhaul) when tightening the lock nut.
5. Using a press, force bearing cone #2 back against the tanged flat washer by pressing on the motor end of the shaft. This sets the bearing so that the shaft end play may be checked. Do not apply excess force which would distort the threads on the shaft and lock nut.
6. Check the end play of the shaft [Section 6.5.2 (Bearing Frame Overhaul)] and Figure 6.9 (Setting Bearing Frame Shaft End Play).

6.5.4 Check End Play of KZ-Bearing Frame

STEPS

1. Grasp the shaft on the motor side of the bearing frame while turning the shaft as far as it will go.

This ensures that the bearing cone is completely in the bearing frame.

2. Hold the shaft in place to prevent axial movement.
3. Zero out and set the dial indicator as shown in Figure 6.9 (Setting Bearing Frame Shaft End Play).
4. Push the shaft back toward the motor side of the bearing frame and observe the movement on the dial indicator. The end play should read 0.011 - 0.014-inches (0.28 - 0.36 mm).

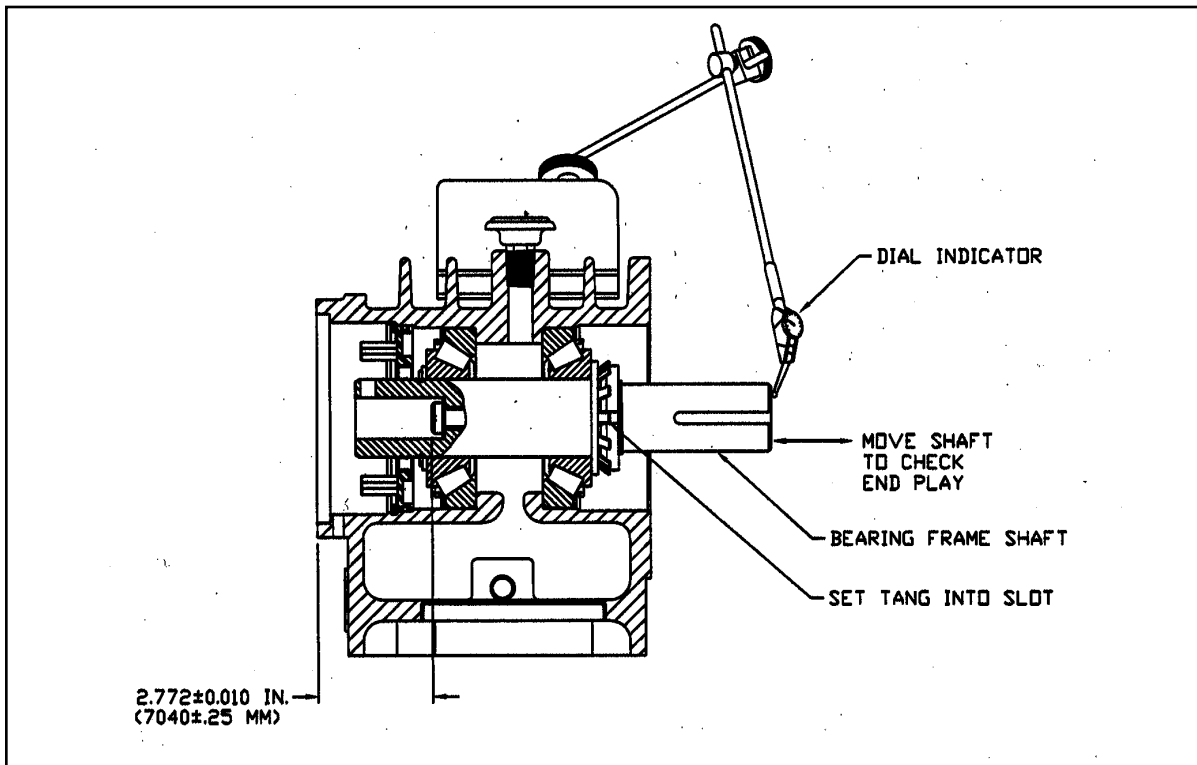


Figure 6.9
Setting Bearing Frame
Shaft End Play

5. Repeat Step 4 two to three times to verify end play accuracy.
- NOTE:** End play of 0.011 - 0.014-inch (0.25 - 0.36 mm) or less is difficult to read by hand. Ge recommends using a dial indicator to measure end play.
6. If further adjustment is necessary, press bearing cone #2 to reset it against the bearing cup.

7. Tighten or loosen the lock nut as required. Advancement of the nut until the next lock washer tang is aligned results in 0.0008-inch (0.02 mm) less end play. Advancing the lock nut until the same notch lines-up with the next lock washer tang results in 0.003-inch (0.08 mm) less end play.
8. Repeat Steps 5 and 6.
9. When the end play setting is correct, set one tang of the lock washer into a slot in the lock nut.
10. Inspect and replace the O-ring on the oil seal holder and on the end cap. If damaged, replace the oil seals.
11. Reinstall the oil seal holder, oil seal, and retaining ring (Figure 6.8, KZ-Bearing Frame Overhaul) making sure the seal and O-ring are lubricated with grease or oil.
12. Install the motor adapter on the motor end of the bearing frame. The oil seal rubber must be lubricated with grease or oil and the shaft key must be covered to protect the oil seal from damage.

WARNING: IT IS IMPORTANT NOT TO DAMAGE THE OIL SEAL LIP TO PREVENT DAMAGE.

13. Install the four (4) 3/8-inch bolts and lock washers to secure the bearing frame cap.

6.5.5 Install Liquid End and Remount Pump

STEPS

1. Install the liquid end on the bearing frame (Section 6.2.2, Installation of Liquid End Assembly, Steps 1 - 5).
2. Mount the pump on the motor or other mounting position and tighten the clamp on the discharge support.
3. Lubricate as indicated in Section 3.11 (Lubrication of KZ-Bearing Frame Pumps). Reference Figure 3.5 (Initial Cold Setting of Oil Level for KZ-Bearing Frame Pumps).

6.6 Oil Seal Replacement

Oil leaking around the bearing frame shaft indicates oil seal #2 (Figure 6.8, KZ-Bearing Frame Overhaul) is leaking.

Oil leaking from the ports in the bearing frame near the liquid end indicates oil seal #1 (Figure 6.8) is leaking.

6.6.1 Replacement of Oil Seal #2

STEPS

1. Remove the flexible coupling guard, if installed (Figure 6.8, KZ-Bearing Frame Overhaul).
2. Either remove the pump or the motor from the bedplate or other mounting.
3. Remove the flexible coupling flange and key from the bearing frame shaft.
4. Remove the four (4) bolts and lock washers that fasten the adapter to the bearing frame. Separate the motor adapter from the bearing frame.
5. Reinstall the oil seal holder and retaining ring in the bearing frame. Make sure the O-ring on the outside of the oil seal holder and oil seal lip are lubricated before installing. If damaged, replace the O-ring.
6. Install the liquid end and remount the pump (Section 6.2.2, Installation of Liquid End Assembly, Step 4).

6.6.2 Replacement of Oil Seal #1

STEPS

1. Remove the liquid end assembly from the bearing frame as described in Section 6.2.1 (Removal of Liquid End Assembly).
2. Remove retaining ring #1 (Figure 6.8, KZ-Bearing Frame Overhaul).
3. Remove the oil seal holder (Figure 6.8), which can be done as described in Section 6.3 (Step 2), or as described here by making a simple fix.
 - A. Use two (2) 5/16-18 NC bolts and a flat plate (not provided) to bridge across the end of the bearing to pull out the seal holder.

3. Remove the oil seal holder (Figure 6.8), which can be done as described in Section 6.3 (Step 2), or as described here by making a simple fix.
 - A. Use two (2) 5/16-18 NC bolts and a flat plate (not provided) to bridge across the end of the bearing to pull out the seal holder.
 - B. Drill two (2) holes, 3/8-inch (10 mm) diameter, through the flat plate. Space the holes 3.25-inch (82 mm) apart.
 - C. Insert two (2) 5/16-18 NC bolts through the plate.
 - D. Turn the bolts into the seal holder's two (2) bolts uniformly to pull the seal holder out straight.
 - E. Install the liquid end and remount the pump (Section 6.5.5, Install Liquid End and Remount Pump).

6.6.3 Replacement of Oil Chamber Bulkhead

STEPS

Removal

1. Remove liquid end. Disassemble the bearing frame (Section 6.5.1, Disassembly of KZ-Bearing Frame Pumps).
2. Remove the bearing frame vent.
3. Using a long screwdriver or 3/8-inch diameter bar, knock out the bulkhead. Access the bulkhead through the vent hole in the top of the bearing frame.

Installation

1. Apply a gasket forming sealant to the outside diameter of the new bulkhead.
2. Insert the bulkhead into the bearing frame with the lip outward and press in place.
3. Assemble the bearing frame (Section 6.5.3, Assembly of KZ-Bearing Frame Pumps).

7.0 TONKAFLO SERVICE POLICY - PUMP LIQUID END

Section 6.0 (Tonkaflo Field Maintenance) in the Tonkaflo Installation, Operation, and Maintenance Manual was written to assist our customers in performing minor maintenance in the field on Tonkaflo pumps. Proper maintenance will ensure longer pump life and minimize down time. Tonkaflo pumps are manufactured to make field repairs on the mechanical seal a quick and easy process. Bearing frame overhauls may be done by the customer, a local maintenance shop, or the factory. If repair at the factory is desired, call GE for a Return Goods Authorization (RGA) number (Section 8.0) and send the complete pump, with or without motor, to the factory. For motor problems, such as worn out motor bearings, it is recommended that maintenance be done at a local motor repair shop.

For motor service: Motors must be sent to the nearest authorized motor service center for repair, replacement, and warranty disposition.

Field service of the pump liquid end, with the exception of mechanical seal replacement, is not recommended. If a pump liquid end is damaged by running the pump dry, inadequate flow, excessive deadheading, cavitation, or other reasons, contact a Tonkaflo distributor certified for service or return it with or without motor to the factory for repair.

The pump has a oil lubricated bearing frame between the pump liquid end and the motor. It is typically characterized by a "KZ" in the model number (e.g., SS5518KZB).

To return an oil lubricated bearing frame pump to the factory, GE requires the whole unit (pump liquid end, bearing frame, and motor adapter) less the motor and flexible coupling pieces. If the motor adapter is not returned, GE will connect a new one to the repaired pump liquid end/bearing frame and you will be billed for it.

The original bearing frame is essential for rebuilding of the pump liquid end on 5500, 8500, 12500, and 24000 Series pumps based on the pump design (shimmed impellers). The pump liquid end and bearing frame form a "matched set". Also, a bearing frame is required to test the pump. If we attach a new bearing frame to your pump liquid end in order to test, it will be shipped with the repaired liquid end of the pump and you will also be billed for it.

8.0 TONKAFLO PUMP RETURN GOODS AUTHORIZATION (RGA) PROCEDURE

If you wish to return goods for repair, warranty evaluation and/or credit, please have your original sales order or invoice available when you call GE. Call (800) 848-1750 and ask to speak with Customer Service. A Customer Service representative will provide instructions and a Return Goods Authorization (RGA) number which needs to be clearly written on the outside of the box used to ship your materials. All equipment must be shipped to GE with the freight prepaid by the customer. Call our Customer Service Center with any questions or issues concerning freight claims and a representative will discuss your situation.

All materials to be returned must be rendered into a non-hazardous condition prior to shipping.

There are two ways to handle a return: (1) send in the pump for repair and return or (2) purchase a new pump and when desired, send the defective pump to the factory for repair and return.

8.1 Motor Warranty

Motors must be sent to the nearest authorized motor service center for repair, replacement, and warranty disposition.

8.2 In-Warranty Pump Failure

8.2.1 Return the defective pump to the factory for repair on an RGA within fifteen (15) days. GE absorbs the cost of repair. The repaired pump will be returned and remains under warranty for the remainder of the original warranty period or three months, whichever is longer.

8.2.2 GE will not restock or issue return credit against a new, non-stock, pump purchase regardless of the warranty status of the failed pump. The warranty (Section 11.0) is 12 months from installation or 15 months from receipt, whichever occurs first.

8.3 Out-of-Warranty Pump Failure

Return the pump on an RGA for repair. The pump will be repaired and repair charges invoiced to the customer. The warranty on repairs is three months.

8.4 Shipping Charges

8.4.1 In-Warranty

Customer pays for shipment to GE, Inc. GE pays one way surface freight return to customer.

8.4.2 Out-of-Warranty When New Pump is Purchased

Customer pays all shipping charges.

9.0 DIMENSIONAL DRAWING

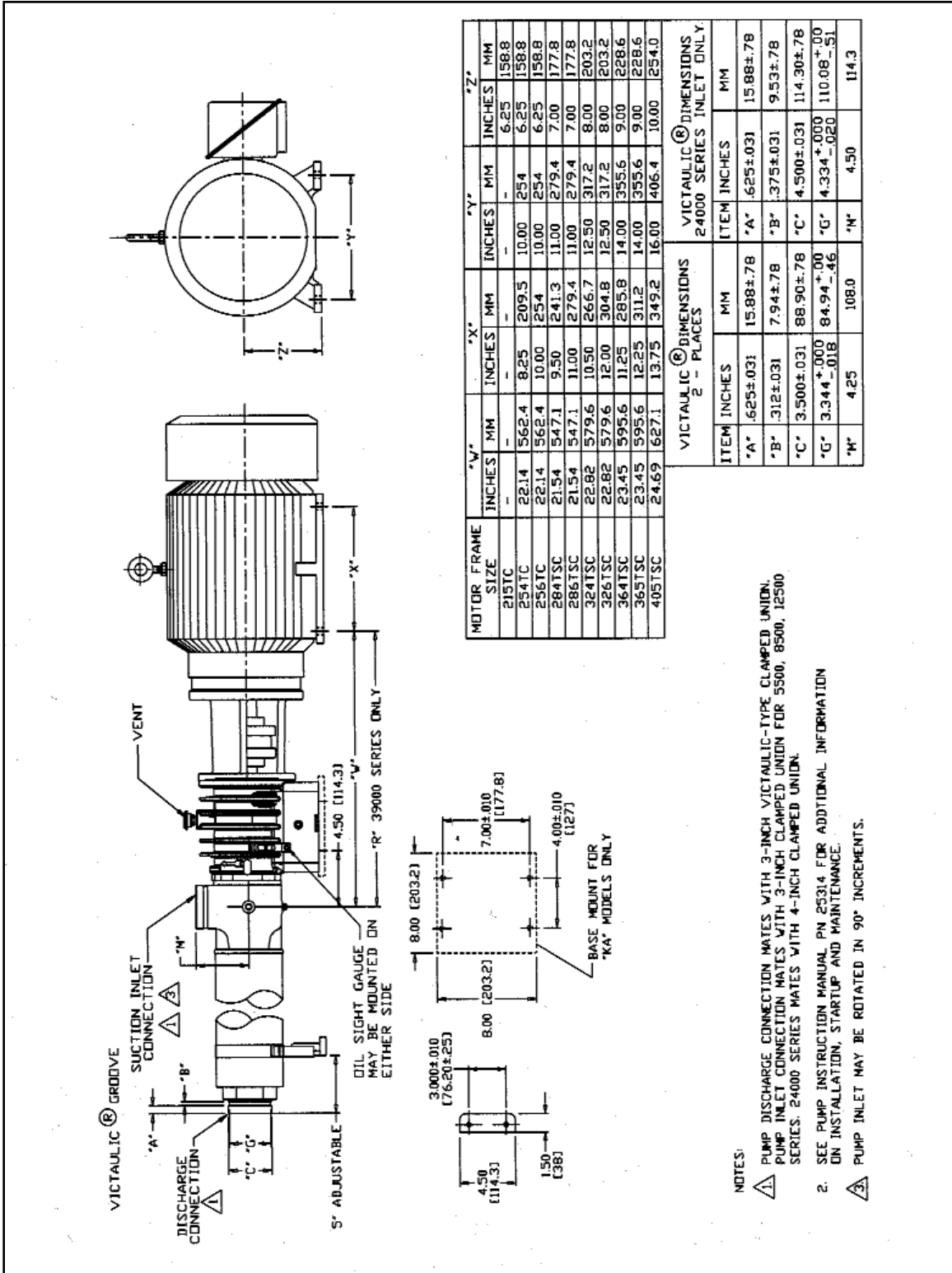


Figure 9.10
Mounting Dimensions

10.0 REPLACEMENT PARTS

10.1 Cutaway Pump Drawing

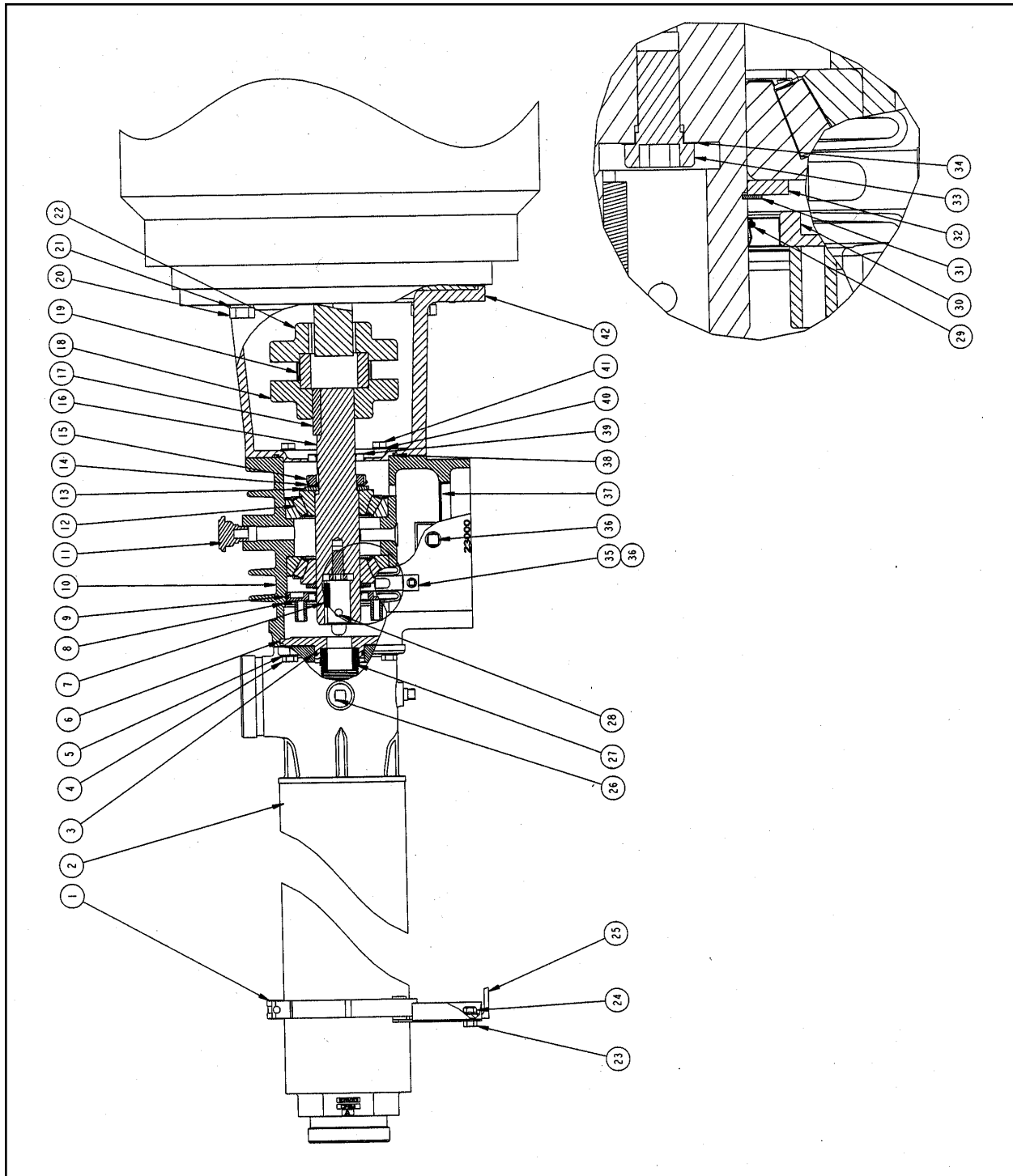


Figure 10.11
Cutaway Pump
Drawing

10.2 Standard Model Parts List

Item Number	Part Description	Part Number	Item Number	Part Description	Part Number
1	Clamp, HD	1114375	23	Bolt, 5/16-18 NC x 1/2-inch	1110471
2	Liquid End Assembly	*	24	Nut, Lock	1113769
3	O-ring, Buna-N, -225	1114284	25	Discharge Support Assembly (Includes items 23 & 24)	
4	Machine Bolt, 3/8-16 x 1-1/4-inch	1110984		6.25 Center Line	1125426
5	Lock washer, 3/8-inch	1110012		7.0 Center Line	1125427
6	Seal Holder	1120341		8.00, 9.00 Center Line	1120600
7	Shaft Key, 1/4- x 1-1/2-inch	1120445	26	Plug, 1/4 NPT, SS, 316	1115055
8	Retaining Ring, N5000-433	1114280	27	Mechanical Seal, - Buna Standard, Type 21, 200psi (13.8 bar), ceramic seat	1121167
9	O-ring, Viton, -224	1113998		High-Pressure, Type 1, 300 psi (20.7 bar), Ceramic Seat	1116127
10	Bearing Frame Assembly (Includes Motor Adapter KZA/KZB KZC KZE KZF)	1125246 1125247 1125248 1125366		High-Pressure, Type 1,300 psi (20.7 bar), NI Resist Seat	1114326
11	Oil Breather	1114851		High-Pressure, Type 1, 400 psi (27.6 bar), Tungsten Carbide Seat	1115090
12	Roller Bearing, Cup & Cone	1120603			
13	Lock Washer	1114283			
14	Tanged Washer	1114282			
15	Lock Nut, Left Hand Thread	1115975			
16	Bearing Frame Shaft	1120348			
17	Coupling Flange, Pump Size 6, 1-5/8-inch bore Size 7, 1-5/8-inch bore Size 8, 1-5/8-inch bore Size 9, 1-5/8-inch bore	1114333 1114334 1114335 1115177	28 29 30 31	Set Screw Oil Seal Bearing Oil Seal Holder Bearing Frame Retaining Ring 5100-187	1113769 1121049 1120723 1113999
18	Coupling Sleeve Size 6 Size 7 Size 8 Size 9	1120306 1121702 1125111 1125112	32 33 34 35 36	Washer, Bearing Frame Bolt, 1/2 x 13 NC Low Profile Shim Bearing Frame Oil Sight Gauge Plug, 3/8 NPT	1120723 1114379 1120361 1225967 1122036
19	Key, Pump Flange	1120444	37	Oil Chamber Bulkhead	1123792
20	Bolt, 1/2-13 NC x 1.25-inch	1113973	38	O-ring, 249	1121063
	Bolt, 5/8-11 NC x 1.25-inch	1125103	39	Oil Seal Adapter	1113996
21	Lock Washer, 1/2-inch	1113104	40	Lock Washer, 3/8-inch	1112012
	Lock Washer, 5/8-inch	1111650	41	Bolt, 3/8-19 NC x 1-inch	1112048
22	Coupling Flange, Motor Size 6, 1-5/8-inch bore Size 7, 1-5/8-inch bore Size 8, 1-5/8-inch bore Size 8, 1-7/8-inch bore Size 9, 1-5/8-inch bore	1114333 1114334 1114335 1114336 1115178	42	Motor Adapter, Painted KZA/KZB KZC KZE KZF	1123382 1123383 1123384 1125365

10.3 Pump Accessories

Part Description	Part Number
Retaining Ring Pliers for Mechanical Seal Retaining Ring	1121717
Set Screw for Pump Shaft for D-, E-, G-, H-, and KZ-Bearing Frames	1113769
Allen Wrench, 3/19-inch, for Set Screw (P/N 1113679)	1113770
Pump Discharge Screen (3-inch Victaulic)	1120501
Heavy-Duty Hydraulic Oil, ISO-Vg, Grade 100	1120693
1 Quart (0.9 L)	1120682
12 Quart Case [3 Gallon (11.4 L)]	
Anti-Seize Thread Compound	
10 Ounce Tube	112970
16 Ounce Can	1120110
Thrust Washer	1120424
Stage Bearing	1120349
Carbon Bearing	1120386
Center Housing Tool, 6-inch Pumps, 5500 - 12500 Series	1120780
Discharge Housing Tool, 6-inch Pumps	1120781
All Stage Parts - Field Repair Not Recommended	Contact Factory
Mechanical Seal Replacement Kit	
200 psi (13.8 bar), Type 21 Ceramic, BUNA	1121177
300 psi (20.7 bar), Type 1 Ceramic, BUNA	1120606
300 psi (20.7 bar), Type 1 Ni-Resist, BUNA	1120607
400 psi (27.6 bar), Type 1 Tungsten Carbide, BUNA	1120608
Coupling Guard	
KA/KB Coupling Guard Kit	1239456
KC Coupling Guard Kit	1239455
KE/KZF Coupling Guard Kit	1231322

Part Description	Part Number
Victaulic Adapters	
3-inch Victaulic x 3-inch MNPT 304SS	1120589
3-inch Victaulic x 3-inch MNPT 316SS	1120590
3-inch Victaulic x 2-inch FNPT 304SS	1120586
3-inch Victaulic x 2-inch FNPT 316SS	1120587
3-inch Victaulic x 1-1/2-inch FNPT 304SS	1120588
4-inch Victaulic x 4-inch MNPT 304SS	1122066
4-inch Victaulic x 4-inch MNPT 316SS	1122067
Victaulic Coupling, 3-inch, Style, BUNA	1114373
Victaulic Coupling, 4-inch, Style, BUNA	1115161

10.4 Recommended Spare Parts for Standard Tonkaflo Pumps with KZ-Bearing Frames

Spare Parts for Mechanical Seal Replacement and General Bearing Frame Maintenance.

Part Description	Part Number	Quantity
Installation, Operation and Maintenance Manual for SS5500, SS8500, SS12500, and SS24000 Series High-Pressure Pumps [Up to 1000 psig (69 barg)] with KZ-Bearing Frame	1125314	1
One-inch, Type 21, BF501C1-316SS Mechanical Seal Kit, Inlet Pressure 0 - 200 psig (0- 13.8 barg)	1121177	1
Heavy-Duty, Anti-Wear Hydraulic Oil, ISO-VG 100 1 Quart (0.95 L)	1120693	2

10.5 Complete Set of Bearing Frame Replacement Parts

Part Description	Part Number	Quantity
Bearing Frame Oil Seal, Motor Side (Replaces P/N 1113997)	1121049	1
Bearing Frame Oil Seal, Pump Side	1113996	1
O-ring for Oil Seal Holder	1113988	1
O-ring for Motor Adapter	1121063	1
Bearing Cup and Cone	1120603	2
Retaining Ring for Bearing Frame Housing	1114280	1
Retaining Ring for Bearing Frame Shaft	1113999	1
Lock Nut - Left-hand Thread	1115975	1
Lock Washer, Flat with Tag	1114282	1
Multi-tanged Washer	1114283	1
Bearing Frame Shaft, Left-hand Thread	1120348	1
Bearing Frame Shaft Bolt Shims	1120361	3
Bearing Frame, Painted	1123381	1
Bearing Frame Shaft Washer	1120379	1
Bearing Frame Shaft Bolt	1114379	1
Oil Breather	1114851	1
Bearing Frame Shaft Set Screw Cone Point	1113769	1
Oil Sight Gauge	1225967	1
Oil Drain Plug, 3/8-inch	1122036	3
Oil Seal Holder Assembly (Without Oil Seal, P/N 1113996)	1120723	1
Coupling Flanges and Sleeve: Refer to Coupling Size (Section 10.2)	*	**
Coupling Key Bearing Frame	1120444	1
Pump Shaft Key	1120446	1
Machine Bolts, 5/16- x 18 NC x 2-1/2-inch long [US Thread (for Oil Seal Holder Removal)]	1116595	2

* D: Quantity of two (2) Coupling Flanges

* Quantity of one (1) Coupling Sleeve

** Refer to Section 10.2 (Parts List, Standard Model) for part numbers

10.6 Bearing Frame Overhaul Tools

1. Two (2) 5/16-inch x 18 UNC x 2-1/2-inch long bolts for removal of grease seal holder.
2. One (1) 3/8-inch bolt to hold bearing frame shaft when removing lock nut.
3. One (1) 3/16-inch Allen (hex) wrench for removal of bearing frame shaft set screw.
4. Bearing press (arbor press).
5. Dial indicator for setting bearing frame shaft end play.
6. Retaining ring pliers for removal of retaining ring from E-Bearing frame shaft (Truarc L1520 or equivalent).

10.7 Mechanical Seal Change-Out Tools

1. One (1) 3/16-inch Allen (hex) wrench for removal of bearing frame shaft set screw.
2. One (1) 3/8-inch wrench.

10.8 Ordering Parts

Order parts through your local distributor or directly from:

GE Infrastructure
Water & Process Technologies
5951 Clearwater Drive
Minnetonka, MN 55343-8995 USA
Telephone: (952) 933-2277
Fax: (952) 933-0141
Toll Free: (800) 848-1750

To order parts, the following information is necessary:

1. Pump model number (see pump label)
2. Pump serial number (see pump label)
3. Other nameplate information such as operating temperature, materials of construction, or material code and type of mechanical seal
4. Motor horsepower, motor frame size, and enclosure specification
5. Part name
6. Part number
7. Quantity desired
8. Specific materials of construction, if any.

11.0 WARRANTY

TONKAFLO PUMP WARRANTY

GE warrants its pumps to be free from defects in design, material or workmanship for a period of 15 months from receipt or 12 months from installation of the product, whichever occurs first, when said products are operated in accordance with written instructions and are installed properly. If Tonkaflo pumps are altered or repaired without prior approval of GE, all warranties are void. If any defects or malperformance occur during the warranty period, GE's sole obligation shall be limited to alteration, repair, or replacement at GE's expense, F.O.B. factory, of parts or equipment, which upon return to GE and upon GE's examination prove to be defective. Equipment and accessories not manufactured by GE are warranted only to the extent of and by the original manufacturer's warranty. GE shall not be liable for damage or wear to equipment caused by abnormal conditions, excessive temperature, vibration, failure to properly prime or to operate equipment without flow, or caused by corrosive, abrasive or foreign objects. The foregoing warranty is exclusive and in lieu of all other warranties, whether expressed or implied, including any warranty of merchantability or fitness for any particular purpose. In no event shall GE be liable for consequential or incidental damages.

PUMP MODEL NUMBER: _____

PUMP SERIAL NUMBER: _____

For more information call 952-933-2277 or 800-848-1750 in the U.S., or visit www.gewater.com.

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