TEIKOKU USA INC
CHEMPUMP

Instruction Manual

for: Installation, Operation, & Maintenance

DYNAPUMP

Sealless Leakproof Canned Motor Pump

LE SERIES

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CAUTION

Dynapump LE Series are canned motor, sealless pumps that offer a low cost, off the shelf, environmentally friendly alternative to sealed and single containment sealless pumps. Care should be exercised upon installation, start up, removal and maintenance of the pumps. Recommended safety equipment should be used at all times.

Prior to returning any Dynapump LE Series to the factory the following procedure must be followed:

1. Return Authorization must be obtained from the factory.

2. The pump must be decontaminated and cleaned.

3. The pump must be accompanied by a Decontamination Form, completely filled out and signed by a responsible individual at the customer's facility. (Refer to copy of Decontamination Form in the Appendix of the Instruction Manual.)

It is recommend that, as a minimum, a set of bearings and gaskets be purchased for each Dynapump LE Series installed. When ordering spare parts, please reference the serial number and model designation indicated on pump nameplate. When ordering an impeller assembly, specify the diameter which can be measured across the blade tips.

Dynapump LE Series purchased for a particular application should only be used for that service. Metallurgy, bearing materials and motor size may not be compatible if used on a different application. Consult your local, authorized Teikoku USA Inc / Chempump representative or distributor, or contact the factory for confirmation.

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SECTION 1. General Information

1.1 General Design and Operation

The Dynapump LE Series is a combined centrifugal pump and squirrel cage induction electric motor built together into a single hermetically sealed unit. The pump impeller is of the closed type, and is mounted on one end of the rotor shaft, which extends from the motor section into the pump casing. The rotor is submerged in the fluid being pumped and is, therefore, “canned” to isolate the motor rotor from contact with the fluid. The stator winding is also “canned” to isolate it from the fluid being pumped. Bearings are submerged in system fluid and are therefore, lubricated by the process fluid.

The Dynapump LE has only one moving part, a combined rotor-impeller assembly that is driven by the induced magnetic field of an induction motor. A portion of the pumped fluid is allowed to re-circulate through the rotor cavity to cool the motor and lubricate the bearings. The stator windings are protected from contact with the re-circulating fluid by a corrosion resistant, non-magnetic, alloy liner, which completely seals or “cans” the stator winding. The re-circulating fluid is channeled into the motor section by holes drilled in the front bearing housing. A portion of the pumpage flows across the front bearing and returns to the rear of the impeller. The remainder passes over the rotor, across the rear bearing, and returns to suction through a hollow shaft. See Figure 1-1.

The Dynapump LE offers true positive secondary containment as a standard design feature. In the event of a failure of the primary containment can, the stator assembly in conjunction with the leak proof terminal post assembly provides the secondary containment. This design prevents any release of the process fluid out to the atmosphere.

A standard feature of the Dynapump LE is the patented Teikoku Rotary Guardian (TRG). The TRG is an electrical meter that continuously monitors the condition of the bearings. For more information on the TRG refer to 2-3.4 Bearing Wear Monitor, Page 7.

The Dynapump LE sealless pump is a precision-built unit that, with proper care, will give years of trouble-free, leakproof service. The entire unit is mounted on a fabricated steel base cradle. Operation is unaffected by the mounting or operating position, eliminating the need for any costly alignment procedures. This manual, containing basic instructions for installation, operation and maintenance of the Dynapump LE Series, is designed to assist you in obtaining this service.

It is important that the persons responsible for the installation, operation, and maintenance of the pump, read and understand the manual thoroughly. Trouble-free Dynapump LE performance begins with proper pump selection and application. If the selected pump does not have the required performance characteristics, or if the materials of construction are not properly specified for the fluid being handled, unsatisfactory operation may result. No amount of maintenance can compensate for this.

If you are in doubt about proper Dynapump LE selection or application, write or call your Dynapump LE engineering representative or the factory for assistance. Additional copies of this manual are available from the Dynapump LE field representative, the factory or on our website: www.dynapump.com.

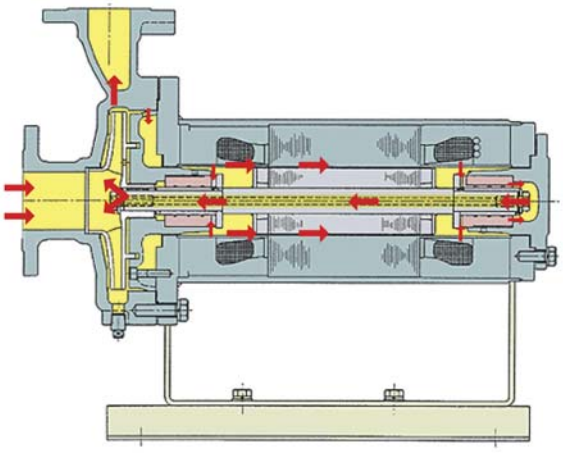

Figure 1-1. Dynapump LE Series Standard Circulation

1-2. Stator Assembly

The stator assembly consists of a set of three-phase windings connected in a one-circuit wye arrangement. Stator laminations are of low-silicon grade steel. Laminations and windings are mounted inside the cylindrical stator band. End bells, welded to the stator band, close off the ends of the stator assembly. The stator liner is, in effect, a cylindrical "can" placed in the stator bore and welded to the rear end bell and front end bell to hermetically seal off the windings from contact with the liquid being pumped. Terminal leads from the windings are brought into an oversized electrical terminal box. Motor lead wires are isolated from the users' conduit line by a leakproof terminal post assembly mounted inside the terminal box. The design of the stator assembly in conjunction with the leakproof terminal post assembly provides a true positive secondary containment.

1-3. Rotor Assembly

The rotor assembly is a squirrel cage induction rotor constructed and machined for use in the Dynapump LE. It consists of a machined corrosion resistant hollow shaft, laminated core with cast aluminum bars and end rings, corrosion resistant end covers, and a corrosion resistant can. The impeller is keyed to the shaft and held in place with a bolt and lockwasher.

The rotor end covers are welded to the shaft and also to the rotor can which surrounds the outside of the rotor, thus hermetically sealing off the rotor core from contact with the liquid being pumped.

The shaft is fitted with replaceable shaft sleeves and thrust collars. These parts are pinned or keyed to prevent rotation. Axial movement is restricted by the thrust collars contacting the face of the front and rear bearings.

1-4. Bearings

The bearings for the Dynapump LE Series are carbon graphite as standard (silicon carbide is available as an option) and are machined with special helix grooves through the bore to assure adequate fluid circulation at the journal area. Each bearing is manufactured to close tolerances for a high degree of concentricity and is held in a bearing housing by a retaining screw. Bearings are easily replaced by removing the retaining screw and sliding the bearing from its housing.

1-5. Thrust Collars and Shaft Sleeves

All Dynapump LE models are equipped with thrust collars providing a replaceable surface against which axial loads can be carried during process upset conditions. The shaft is also fitted with replaceable shaft sleeves. Both the thrust collars and shaft sleeves are constructed of 316SS with a hard chrome wear surface for long life. These parts are pinned or keyed to prevent rotation.

1-6. Cooling Flow

Cooling for stator, rotor, and bearings, as well as bearing lubrication, is provided by circulation of the pumped fluid. A portion of the process fluid enters the motor section through ports in the front bearing housing. The fluid flows across the front bearing and returns to the rear of the impeller. The remainder passes over the rotor, across the rear bearing, and returns to suction through the hollow shaft. See Figure 1-1, Page 1.

1-7. Automatic Thrust Balance

Based on hydraulic principles, Dynapump LE's automatic thrust balance is accomplished by the pressure of the pumped fluid itself, operating in a balance chamber at the front and rear of the impeller.

When a change in load shifts the position of the impeller away from the balance condition, there is an equalizing change of hydraulic pressure in the balance chamber, which immediately returns the impeller-rotor assembly to the balanced position.

1-8. Safety Precautions.

1. Do not run pump dry. If the pump is allowed to run dry the bearing sleeves and other components will be damaged and serious overheating of the motor windings will occur.

2. Avoid rapid temperature changes. Rapid changes in temperature can cause leaks to occur in the gasket areas of the pump.

3. Pump may be hot. Motor section of the pump can be very hot, even when pumping cool liquids. Motor windings are rated to 356° F.

4. If the motor trips due to the thermal cutouts, do not restart before determining the cause.

Restarting the motor before ascertaining the cause can result in excessive heat leading to premature failure.

5. Do not remove internal bolts in the terminal box without taking the necessary precautions. The electrical junction box is a pressure-containing component of the pump. It is possible the fluid you are pumping may be present in the motor cavity in the event of a stator liner rupture.

6. Do not remove any bolts on the pump, motor or drain plug without taking the necessary precautions. The pump may be under pressure. Always loosen the drain plug slowly to relieve any internal pressure before attempting to disassemble the pump. Adequate precautions must be taken if the liquid in the pump could be hazardous to personnel or the environment.

7. Always assume that there is liquid left in the pump. There is always the possibility that residual liquid could remain in the pump and motor, even after thorough decontamination. Pay particular attention to the clearances between the shaft and the impeller, bearings, sleeves, bearing housings, and gaskets. Adequate precautions must be taken if the liquid in the pump could be hazardous to personnel or the environment.

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SECTION 2. Installation

2-1. Receipt Inspection

1. Visually inspect the shipping container for evidence of damage during shipment.

2. Check unit to see that suction, discharge and any other connections are sealed.

3. Inspect the suction and discharge gasket seating surface to be certain that they are clean of foreign matter and free from nicks, gouges and scratches.

4. Check all nameplate data against shipping papers.

2-1.1. Storage Note

In situations where a Dynapump LE Series is to be stored for a period of time prior to installation and where the climate experiences wide temperature changes and high humidity, the terminal box, suction and discharge flange, and any other openings must be sealed to prevent moisture from entering the internals of the pump.

2-2. Structural

The pump design and construction eliminates the necessity of aligning the pump and motor. The pump should be supported from the mountings provided. It should be mounted in such a way as to have its weight properly supported. Suction and discharge piping must be properly supported and aligned so that no strain is placed on the pump casing.

General

1. Remove burrs and sharp edges from flanges when making up joints.

2. When connecting flanged joints, be sure inside diameters match within 1/16" so as not to impose a strain on the pump casing.

3. Use pipe hangers or supports at intervals as necessary.

2-2.1. Pump Location

Locate the pump as close as possible to the fluid supply with a positive suction head. Installations with suction lift are possible but not recommended. Location of the pump and arrangement of the system should be such that sufficient NPSH (Net Positive Suction Head) is provided over vapor pressure of the fluid at the pump inlet. NPSH requirements at the design point are stated on the pump order data sheet. For additional design points, refer to the corresponding performance curves located in the Appendix of this manual.

NOTE

Experience has proven that most pump troubles result from poor suction conditions including insufficient NPSH. The suction line must have as few pressure drops as possible and available NPSH MUST be greater than required NPSH.

Depending on job conditions, available NPSH can sometimes be increased to meet the NPSH required by the pump for satisfactory operation. NPSH can be “tailored” by changes in the piping, in liquid supply level, by pressurizing the suction vessel and by several other methods. Refer to Table 2-2, Page 8, Trouble Shooting.

2-2.2. Mounting and Alignment

The Dynapump LE Series combines a pump and motor in a single hermetically sealed unit. No tedious coupling alignment is required because the pump has no external coupling between pump and motor. All models can be mounted in any position. For mounting with discharge on the side or in any other position other than top discharge, please contact the factory. Modifications must be made to the standard internal venting arrangement and hydraulic thrust balance system.

Base cradles are offered on all models. Simply set the pump on a foundation strong enough to support its weight. There is no need to bolt down or grout in a Dynapump LE Series. All Dynapump LE Series models are provided with a specially made base designed to mount on a standard ANSI base plate to facilitate inspection and repair.

Be sure that the suction and discharge piping is properly aligned so that no strain is placed on the pump casing by out-of-line piping.

2-2.3. Piping Data

Observe the standards of the Hydraulic Institute when sizing and making up suction and discharge piping. Follow these procedures:

1. Remove burrs and sharp edges when making up joints.

2. When using flanged joints, be sure inside diameters match properly. When gasketing flanged joints, DO NOT cut flow hole smaller than flange opening.

3. Use pipe hangers or supports at necessary intervals.

4. Provide for pipe expansion when required by fluid temperature.

5. When welding joints, avoid possibility of welding shot entering the suction or discharge line, and thereby entering the pump. **Do not weld pipe while connected to pump.**

6. When starting up a new system, it is recommended to place a temporary 3/16" mesh screen at or near suction port of pump to catch welding shot, scale or other foreign matter. Refer to Section 3-1, Page 9.

7. Do not spring piping when making up any connections.

8. Make suction piping as straight as possible, avoiding unnecessary elbows. Where necessary, use 45 degree or long-sweep 90 degree fittings.

9. Make suction piping short, direct, and never smaller in diameter than suction opening of pump. Suction piping should be equal to or larger than pump suction port, depending on pipe length.

10. Insure that all joints in suction piping are airtight.

11. When installing valves and other fittings, position them to avoid formation of air pockets.

12. Permanently mounted suction filters are not recommended.

It is extremely important to design and size the suction system to minimize pressure losses and to be sure that the pump will not be “starved” for fluid during operation. NPSH problems are a result of improper suction systems.

If suction pipe length is short, pipe diameter can be the same size as the pump suction port diameter. If suction piping is long, the size should be one or two sizes larger than pump suction port, depending on piping length. Use the largest pipe size practical on suction piping and keep piping short and free from elbows, tees or other sources of pressure drop.

If elbows, tees or valves must be used, locate them from 10 to 15 pipe diameters upstream from suction. When reducing to pump suction port diameter, use eccentric reducers with eccentric side down to avoid air pockets.

When operating under conditions where pump prime can be lost during off cycles, a foot valve should be provided in the suction line to avoid the necessity of priming each time the pump is started. This valve should be of the flapper type rather than the multiple spring type and of ample size to avoid undue friction loss in the suction line.

When foot valves are used, or when there are other possibilities of fluid hammer, it is important to close the discharge valve before shutting down the pump.

When it is necessary to connect two or more pumps to the same suction line, provide gate valves so that any pump can be isolated from the line. Install gate valves with stems horizontal to avoid air pockets. Globe valves should be avoided, particularly where NPSH is critical.

If discharge pipe length is normal, pipe diameter can be the same size as the pump discharge port diameter. If discharge piping is of considerable length, use larger diameter pipe (one or two sizes larger).

If the pump is to discharge into a closed system or an elevated tank, place a gate valve or check valve in the discharge line close to the pump. The pump can then be opened for inspection without fluid loss or damage to the immediate area.

RECOMMENDED

Install properly sized pressure gauges in suction and discharge lines near the pump ports so that operation of the pump and system can be easily observed. Should cavitation, vapor binding, or unstable operation occur, widely fluctuating discharge pressures will be observed.

Such gauges provide a positive means of determining actual system conditions and can be used to great advantage in evaluating system problems.

2-3. Electrical

2-3.1. General

Except where indicated, all Dynapump LE Series are started with full line voltage. Refer to Paragraph 3-3, Page 9, for checking direction of rotation. Also see Wiring Diagram Figure 2-1, Page 7 for proper wiring connections.

2-3.2. Thermal Cutouts

All Dynapump LE Series are fitted with a thermal cutout. The cutout is a heat-sensitive bimetallic switch mounted in intimate contact with the stator windings. The TCO wiring diagram is shown in Figure 2-1, Page 7. Maximum holding coil currents is 3.1 AMPS for 115 volts.

WARNING

Do not connect TCO in series with main power lead. Excessive heat build up in the winding area opens the normally closed thermal switch, which, in turn, opens the holding coil circuit, shutting off power to the pump. Be sure to connect the thermal cutout as required.

Thermal cutouts in Class H insulated motors are set to open at 356° F (180° C). If the motor cuts out because of TCO action, there will be a time delay before the motor can be restarted. The motor must be restarted manually.

DO NOT RESTART UNTIL YOU DETERMINE THE CAUSE OF THE OVERHEATING.

WARNING

The thermal cutout switch does not provide protection against fast heat build-up resulting from locked rotor conditions, single phasing or heavy overloads. The current overload relay heaters in the magnetic starter must provide for this protection. The rating of the heaters should be high enough to avoid nuisance cut outs under running loads, but must not be oversized. Refer to Table 2-1, Page 7, for starting and running electrical characteristics. It is recommended that "quick trip" (Class 10) heaters be used because of the more rapid response time.

2-3.3. Starting Equipment

Motor starters (normally not supplied with Dynapump LE Series) should be sized to handle the load required. Full Load HP, Full Load Amps and Start KVA Data is listed in Table 2-1, Page 7.

Heaters in the starters should be sized for the amperage shown on the Dynapump LE Series nameplate. DO NOT size heaters in excess of 10% of full load amp rating. In order to provide complete protection for Dynapump LE Series motors under all conditions, it is recommended that "**quick trip**" (Class 10) type heaters be used in the starters where available. Standard heaters provide adequate protection for Dynapump LE Series motors under starting or normal running conditions, but require a greater length of time than "**quick trip**" type heaters to cut out if the motor is subject to locked rotor or overload conditions.

CASE I - 460 Volt, 3-Phase Dynapump LE Series (See Figure 2-1, Page 7).

Typical 3-phase across-the-line magnetic starter with start-stop push button station shown.

Thermo switch (thermal cutout inside Dynapump LE Series motor) is wired as shown in Figure 2-1, Page 7.

Be sure to size heaters properly. Motor data can be found on the pump nameplate.

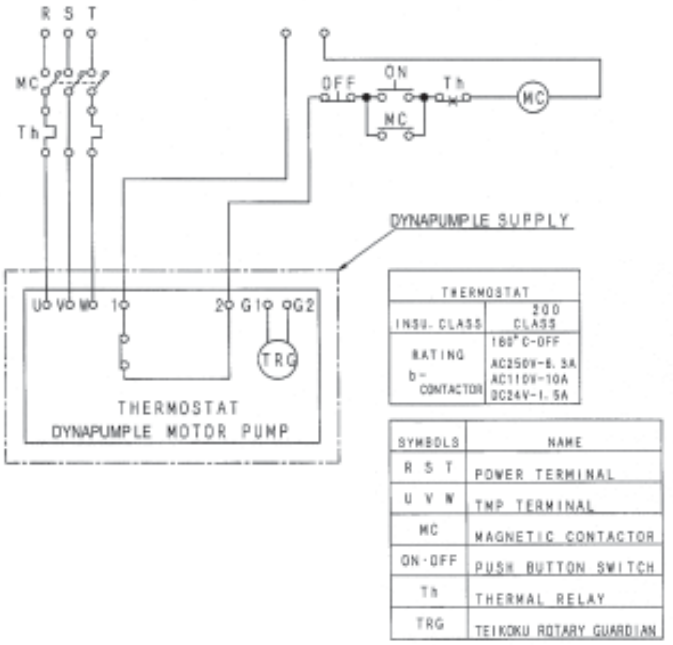

Figure 2-1. Dynapump LE Series 460-Volt, 3-Phase

2-3.4. Bearing Wear Monitor

The Dynapump LE Series patented Teikoku Rotary Guardian (TRG) takes the mystery out of pump reliability by continuously monitoring the critical running clearances between the rotating and stationary components. The TRG is mounted on the electrical junction box as standard.

The TRG meter operates on the principle of induced voltage. Electric coils are embedded in the stator windings and an electric current is produced with the rotation of the rotor assembly. When the rotor is perfectly centered in the stator between the coils the electric currents are balanced and no voltage is detected. When bearing wear occurs the rotor moves toward one coil and away from the other producing a low voltage that is indicated by the TRG meter. As this gap becomes larger the voltage increases. The TRG should be monitored frequently to determine the condition of the pump.

The TRG METER is color coded for easy recognition:

- Green = Normal operation.
- Yellow = Pump should be scheduled for maintenance.
- Red = Pump should be shut down and removed for maintenance.

There is no requirement for resetting of the TRG after replacement of worn components. Once the worn components are replaced and the pump is returned to service, the TRG meter will return to the Green position.

The TRG has been designed to accommodate a variety of output options and can be configured to match existing or future plant instrumentation without significant modification.

Figure 2-2. Dynapump LE Series TRG

Table 2-1. Dynapump LE Series Electrical Data

MOTOR SIZE	INSUL CLASS	VOLT	PHASE	HERTZ	RPM	FULL LOAD AMPS	FULL LOAD KW	FULL LOAD HP	START KVA	STARTING AMPS	LOCKED ROTOR CODE	OPER TEMP CODE
3111	H	460	3	60	3450	3.1	1.4	1.8	8.3	10.4	E	T3A
3115	H	460	3	60	3450	5.5	2.5	3.3	15.4	19.4	E	T3A
3211	H	460	3	60	3450	8.0	4.0	5.3	22.7	28.5	D	T3A
3215	H	460	3	60	3450	14.5	7.5	10.0	41.3	51.8	D	T3A
3311	H	460	3	60	3450	17.0	8.8	11.7	49.6	62.3	D	T3A
3315	H	460	3	60	3450	24.0	12.4	16.6	76.1	95.5	E	T3A

Table 2-2. Trouble Shooting

Trouble	Cause	Remedy
I. Failure to Deliver Required Capacity	a. Pump not primed. b. Air leaks in suction piping. c. Motor not energized. d. Motor windings burnt out or grounded. e. Low suction head. f. Discharge head too high. g. Discharge valve closed or partially opened. h. Impeller clogged. i. Wrong direction of rotation. j. Damaged impeller.	a. Re-prime pump in accordance with Paragraph 3-2. b. Locate leaks and eliminate. c. Check motor wiring. See Paragraph 2-3. d. Check electrical continuity of windings and if negative response, stator assembly needs to be replaced. e. Correct suction side of system to insure availability of design NPSH. f. Correct discharge side of system to insure proper operating conditions. g. Open discharge valve until rated discharge pressure is obtained. h. Remove obstructions in the impeller. i. Reverse any two motor leads and check with phase sequence meter. See Paragraph 3-3. j. Impeller must be repaired or replaced.
II. Insufficient Pressure	a. Pump not primed. b. Air leaks in suction piping. c. Motor not energized. d. Motor windings burnt out or grounded. e. Low suction head. f. Discharge valve open too wide. g. Impeller clogged. h. Wrong direction of rotation. i. Damaged impeller.	a. Re-prime pump in accordance with Paragraph 3-2. b. Locate leaks and eliminate. c. Check motor wiring. See Paragraph 2-3. d. Check electrical continuity of windings and if negative response, stator assembly needs to be replaced. e. Correct suction side of system to insure availability of design NPSH. f. Close down discharge valve until rated discharge pressure is obtained. g. Remove obstructions in the impeller. h. Reverse any two motor leads. i. Impeller must be repaired or replaced.
III. Pump Loses Prime After Starting	a. Pump not properly primed at starting. b. Air leaks in suction piping. c. Air or gas in fluid. d. Low suction head.	a. Reprime pump in accordance with Paragraph 3-2. b. Locate leaks and eliminate. c. Locate source of gas or air entrainment and correct. d. Correct suction side of system to insure availability of design NPSH.
IV. Pump Takes Too Much Power	a. Shaft bent. b. Rotating element binds. c. Electrical short. d. Wrong direction of rotation.	a. Replace rotor assembly or straighten shaft if bend is not too great. b. Replace bearings (See Paragraph 4-1) as a result of excessive wear, or check for presence of foreign material in rotor chamber. c. Check electrical continuity of all phases of the motor winding and replace stator assembly if necessary. d. Reverse any two motor leads.
V. Pump Vibrates	a. Foundation not sufficiently rigid. b. Impeller partially clogged. c. Shaft bent. d. Worn bearings. e. Rotating element rubbing stator liner.	a. Tighten all bolts on with the pump base and base supporting structure. b. Remove obstructions in the impeller. c. Replace rotor assembly or straighten shaft if bend is not too great. d. Replace bearings (See Paragraph 4-1). e. Replace bearings (See Paragraph 4-1) as a result of excessive wear or check for presence of foreign material in rotor chamber.
VI. Motor Running Hot	a. Motor operating at overload condition. b. Pump is operating below minimum flow. c. Pump is running dry.	a. Make sure pump is operating at design point and conditions specified when purchased. b. Increase the flow thru the pump. c. Check suction line for obstructions and closed valves.

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SECTION 3. Operation

3-1. Procedure Before Initial Start

Before starting the pump for the first time, make sure suction and discharge piping are free of tools, nuts, bolts, or other foreign matter. Save time and money by checking before start-up.

RECOMMENDED

Install a temporary 3/16" mesh screen near the suction port to trap scale and other foreign particles. The screen can be installed for 24 hours of operation, but watch closely that the pump does not become starved for fluid because of a clogged screen. REMOVE SCREEN AFTER 24 HOURS OF RUNNING.

3-2. Priming and Venting

The pump must be primed before operating. Priming requires the filling of the pump casing and motor chamber with liquid.

When there is a positive suction head on the pump, priming can be accomplished by opening the valves in the suction and discharge line, and allowing the pump casing and motor chamber to fill. The Dynapump LE Series is centerline discharge and is self-venting when installed in the horizontal position.

3-3. Rotation Check

Centrifugal pump impellers must rotate in the proper direction to deliver rated head and capacity. The impeller must rotate in the same direction as the arrow cast on the pump casing.

The correct direction of rotation can be checked as follows:

Wire Dynapump LE Series motor for correct voltage.

1. With main power leads connected, check direction of impeller rotation. If the unit is not installed in the system, rotation can be observed by "bumping" the motor and looking into the suction flange. **NEVER LOOK INTO THE DISCHARGE FLANGE**. If direction of impeller rotation is incorrect, change two power leads.

2. If the pump is installed and primed, the direction of rotation can be checked by the following methods:

   A. A hand-held direction of rotation indicator is available from Teikoku USA Inc and the Chempump Division. This portable device can be used to confirm the rotation of any motor.

   B. Use a phase sequence meter on the electrical connections.

   C. After the Dynapump LE is properly primed and vented, open suction valve 100% and start the unit with the discharge valve 20% open. Note the discharge pressure at a pressure gauge, which should be installed between the pump casing and discharge valve. Reverse any two of the three power leads and read the pressure gauge again. The higher pressure is the correct direction of rotation. It is recommended that the unit be run as little as possible with a closed discharge valve in order to prevent excessive overheating of the fluid circulating within the unit.

NOTE

If a discharge valve is not available an alternate method is to use a flow meter and determine higher flow rate. Wrong direction of rotation is indicated by a low discharge pressure or flow rate. At shut-off, head is about 2/3 of the head produced by correct rotation. Continued operation in reverse can result in damage to the pump. If reverse rotation has occurred, it is wise to shut down the unit and tighten the impeller bolt before restarting.

Once you have determined correct rotation, tag correctly connected main power leads, in accordance with motor lead markings.

3-4. Starting Procedure

After priming, venting, and checking the direction of rotation, put the pump in operation as follows:

1. Fully open the valve in the suction line.

2. Set the valve in the discharge line to 20% open.

3. Start the pump. Pump should operate with very low noise and vibrations. Excessive or abnor-

mal noise or vibrations should be corrected immediately.

4. When the pump is running at full speed, slowly open the valve in the discharge line to the desired setting.

5. Once pump is operational, check the reading of the TRG meter. If the meter is in the green, pump is operating normally. If the meter is in the yellow or red, stop the pump and check for possible causes of the incorrect reading. Record initial reading for comparison to future readings.

CAUTION

The pump should not be allowed to run for more than one minute with the discharge valve fully closed.

NOTES:

1. If the suction and discharge lines are completely filled with system fluid and adequate suction head is available, the pump can be started without closing the discharge valve. During any start up sequence, caution must be exercised not to exceed full load ampere rating indicated on the nameplate.

2. If the unit has not been run for a period of two weeks or more, the following inspections should precede its operation:

   A. Check terminal box for moisture.

   B. Upon starting, check for excessive noise, vibration, erratic speeds or excessive amp draw.

CAUTION

If the pump appears to be air bound as a result of the unit not being properly primed, do not continue operation. Locate and correct the conditions that prevent proper priming before attempting to start the unit.

3-5. Operation Details

TRG meter should be checked periodically during operation. If the initial reading (TRGi) was not recorded, then the color coding system shown in section 2-3.4, Page 7 may be used to determine bearing changing intervals. If the TRGi was recorded, then the following formulas can be used. If the reading exceeds TRGi +0.3, then the pump should be scheduled for maintenance. If the reading exceeds TRGi +0.4, then the pump should be shut down and removed for maintenance.

Discharge pressure should be checked frequently during operation. Pressure should be stable in a non-variable closed loop although the discharge pressure gauge needle may show small fluctuations.

In some cases, the fluid supply may contain an excessive amount of air or gas, which will tend to separate from the fluid and remain in the passages of the pump. This results in the pump losing its prime and becoming air bound with a marked reduction in capacity. The discharge pressure gauge will show large fluctuations if this occurs.

3-6. Shutdown Procedure

Shutdown as follows:

1. Close the valve in the discharge line.

CAUTION

The pump should not be allowed to run for more than one minute with the discharge valve fully closed.

2. Stop the pump (De-energize the motor).

3. Close suction valves if pump is to be removed from service.

CAUTION

If the pump is to be shut down for a long period of time or if there is danger of freezing, after stopping the pump, shut all suction and discharge valves, and drain the entire pump and connected piping.

NOTE

To assist in determining remedies for various problems, see Table 2-2, Page 8 Trouble Shooting.

SECTION 4. Maintenance

4-1. Recommended tools for Disassembly Reassembly and Inspection.

Size	Description
17 mm	Socket wrench for pump casing, rear bearing housing bolts, rear shaft sleeve retaining bolt, and impeller retaining bolt M10.
19 mm	Socket wrench for impeller retaining bolt M12.
3 mm	Hex wrench for bearing retaining screws.
5 mm	Hex wrench for front bearing housing retaining bolts.
.200"	Travel Dial Indicator to measure endplay.
Dial calipers	To measure bearing wear.
Feeler Gauges	To measure "g" gap.
Torque Wrench	To measure bolt tightness.

4-1.1. Disassembly

1. Fully close valves in discharge, suction and utility piping.

2. Disconnect the power cables from the connection box prior to disassembly.

WARNING
SAFETY HAZARD TO PERSONNEL WILL EXIST IF THIS STEP IS NOT FOLLOWED.

3. Remove drain plug or open drain valve to drain liquid in the pump.

4. Since piping loads may exist, insert bracing under casing.

5. Remove casing bolts. Be careful not to spill any remaining fluid that may be trapped in casing.

6. Remove anchor bolting in order to slide pump out of casing. Casing will remain attached to piping.

7. Measure and record the "g" gap before further disassembly. See Figure 4-2, on Page 13.

8. To remove impeller, extend tabs of lock washer and remove impeller bolt. Be careful of small parts that can be lost.

9. Remove socket head cap screws and remove Front Bearing Housing from Stator Assembly. Exercise care while removing this housing because of liquids which may be contained in the stator assembly.

10. Remove Rear Bearing Housing Bolts and remove Rear Bearing Housing from Stator Assembly. Exercise caution while removing this housing because of liquids which may be contained in the Stator Assembly.

11. Remove Rotor Assembly. Place on a clean cloth to avoid damage. During the removal of the rotor take care in handling the rotor to prevent damage to the rotor or stator because the rotor will drop once the armature clears the stator assembly and the rotor shaft may hit the stator liner if not properly supported.

12. Remove front shaft sleeve and front thrust collar.

13. To remove rear Shaft Sleeve and thrust collar, bend tabs up on lock washer and unscrew bolt. **This bolt has left hand threads.**

14. To remove bearing, remove set screw and slide out bearing.

4-2. Inspection

4-2.1. Bearings

Check the following points:

A. Thrust face for scratches and chips. Refer to Table 4-1(L), Page 14 for excess wear on thrust surface. (Check this dimension after bearing has been removed.)

B. Wear inside of bearing bore. Refer to Table 4-1 (A – B), on Page 14.

4-2.2. Shaft Sleeves and Thrust Collars

The rotor assembly shaft sleeves and thrust surfaces should also be visually inspected at the bearing con-

tact area for general appearance and uniform wear. Excessive undercutting, pitting, or scoring is cause for replacement.

Check the following points:

A. Corrosion

B. Contact marks and wear.

4-2.3. Rotor Assembly Inspection

The complete rotor assembly should be visually inspected for cracks, breaks, pitting, or corrosion which might destroy the effectiveness of the hermetically sealed rotor end covers and sleeve.

4-2.4. Stator Assembly Inspection

The complete stator assembly should be visually inspected for cracks, breaks, pitting, or corrosion of the stator liner which may destroy the effectiveness of the barrier. Inspect the inside of the electrical junction box for corrosion and moisture.

4-2.5. General Inspection

1. Inspect the impeller bolt threads on the rotor shaft to ensure they are not damaged. LE Series Dynapumps have right hand threads.

2. Be sure that all mating faces are free of nicks and burrs so that they will have a smooth face ensuring a good seal. Clean off any trace of old gasket material.

3. Make sure all parts are clean. Inaccessible area may be cleaned with a small brush or pointed tool.

4. The impeller face should be inspected for wear. If excessive grooving or scoring of the wear rings is evident, the impeller must be repaired or replaced.

4-3. Reassembly

1. Clean and dry all parts. Reassemble in the reverse manner of disassembly.

2. Insert bearing with flat washer into front and rear bearing housings. Position flat washer side of bearing in line with set screw hole. While holding bearing down tighten set screw.

   NOTE

   The front bearing has only spiral grooves, the rear bearing has spiral and straight grooves.

3. Slide on Rear Thrust Collar, verifying that the Thrust Collar is installed correctly. Slide on the Rear Shaft Sleeve insuring that the Shaft Sleeve is tight against the Thrust Collar and is engaged in the anti-rotational key or pin. Install the Flat Washer, Lock Washer, and Lock Bolt insuring that the Lock Washer tab is engaged in the slot in the Shaft Sleeve. Torque Lock Bolt per Table 4-4, Page 14. **This bolt has left hand threads.**

4. Slide on Front Thrust Collar, verifying that the Thrust Collar is installed correctly. Slide on the Front Shaft Sleeve insuring that the Shaft Sleeve is tight against the Thrust Collar and is engaged in the anti-rotational key or pin. Slide assembled Rotor into Stator with rear end of Rotor extending out of the Stator.

5. Install the Rear Stator Gasket. Slide the Rear Bearing Housing onto the Rotor and slide the Rear Bearing Housing and Rotor into the Stator. Take care to tighten bolting evenly. Torque Bolts per Table 4-5, Page 14.

6. Slide Front Bearing Housing onto Rotor and into Stator. Take care to tighten bolting evenly. Insure that the Shaft Sleeve is tight against the Thrust Collar and is engaged in the anti-rotational key or pin.

7. Slide Adjusting Washers onto Rotor Shaft. Slide Impeller onto Rotor Shaft, install the Flat Washer, Lock Washer and Lock Bolt insuring that the Lock Washer tab is engaged in the Impeller key slot. Check Rotor Assembly endplay. End play should be within the range indicated in Table 4-2, Page 7. If the rotor assembly does not fall within this range, discard the old bearings and change to new bearings.

8. Adjusting the “g-gap” using Figure 4-2, Page 13 and Table 4-3, Page 14. Pull impeller forward and with adjusting washers, installed behind impeller in place, Gap “g” should be within indicated ranges using Table 4-3, Page 14. If gap is not within specified range, use adjusting washers behind impeller to make adjustments.

9. Make sure impeller bolt is tight (use Table 4-4, Page 14. for correct torque values) and lock washer locking tabs are bent over.

10. Assembled pump should rotate freely by hand with no metal to metal contact.

11. Install Pump Case Gasket. Slide pump back into casing and tighten all bolts. Add new Teflon tape to plugs where needed. Torque Bolts per Table 4-5, Page 14.

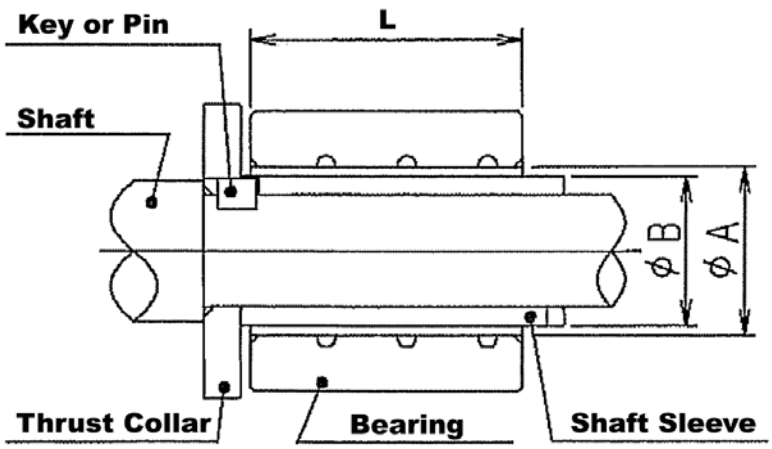


Figure 4-1. Bearing Wear

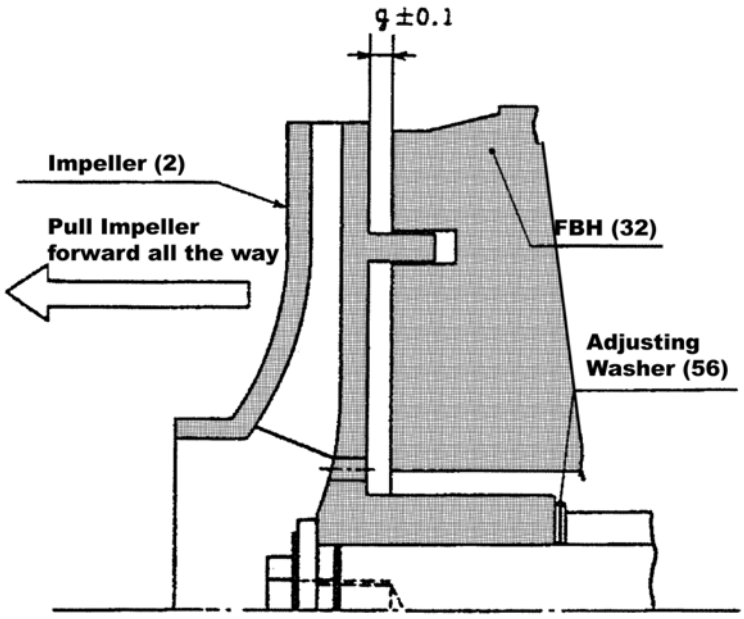


Figure 4-2. "g" Gap

* MODEL NUMBER IDENTIFICATION CODE EXAMPLE: F60-**[3215]**N4BL-0204**[SF]**1-AV

MOTOR | IMPELLER SIZE

TABLE 4-1. Bearing Wear Limit

Note: 15A = Front Bearing, and 15B = Rear Bearing

Motor Frame Number *	A-B	L
3111, 3115(15B)	0.3mm (0.012 in.)	44.2mm (1.746 in.)
3115(15A), 3211, 3215(15B)	0.4mm (0.016 in.)	49.2mm (1.937 in.)
3215(15A)3311, 3315(15B)	0.4mm (0.016 in.)	59.2mm (2.331 in.)
3315(15A)	0.4mm (0.016 in.)	69.2mm (2.724 in.)

TABLE 4-2. Playing Gap of Rotor (Axial End Play)

Motor Frame Number *	New Bearing
3111	0.7~1.9mm (0.028~0.075 in.)
3115, 3211	0.7~2.1mm (0.028~0.083 in.)
3215, 3311	0.7~2.1mm (0.028~0.083 in.)
3315	0.9~2.5mm (0.035~0.098 in.)

TABLE 4-3. Adjusting Value of Gap "g"

Note: "g" Gap has a +/-0.1mm adjustment range or +/-0.004 in. tolerance

Motor Frame Number *	Impeller Size	"g" Adjusted
3111	SG, SF	4mm (0.158 in.)
3115, 3211	SG, SF, TG	4mm (0.158 in.)
	TF	4.2mm (0.165 in.)
3215, 3311	SG, SF, TG	4mm (0.158 in.)
	TF	4.2mm (0.165 in.)
3315	TF	4.5mm (0.177 in.)

TABLE 4-4. Tightening Torque for Impeller and Rotor Bolts

Note: Rotor Bolts have left hand threads.

Motor Size	Bolt Type	Bolt Size	Value of Torque (ft. lb.)
3111	Impeller	M8	8
3115, 3211	Impeller	M10	13
3215, 3311	Impeller	M12	22
3315	Impeller	M14	34
3111, 3115	Rotor	M8	8
3211, 3215	Rotor	M10	13
3311, 3315	Rotor	M12	34

TABLE 4-5. Tightening Torque for Pump Casing and Rear Bearing Housing Bolts

Note: Number follows M represents nominal threads OD in mm.

Motor Size	Bolt Type	Bolt Size	Value of Torque (ft. lb.)
3111, 3115, 3211, & 3215(SG, SF)	Pump Casing	M10	26
3215(TG, TF), 3311, & 3315	Pump Casing	M12	44
All	Rear Bearing Housing	M10	26

APPENDIX

TEIKOKU USA INC
CHEMPUMP

TROUBLE ANALYSIS SHEET

CUSTOMER: _____ **DATE:** _____

ADDRESS: _____ **PHONE:** _____

_____ **FAX:** _____

CONTACT: _____ **S/N #:** _____

E-MAIL: _____

Proper analysis of the trouble you have been experiencing requires an accurate description of operating conditions and the system in which the pump is installed.

DATE INSTALLED:_____ **DATE REMOVED:**_____ **HOURS USED:** _____

1.) LIQUID OR SOLUTION HANDLED (Include impurities or % if mixture):_____

_____

IS DISSOLVED GAS PRESENT?_____

ARE SOLIDS IN SUSPENSION PRESENT?_____

IF SO, STATE NATURE:_____

2.) ACTUAL OPERATING CONDITIONS: TRANSFER CIRCULATION

FLOW: _____**GPM** **SUCTION PRESSURE:** _____**PSIG**

DISCHARGE PRESSURE: _____**PSIG** **DIFFERENTIAL:** _____**PSI/FT**

PUMPING TEMPERATURE: _____**F** **SP. GR. @ P.T.:** _____

VISCOSITY AT: **VAPOR PRESSURE AT:**

PUMPING TEMPERATURE: _____**CPS** **PUMPING TEMPERATURE:**_____**PSIA/MMHG**

AMBIENT: _____**CPS** **AMBIENT:** _____**PSIA/MMHG**

3.) PLEASE SEND A SKETCH OF YOUR SYSTEM. GIVE A BRIEF DESCRIPTION, INCLUDING A ROUGH FLOW SHEET. INDICATE WHAT CHEMICAL OR PHYSICAL ACTION OCCURS BEFORE THE PUMP. SHOW COOLING OR HEATING SERVICES ON LINES DIRECTLY AFFECTING THE PUMP. SHOW WHAT CONTROLS ARE USED AND WHAT THEY OPERATE. IF MORE THAN ONE PUMP OPERATES ON A COMMON SUCTION, SHOW HOW THEY ARE BALANCED.

YOUR ATTENTION TO THIS REPORT IS GREATLY APPRECIATED. UPON RECEIPT AT CHEMPUMP, WE WILL EVALUATE THE FACTS SHOWN AND RETURN OUR RECOMMENDATIONS TO YOU.

RETURN COMPLETED FORM TO:

CHEMPUMP
FACTORY SERVICE CENTER
959 MEARNS ROAD, WARMINSTER, PA 18974
PHONE: (215) 343-6000 FAX: (267) 486-1037

TEIKOKU USA INC
CHEMPUMP

DECONTAMINATION CERTIFICATION AND FLUSHING PROCEDURE

CUSTOMER _____ **DATE:** _____

ADDRESS: _____ **PHONE:** _____

_____ **FAX:** _____

CONTACT: _____ **RMA #:** _____

Please complete the items below. Providing this information will allow us to work as quickly and safely as possible.

PUMP MODEL: _____ **SERIAL NUMBER:** _____

PART NUMBER: _____ **DATE INSTALLED:** _____

DATE PURCHASED: _____ **INDOOR / OUTDOOR:** _____

REASON FOR RETURN: ☐ WARRANTY REQUEST ☐ FACTORY SERVICE

FAILURE INFORMATION:

☐ Failure To Deliver Required Capacity
☐ Loses Prime After Starting
☐ Axial Wear Due To Thrust
☐ Vibration
☐ Bearing Failure
☐ Insufficient Pressure
☐ Motor Burnout
☐ Other: _____

BRIEF DESCRIPTION OF PUMP FAILURE: _____

_____

_____

DECONTAMINATION INFORMATION

All pumps/parts must be completely decontaminated and all information in this section must be completed prior to shipment to our factory or service center. Shipments received without this documentation will not be accepted and will be returned to the point of shipment.

CHECK ONE OF THE FOLLOWING:

☐ The pump has been flushed by following steps A through A3 of the Chempump Flushing Procedure on page 2 of this form. No liner rupture is suspected.

☐ Both the complete pump and the stator assembly have been flushed by following steps A through B3 of the Chempump Flushing Procedure on page 2 of this form. The motor must be rewound.

FLUID PUMPED: _____ **WHAT FLUID DID YOU FLUSH WITH:** _____

Attach completed material safety data sheets (MSDS) for these fluids. *If either fluid is proprietary, please attach a description of any characteristics that will assist Chempump in safe handling. Without detailed and complete information on the pumped fluid, we will not be able to process your order.*

PROTECTION EQUIPMENT RECOMMENDED FOR SAFE HANDLING OF THE PROCESS FLUID: _____

_____

DECONTAMINATION CERTIFIED BY: _____ **DATE:** _____

TITLE: _____ **PHONE:** _____

RETURN COMPLETED FORM AND PUMP/PART TO:

☐ CHEMPUMP
FACTORY SERVICE CENTER
959 MEARNS ROAD
WARMINSTER, PA 18974
PHONE: (215) 343-6000
FAX: (267) 486-1037

☐ CHEMPUMP
MIDWEST SERVICE CENTER
STATE ROUTE 2
BELMONT, WV 26134
PHONE: (304) 684-2459
FAX: (304) 684-7593

☐ TEXAS PROCESS EQUIPMENT
5880 BINGLE ROAD
HOUSTON, TX 77092
PHONE: (713) 460-5555
FAX: (713) 460-4807

FLUSHING PROCEDURES FOR CHEMPUMP PRODUCTS

THE FOLLOWING FLUSHING PROCEDURES ARE REQUIRED TO ALLOW FOR MAXIMUM REMOVAL OF PROCESS FLUIDS.

A. COMPLETE PUMP

A1) WITH THE SUCTION FLANGE DOWN, INTRODUCE AN APPROPRIATE NEUTRALIZING FLUID THROUGH THE DISCHARGE FLANGE. FLUSH THE PUMP IN THIS MANNER FOR A SUFFICIENT TIME TO ALLOW FOR THE REMOVAL OF ALL PROCESS FLUID.

A2) AGAIN, WITH THE SUCTION FLANGE DOWN, REMOVE THE CIRCULATION LINE (AND FITTING IF NECESSARY) AND INTRODUCE AN APPROPRIATE NEUTRALIZING FLUID TO THE REAR OF THE PUMP. FLUSH THE PUMP IN THIS MANNER FOR A SUFFICIENT TIME TO ALLOW FOR THE REMOVAL OF ALL PROCESS FLUID. ALSO FLUSH THE CIRCULATION LINE AND/OR HEAT EXCHANGER TUBING, AS REQUIRED.

A3) AFTER FLUSHING AS SPECIFIED ABOVE, REMOVE AS MUCH OF THE NEUTRALIZING FLUID AS POSSIBLE USING COMPRESSED AIR OR INERT GAS.

B. G and J-SERIES STATOR ASSEMBLY (if equipped with a relief valve): IF A STATOR LINER RUPTURE IS SUSPECTED, FOLLOW THIS SECTION TO FLUSH THE STATOR CAVITY. *CAUTION: IF THIS STEP IS FOLLOWED, THE MOTOR MUST BE REWOUND.*

B1) REMOVE THE RELIEF VALVE. INSERT A SCREWDRIVER INTO THE RELIEF VALVE ADAPTER AND PRY THE LISK FILTER TO ONE SIDE. REMOVE THE CONNECTION BOX FROM THE LEAD NIPPLE AND CHIP AWAY THE POTTING COMPOUND FROM THE LEAD NIPPLE.

B2) POSITION THE STATOR ASSEMBLY WITH THE LEAD NIPPLE DOWN AND INTRODUCE AN APPROPRIATE NEUTRALIZING FLUID TO THE RELIEF VALVE ADAPTER. THE FLUID WILL EXIT THROUGH THE LEAD NIPPLE. FLUSH THE STATOR CAVITY IN THIS MANNER FOR A SUFFICIENT TIME TO ALLOW FOR THE REMOVAL OF ALL PROCESS FLUID AND STATOR OIL.

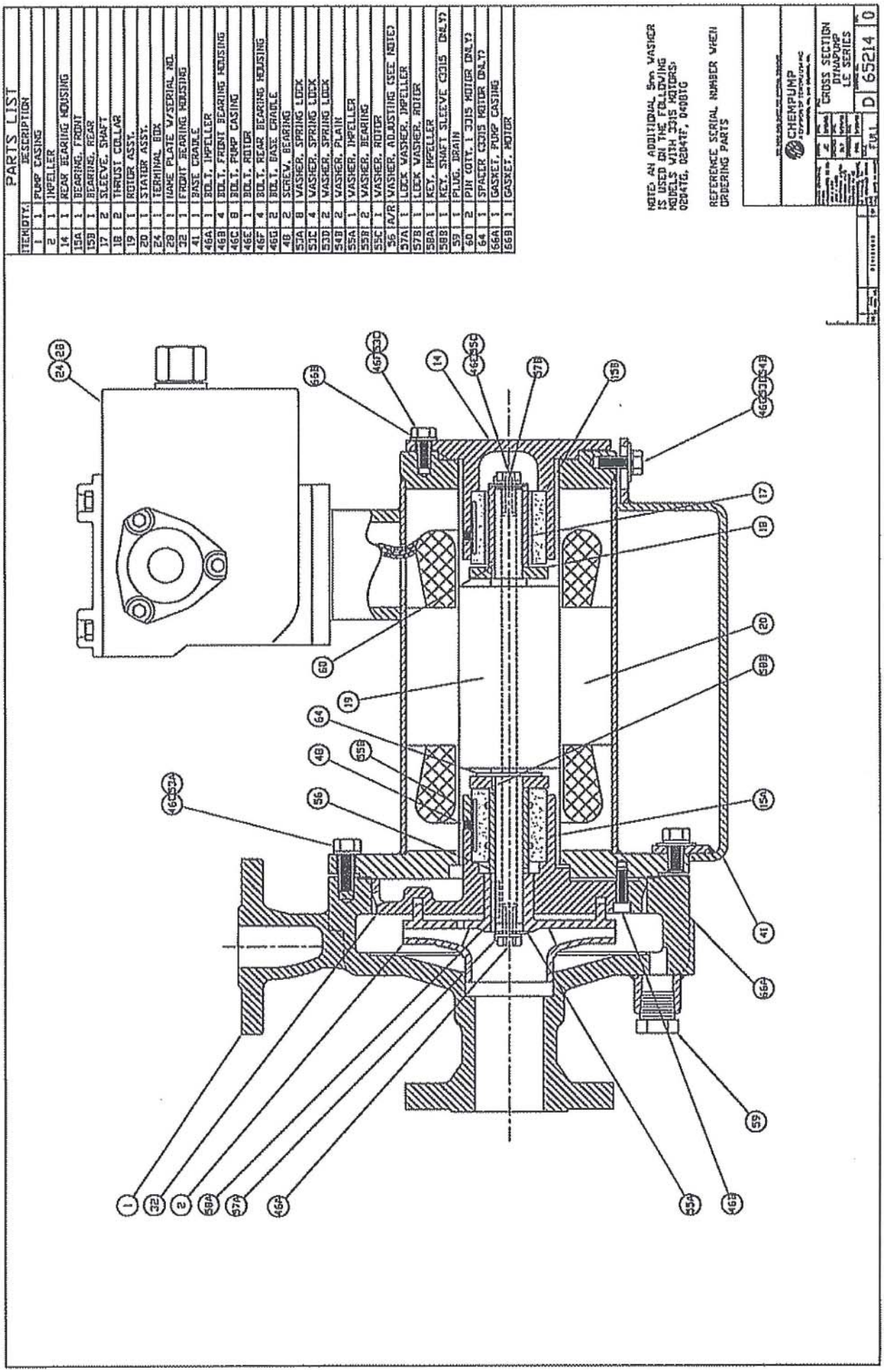
B3) REMOVE AS MUCH OF THE NEUTRALIZING FLUID AS POSSIBLE BY PURGING THE STATOR CAVITY WITH COMPRESSED AIR OR INERT GAS FOR 3 - 5 MINUTES.

C. NC and LE-SERIES STATOR ASSEMBLY (no relief valve): IF A STATOR LINER RUPTURE IS SUSPECTED, FOLLOW THIS SECTION TO FLUSH THE STATOR CAVITY. *CAUTION: IF THIS STEP IS FOLLOWED, THE MOTOR MUST BE REWOUND.*

C1) DRILL A HOLE THROUGH BASE CRADLE MOUNTING HOLE LOCATED IN REAR END BELL, DRILL THIS HOLE JUST DEEP ENOUGH TO BREAK THROUGH END BELL. DRILL A SECOND HOLE THROUGH STATOR LINER ON OPPOSITE END OF STATOR.

C2) POSITION THE STATOR ASSEMBLY WITH REAR END BELL UP AND INTRODUCE AN APPROPRIATE NEUTRALIZING FLUID THROUGH DRILLED HOLE IN REAR END BELL. THE FLUID WILL EXIT THROUGH THE DRILLED HOLE ON OPPOSITE SIDE. FLUSH THE STATOR CAVITY FOR A SUFFICIENT TIME TO ALLOW FOR THE REMOVAL OF ALL PROCESS FLUID.

C3) REMOVE AS MUCH OF THE NEUTRALIZING FLUID AS POSSIBLE BY PURGING THE STATOR CAVITY WITH COMPRESSED AIR OR INERT GAS FOR 3 - 5 MINUTES.


PARTS LIST
ITEM QTY. DESCRIPTION
1 1 PUMP CASING
2 1 IMPELLER
14 1 REAR BEARING HOUSING
15A 1 BEARING, REAR
15B 1 BEARING, FRONT
17 2 SLEEVE, SHAFT
18 2 THRUST COLLAR
19 1 ROTOR ASSY.
20 1 STATOR ASSY.
24 1 TERMINAL BOX
28 1 NAME PLATE W/SERIAL NO.
32 1 FRONT BEARING HOUSING
41 1 BASE CRADLE
46A 1 BOLT, IMPELLER
46B 4 BOLT, FRONT BEARING HOUSING
46C 8 BOLT, PUMP CASING
46E 1 BOLT, ROTOR
46F 4 BOLT, REAR BEARING HOUSING
46G 2 BOLT, BASE CRADLE
48 2 SCREW, BEARING
53A 8 WASHER, SPRING LOCK
53C 4 WASHER, SPRING LOCK
53D 2 WASHER, SPRING LOCK
54B 2 WASHER, PLAIN
55A 1 WASHER, IMPELLER
55B 2 WASHER, BEARING
55C 1 WASHER, ROTOR
56 A/R WASHER, ADJUSTING (SEE NOTE)
57A 1 LOCK WASHER, IMPELLER
57B 1 LOCK WASHER, ROTOR
58A 1 KEY, IMPELLER
58B 1 KEY, SHAFT SLEEVE (3315 ONLY)
59 1 PLUG, DRAIN
60 2 PIN COTT. (3315 MOTOR ONLY)
64 1 SPACER (3315 MOTOR ONLY)
66A 1 GASKET, PUMP CASING
66B 1 GASKET, MOTOR
NOTE: AN ADDITIONAL 5mm WASHER IS USED ON THE FOLLOWING MODELS WITH 3315 MOTORS: 0204TG, 0204TF, 0408TG
REFERENCE SERIAL NUMBER WHEN ORDERING PARTS
CHEMPUMP
CROSS SECTION DYNAPUMP LE SERIES
D 65214 0

TEIKOKU USA INC.
CHEMPUMP

Containment, Reliability & Safety by Design

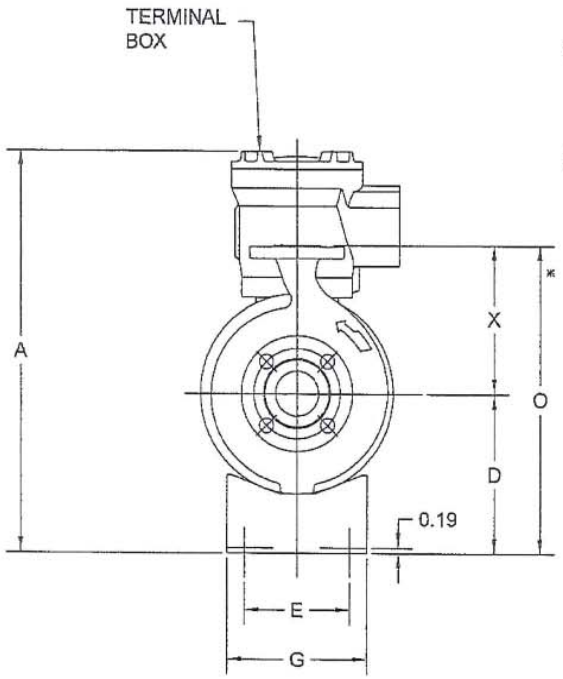
DYNAPUMP LE MINIMUM FLOWS

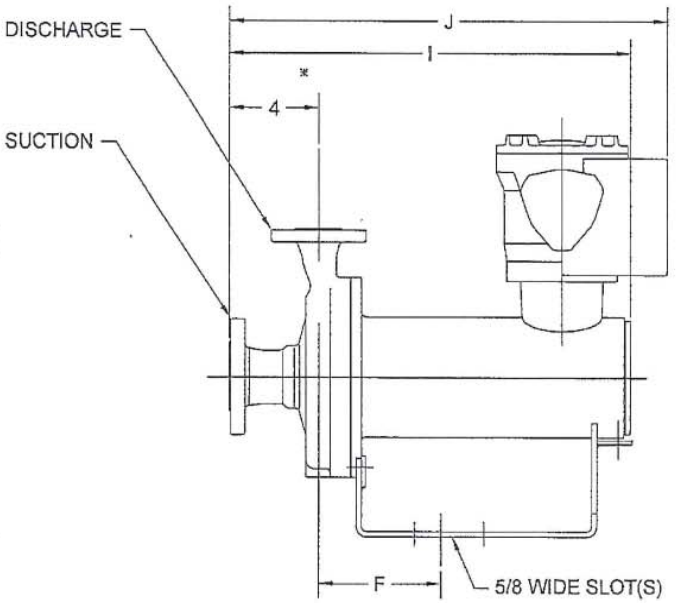
MODEL	BEP Flow GPM	MIN Flow %	MIN Flow GPM*
0204SG	**1 x 1.5 - 6 (low flow)**		
MAX IMP	41	10.00%	**4**
MIN IMP	31	10.00%	**3**
0204SF	**1 x 1.5 - 6**		
MAX IMP	65	7.00%	**5**
MIN IMP	45	7.00%	**3**
0204TG	**1 x 1.5 - 6 (low flow)**		
MAX IMP	75	5.00%	**4**
MIN IMP	60	5.00%	**3**
0204TF	**1 x 1.5 - 8**		
MAX IMP	135	5.00%	**7**
MIN IMP	97	5.00%	**5**

MODEL	BEP Flow GPM	MIN Flow %	MIN Flow GPM*
0408SG	**3 x 1.5 - 6 (low flow)**		
MAX IMP	133	9.00%	**12**
MIN IMP	99	9.00%	**9**
0408SF	**3 x 1.5 - 6**		
MAX IMP	159	8.00%	**13**
MIN IMP	113	8.00%	**9**
0408TG	**3 x 1.5 - 8 (low flow)**		
MAX IMP	120	9.00%	**11**
MIN IMP	100	9.00%	**9**
0408TF	**3 x 1.5 - 8**		
MAX IMP	200	7.00%	**14**
MIN IMP	130	7.00%	**9**

MODEL	BEP Flow GPM	MIN Flow %	MIN Flow GPM*
0508SG	**3 x 2 - 6 (low flow)**		
MAX IMP	228	9.00%	**21**
MIN IMP	150	9.00%	**14**
0508SF	**3 x 2 - 6**		
MAX IMP	282	7.50%	**21**
MIN IMP	186	7.50%	**14**
0508TG	**3 x 2 - 8 (low flow)**		
MAX IMP	240	8.50%	**20**
MIN IMP	164	8.50%	**14**
0508TF	**3 x 2 - 8**		
MAX IMP	308	6.00%	**18**
MIN IMP	226	6.00%	**14**

*** Minimum flow is based on laboratory tests pumping water at 70° F with a flooded suction.**





LIQUID END - MOTOR	SUCT	DISC	A	D	E	F	G	I	J	O	X	WT
0204S(F/G)1-3111 (AA-6)	1.5	1	15.75	5.25	0	7.25	7.5	16	17.75	11.75	6.5	100
0204S(F/G)1-3115 (AA-6)	1.5	1	15.75	5.25	0	7.25	7.5	18	19.75	11.75	6.5	110
0204S(F/G)1-3211 (AA-6)	1.5	1	16.25	5.25	0	7.25	7.5	19.5	21.25	11.75	6.5	132
0204S(F/G)1-3215 (AA-6)	1.5	1	16.25	5.25	0	7.25	7.5	23.75	25.25	11.75	6.5	176
0204T(F/G)1-3215 (AA-8)	1.5	1	16.25	5.25	0	7.25	7.5	23.75	25.25	11.75	6.5	198
0204T(F/G)1-3315 (AA-8)	1.5	1	17	5.25	0	7.25	7.5	28.25	30	11.75	6.5	264
0408S(F/G)1-3111 (AB-6)	3	1.5	15.75	5.25	0	7.25	7.5	16	18	11.75	6.5	100
0408S(F/G)1-3211 (AB-6)	3	1.5	16.25	5.25	0	7.25	7.5	20	21.5	11.75	6.5	132
0408S(F/G)1-3215 (AB-6)	3	1.5	16.25	5.25	0	7.25	7.5	24	25.75	11.75	6.5	187
0408T(F/G)1-3311 (A50-8)	3	1.5	20	8.25	7.25	12.5	8.5	24.25	25.75	16.75	8.5	231
0408T(F/G)1-3315 (A50-8)	3	1.5	19	8.25	7.25	12.5	8.5	28.5	30	16.75	8.5	275
0508S(F/G)1-3211 (A10-6)	3	2	19.25	8.25	7.25	12.5	8.5	20	21.5	16.5	8.25	143
0508S(F/G)1-3215 (A10-6)	3	2	19.25	8.25	7.25	12.5	8.5	24.25	25.75	16.5	8.25	198
0508T(F/G)1-3311 (A60-8)	3	2	20	8.25	7.25	12.5	8.5	24.5	26	17.75	9.5	242
0508T(F/G)1-3315 (A60-8)	3	2	20	8.25	7.25	12.5	8.5	28.5	30	17.75	9.5	286

ALL DIMENSIONS IN INCHES, WEIGHT IN LBS.

NO	DATE & PRO. NO.	REVISIONS	BY
1	2/1/07	F DIM. WAS FROM SUCTION FACE TO SLOT	P.A.

SEE WORK DATA SHEET FOR APPROVAL SIGNATURE

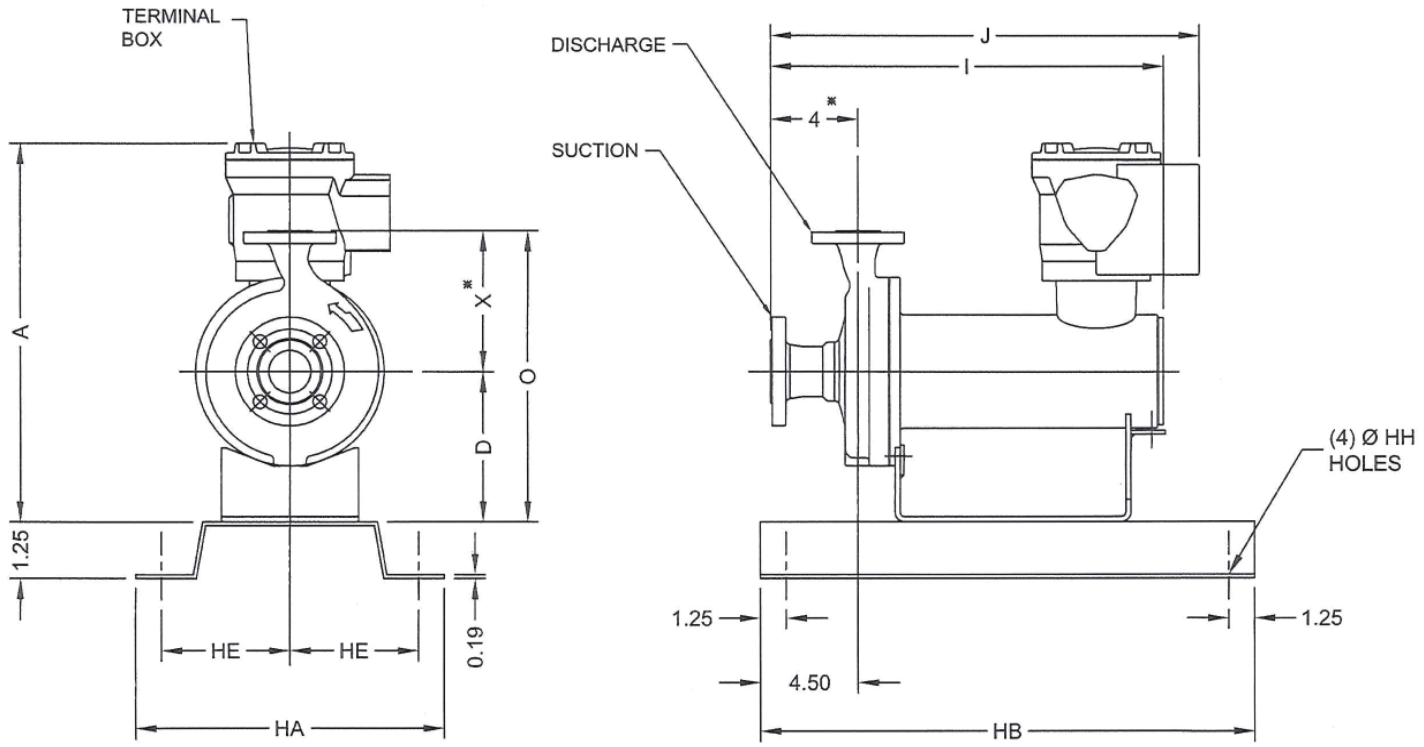
CHEMPUMP
A DIVISION OF TEIKOKU USA INC.
WARMINSTER, PA. and BELMONT, WV.

UNLESS OTHERWISE STATED:
-ALL UNITS IN INCHES
-DIMS. IN BRACKETS ARE IN mm
-DIMS. MARKED * ARE ±1/16 [±2]
-ALL OTHER DIMS. ARE ±1/4 [±8]
-ANGLE DIMS. ARE ±5
NOTE: ROUNDING TO NEAREST INCH/mm PRECLUDES INCH/mm CONVERSION

DRAWN	DATE
P.R.A.	9/16/05
CHECKED	DATE
APPROVED	DATE
SCALE	1:4

TITLE: OUTLINE LE SERIES STANDARD

DRAWING NO. C 60538 REV. 1



LIQUID END - MOTOR	SUCT	DISC	A	D	HA	HB	HE	HH	I	J	O	X	WT
0204S(F/G)1-3111 (AA-6)	1.5	1	15.75	5.25	12	22	4.5	0.75	16	17.75	11.75	6.5	100
0204S(F/G)1-3115 (AA-6)	1.5	1	15.75	5.25	12	22	4.5	0.75	18	19.75	11.75	6.5	110
0204S(F/G)1-3211 (AA-6)	1.5	1	16.25	5.25	12	22	4.5	0.75	19.5	21.25	11.75	6.5	132
0204S(F/G)1-3215 (AA-6)	1.5	1	16.25	5.25	12	28	4.5	0.75	23.75	25.25	11.75	6.5	176
0204T(F/G)1-3215 (AA-8)	1.5	1	16.25	5.25	18	32	7.5	1	23.75	25.25	11.75	6.5	198
0204T(F/G)1-3315 (AA-8)	1.5	1	17	5.25	18	32	7.5	1	28.25	30	11.75	6.5	264
0408S(F/G)1-3111 (AB-6)	3	1.5	15.75	5.25	15	22	6	0.75	16	18	11.75	6.5	100
0408S(F/G)1-3211 (AB-6)	3	1.5	16.25	5.25	15	22	6	0.75	20	21.5	11.75	6.5	132
0408S(F/G)1-3215 (AB-6)	3	1.5	16.25	5.25	15	28	6	0.75	24	25.75	11.75	6.5	187
0408T(F/G)1-3311 (A50-8)	3	1.5	20	8.25	18	32	7.5	1	24.25	25.75	16.75	8.5	231
0408T(F/G)1-3315 (A50-8)	3	1.5	19	8.25	18	32	7.5	1	28.5	30	16.75	8.5	275
0508S(F/G)1-3211 (A10-6)	3	2	19.25	8.25	18	28	7.5	1	20	21.5	16.5	8.25	143
0508S(F/G)1-3215 (A10-6)	3	2	19.25	8.25	18	28	7.5	1	24.25	25.75	16.5	8.25	198
0508T(F/G)1-3311 (A60-8)	3	2	20	8.25	18	32	7.5	1	24.5	26	17.75	9.5	242
0508T(F/G)1-3315 (A60-8)	3	2	20	8.25	18	32	7.5	1	28.5	30	17.75	9.5	286

ALL DIMENSIONS IN INCHES, WEIGHT IN LBS.

COMPUTER GENERATED DOCUMENT
DO NOT MODIFY MANUALLY
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	P.R.A.	3/26/07
	CHECKED	DATE
		3-26-07
	APPROVED	DATE
		3/27/07
	SCALE	
	1:4	

TITLE: OUTLINE LE SERIES WITH ANSI BASEPLATE

SIZE	DRAWING NO.	REV.
C	60541	0

NO	DATE & PRO. NO.	REVISIONS	BY

TEIKOKU USA INC
CHEMPUMP

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