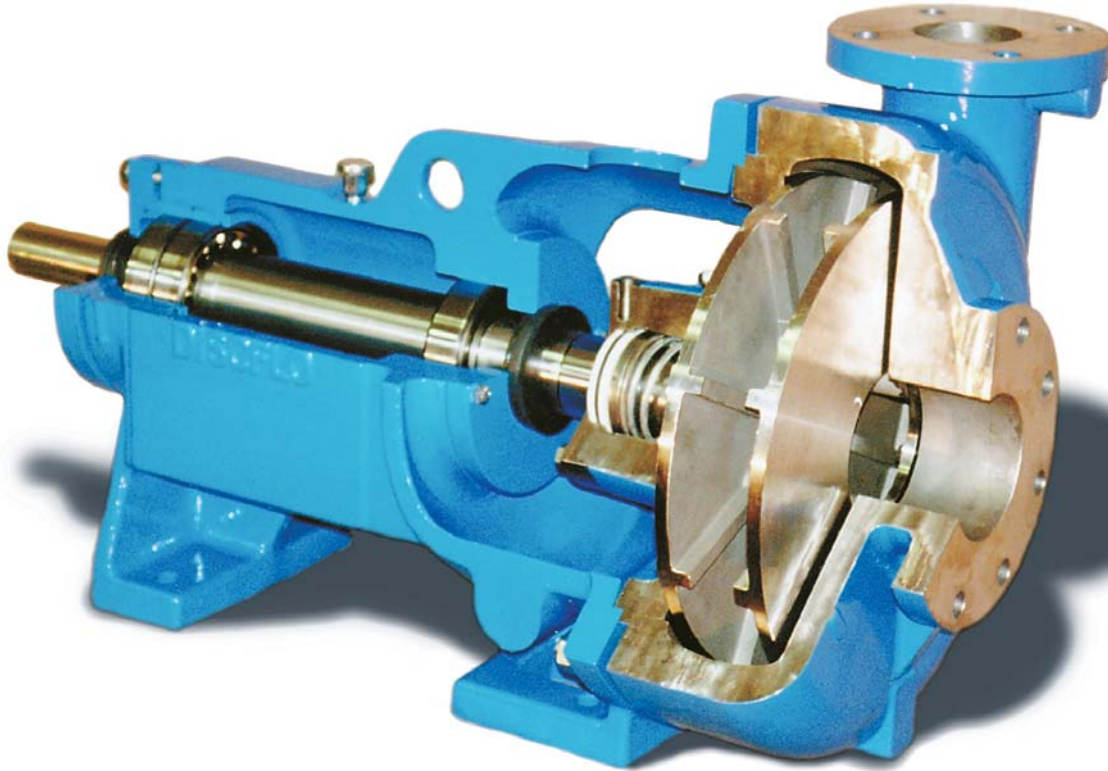


DISCFLO DISC PUMPS



INSTALLATION, OPERATION, & MAINTENANCE MANUAL

HORIZONTAL DIRECT-COUPLED PUMP MODELS:

US Sizes
8 inch Series
10 inch Series
12 inch Series
14 inch Series
17 inch Series
20 inch Series



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FOREWORD

This manual contains instructions for the installation, operation and maintenance of the Discflo horizontal direct-coupled disc pump, standard Series: 8-inch, 10-inch, 12-inch, 14-inch, 17-inch and 20-inch. Should questions arise, or start-up problems occur, contact your pump distributor or call Discflo direct at +1-800-DISCFLO (+1-800-347-2356).

The Discflo pump is designed to give a long and trouble-free service life, through heavier fluid end parts, heavier shaft bearings and reduced wear due to its unique pumping action. The life of the pump and satisfactory operation are, however, enhanced by correct application and installation, regular inspection and routine maintenance. Misuse or improper installation, operation or maintenance of pumps may result in personal injury or pump damage.

This manual must be read and understood before installation, operation or maintenance, paying particular attention to safety instructions. All installation, operation and maintenance works must be carried out by qualified personnel in strict accordance with this manual and must comply with all local, state and national codes. Discflo shall not be liable for injury, damage or delays caused by a failure to observe the instructions contained in this manual.

You are advised to read the warranty that was supplied with your pump. Warranty is valid only when genuine Discflo parts are used. Using the pump for an application other than that stated in the order will nullify the warranty unless written approval is obtained in advance from Discflo Corporation.

PUMP RECORDS

- PUMP MODEL:
- PUMP SERIAL NUMBER:
- DATE:
- MATERIAL OF CONSTRUCTION:

Maintain pump records whenever possible. This will provide ready access to information for ordering spare parts and evaluating the performance of the pump. Information to be included in these records:

- Mechanical seal manufacturer, type and drawing number
- Motor horsepower and speed of operation
- Service conditions, including frequency of operation
- Maintenance records, including parts usage, and part numbers of replacement parts



EC DECLARATION OF CONFORMITY

We herewith declare that the pumps described in this Installation, Operation and Maintenance Manual comply with the following provisions:

- Machinery Directive (98/37/EC)
- ATEX Directive (94/9/EC) Group II, Category 2, non-electrical equipment, Gas and Dust
Method of compliance: prEN 13463-5 (Constructional Safety); Temperature class: T6
Technical File reference no.: 03AT256
- Applied harmonized standards in particular EN 809; EN 292 Parts 1 & 2

Manufacturer:
Discflo Corporation
1817 John Towers Ave
El Cajon, CA 92020, USA

Importer in country of use:

Signature:



WARRANTY INFORMATION

Limited Warranty

Discflo warrants all pumps manufactured by Discflo. Any part or parts found to be defective by Discflo within the warranty period shall be repaired or replaced by Discflo during the warranty period. The warranty period shall exist for a period of (12) months from the date of installation or (15) months from the date of manufacture, whichever is shorter. A customer who believes a warranty claim exists must contact Discflo or their Discflo representative and furnish complete details regarding the claim. Discflo may authorize a distributor to make any warranty adjustments using the Discflo customer service department.

The warranty excludes: Labor, transportation and related costs incurred by the dealer; Reinstallation costs of repaired equipment; Reinstallation costs of replacement equipment; Consequential damages of any kind; and, reimbursement for loss caused by interruption of service.

For purpose of this warranty, the following terms have these definitions:

(1) "Distributor" means any individual, partnership, corporation, association, or other legal relationship that stands between Discflo Pumps and the dealer in purchases, consignments or contracts for sale of the subject pumps.

(2) "Dealer" means any individual, partnership, corporation, association, or other legal relationship, which engages in the business of selling or leasing pumps to customers.

(3) "Customer" means any entity who buys or leases the subject pumps from a dealer. The "customer" may mean an individual, partnership, corporation, limited liability company, association or other legal entity, which may engage in any type of business.

Policy regarding availability of spare parts

Discflo will attempt to maintain replaceable service parts during the normal life of any item of Discflo equipment. This will be contingent upon availability of tools, material, and facilities of our own as well as of our suppliers. After expiration of this period, supply of parts will be limited to available stock of completed parts. If unable to supply the service part, drawings will be furnished, if available, to permit local manufacturing.

Discflo reserves the right to improve, change or otherwise modify the construction of its equipment or any parts thereof without incurring any obligation to provide like changes to equipment previously sold.

Inspection upon Delivery

Discflo equipment is run tested or inspected prior to shipment. When leaving the factory, it is well crated for normal transportation procedures. Discflo cannot, however, guarantee safe arrival. Therefore upon receipt of this equipment check the received items against the packing list for damage or missing parts. Check the packing material thoroughly for small parts.

Visually inspect for damage or loss. Damage or loss should be reported immediately to the delivery carrier

while present. Following the immediate notification of the loss or damaged parts, a detailed description including quantity, description of the loss or damage, and a cash value should be claimed against the carrier with respect to the guidelines set forth by the carrier's policies.

Discflo's responsibility terminates F.O.B. point of manufacture unless otherwise specified in the General Terms and Conditions of Sale published by Discflo.



1. SAFETY INFORMATION

1.1 General Safety Guidelines

This manual gives instructions about pump installation, operation and maintenance. It must be read and understood by the personnel responsible for these duties prior to assembly and start-up. This manual must be kept available at the installation site at all times.

1.1.1 SAFETY SYMBOLS

Safety instructions in this manual are marked by :



This **hazard** symbol indicates a risk to personal safety if the instructions and recommended precautions are not followed.

CAUTION

This **caution** symbol indicates a risk to the pump, the nearby equipment or the environment if instructions and recommended precautions are not followed.



This **electrical hazard** symbol indicates possible risks to personnel and nearby equipment from electrical sources.

EX

This **explosion hazard** symbol indicates possible risks to personnel, nearby equipment or the environment when operating the pump in hazardous areas.

1.1.2 SIGNS AFFIXED TO THE PUMP

The Disc Pump has the following signs affixed. They must be kept legible at all times:

1. Arrow indicating direction of rotation
2. Symbols indicating fluid connections

1.1.3 OPERATING PERSONNEL

The personnel responsible for operation, maintenance, inspection and assembly must be adequately qualified.

The responsibilities of the operating personnel must be exactly defined by the plant operator. If the staff do not have the necessary knowledge, they must be trained and instructed.

1.1.4 IN THE EVENT OF NON-COMPLIANCE

If operating personnel do not comply with the safety instructions contained herein, they may place themselves, the

pump or the environment at risk, which may result in a loss of any right to claim damages.

1.1.5 SAFETY AT WORK

When operating the pump, users must observe not only the safety instructions contained in this manual, but also all relevant national occupational hazard and accident prevention regulations, and any safety instructions issued by the plant operator.

1.1.6 SAFETY APPAREL

The following safety apparel should be available and worn, where appropriate:

1. Insulated work gloves when handling hot bearings or using bearing heater.
2. Heavy gloves when handling parts with sharp edges.
3. Safety glasses with side shields for eye protection, especially in machine shop areas.
4. Steel-toed shoes for foot protection when handling parts, heavy tools, etc.
5. Other personal protective equipment to protect against hazardous/toxic fluids.

1.1.7 SAFETY DECALS ON PUMP

The following safety tag is to your pump. If this tag is removed or becomes unreadable, replace immediately.

READ AND UNDERSTAND THE INSTALLATION, OPERATION & MAINTENANCE MANUAL SUPPLIED WITH THIS PUMP BEFORE INSTALLING AND OPERATING PUMP. FAILURE TO FOLLOW THESE INSTRUCTIONS MAY CAUSE PUMP FAILURE OR PERSONNEL INJURY, AND WILL VOID WARRANTY. ADDITIONAL COPIES OF THIS MANUAL CAN BE DOWNLOADED FROM WWW.DISCFLO.COM OR CALL 1-800-DISCFLO.

DO NOT REMOVE THIS TAG

1. SAFETY INFORMATION

1.1 General Safety Guidelines

1.1.8 UNAUTHORIZED ALTERATIONS AND USE

Modifications to the pump are permissible only with the prior consent of Discflo Corporation. Genuine Discflo parts are recommended. The use of non-Discflo supplied parts may void the warranty.

The pump's reliability can only be guaranteed if it is used for the application and to the operating parameters specified on the pump's data sheet and requested by the purchaser in the sales order. Operation above or below these limits is not permitted, and may increase the risks to personnel and property. It will also void the warranty.

1.1.9 PUMP STORAGE

If pump is to stand idle for a long period of time before installation or start-up, it should be stored with care. Pump cannot be stored around running equipment where resonant vibration may cause damage to the bearings. Regardless of length of storage, the pump should be rotated at least every six weeks, at no less than five full revolutions. The pump should not be stored in an environment where it can rust.

1.2 Specific Hazards

The following provides specific safety information on hazardous conditions which are inherent in any pump. A pump has high speed rotating parts and works with fluids under pressure. These fluids may be hot chemical solutions, or otherwise harmful if contacted. This creates certain unavoidable hazards.

- b. Protection of all electric connections within a sealed junction box.
- c. Proper grounding of the motor.
- d. Protection from flooding. Do not install in an area which could fill with water to a level which would contact the motor.

1.2.1 ELECTRICAL HAZARDS

A pump is normally powered by an electric motor. This creates a hazard of electrical shock which could cause severe injury or even loss of life.

To minimize the risk of this hazard:

1. Employ only trained and authorized electricians to perform all electric/ electronic installation, maintenance, and service.
2. Make sure that all electric/electronic installations comply with all applicable codes and standards.
3. Do not perform any maintenance or service on the motor or any other electrical devices until the electric power source has been turned off and locked out using a locking device for which only the person involved in the maintenance procedure has possession of the key.
4. Where necessary, make installation suitable for a wet environment:
 - a. A power disconnect which can be locked in a power Off position and the key removed. This will allow maintenance or service to be performed with no possibility of power being accidentally turned on.

1.2.2 ROTATING PARTS HAZARD

Routine cleaning and maintenance procedures require pump disassembly. The pump contains parts which rotate during operation. Should the pump start unexpectedly while disassembled, severe injury could result.

To minimize the risk of this hazard:

1. Do not assemble or disassemble the pump unless the power source has been turned off and locked out.
2. Do not remove the guard from the adapter unless the power source has been turned off and locked out.
3. Do not perform any maintenance or service on the motor or pump, unless the power source has been turned off and locked out.



1. SAFETY INFORMATION

1.2 Specific Hazards

1.2.3 PRESSURE HAZARD

Fluids processed by a pump are under pressure. This creates a hazard to personnel working in the area should a leak occur.

To minimize the risk of this hazard:

1. All installation, maintenance, and service of piping, valves and other controls must be performed by trained plumbers only.
2. Plumbing installation must comply with all applicable local and national codes and standards.
3. Never disconnect any lines or fittings (whether process or cleaning/sanitizing) or disassemble the pump when lines are under pressure.
4. Should a leak occur, immediately find the cause and stop the leak.

1.2.4 HIGH TEMPERATURE HAZARD

Some pump applications may require processing of high temperature fluids and/or the use of high temperature cleaning/sanitizing solutions. Pumping high temperature fluids creates a hazard of burns to personnel working in the area from contact with the equipment or with leaking fluid.

To minimize the risk of this hazard:

1. All installation, maintenance, and service of piping, valves, and other controls must be performed by trained plumbers only.
2. Plumbing installation must comply with all applicable codes and standards.
3. All high temperature lines must be labeled leak free, and insulated or otherwise protected from direct contact.
4. Never disconnect any lines or fittings (whether process or cleaning/sanitizing) or assemble the pump until the line is not under pressure and the fluid inside is not hot or harmful.

1.2.5 LEAKING FLUID HAZARD

Fluid leaks or spills may occur in any pumping system. This creates a hazard to personnel in the area due to slippery floor conditions or contact with possibly hazardous fluids.

To minimize the risk of this hazard:

1. Always clean up leaks and spills immediately.
2. Find and correct cause of the leak immediately.

1.2.6 EXPLOSION AREA HAZARD

Coupling guards used in areas with a potential explosion hazard must meet the following criteria:

1. Do not use sparking material
2. Do not use material that could be deformed

When using pumps in areas with a potential explosion hazard, the operator must regularly check for:

1. Leaking at the shaft seals
2. Bearing temperatures, where necessary
3. Liquid level in the pump during commissioning

If the pump fails to meet any of the above conditions, the operator must take the pump out of operation.

When operating the machine in areas with an explosion hazard, the operator must ensure that exterior impacts to the machine casing are avoided.

1. SAFETY INFORMATION

1.3 Specific Cautions

The following cautions describe ways to avoid incorrect operating procedures that can cause serious damage to the pump and/or surrounding equipment.

1.3.1 CAVITATION

Cavitation is a condition within the pump which results in extreme hydraulic forces which can create a risk of severe damage to pump components. Cavitation makes a characteristic “rattling” noise. It is caused by operating with fluid pressure too low at the pump inlet.

To minimize this risk:

Install and operate the pump so that NPSH (net positive suction head) available to the pump equals or exceeds the NPSH required as shown on the pump performance curve. Compared to most other designs of pumps, the disc pump has a low NPSH requirement, and cavitation is rare. To increase NPSH available:

1. Decrease the temperature of the liquid being pumped.
2. Increase the height of liquid supply level.
3. Decrease the suction line length and remove restrictions to flow such as elbows, valves, etc.
4. Increase the suction line size (diameter).
5. Reduce the pump flow rate (throttle discharge).

1.3.2 CORROSION PITTING

If the pump is constructed of stainless steel, it is subject to possible corrosion when improperly cleaned or sanitized.

To minimize this risk:

1. Never use steel wool or a wire brush to clean stainless steel surfaces. Iron particles will embed and cause corrosion pits. Use a non-metallic brush or scrub pads for stubborn soil.
2. Never allow prolonged contact of sanitizing solutions or other corrosive cleaning chemicals with stainless steel. Use sanitizers immediately prior to processing. Do not use sanitizers on exterior, non-product contact surfaces.

1.3.3 MOTOR OVERLOAD

Depending on the Discpac diameter and motor horsepower, there is a risk that the pump motor will overload if operated with a fully opened, unrestricted discharge.

To minimize this risk:

1. BEFORE operating the pump, review performance curve and application giving consideration to motor horsepower and Discpac diameter versus expected discharge flow rate and pressure. If the pump is operated with less than expected discharge pressure, both the flow rate and the load on the motor will increase.
2. Install a throttling type valve in the discharge piping to allow control of pump discharge flow rate during initial operation. The valve may be removed later when the system is proven to supply adequate discharge pressure to prevent overload.

1.3.4 DISCPAC SHAFT LOCATION

The location of the Discpac shaft is critical for the correct pump operation and for maximum operating efficiency. The Discpac must be located precisely between the front and backplate of the casing to ensure the optimum pump efficiency. Incorrect location may cause the Discpac to contact the casing or backplate during operation and cause extensive damage to the pump.

Refer to the procedure in the Maintenance Section of this manual for correctly adjusting Discpac position. This should be referred to whenever a new pump is installed, the shaft is removed, or a replacement casing or backplate is installed.

2. GENERAL INFORMATION

2.1 Disc pump design

Disc Pumps are designed for pumping low to very high viscosity liquids. The design described in this manual is a single stage, end suction, top (or tangential) discharge pump with a Discpac “impeller”.

2.1.1 PUMP IDENTIFICATION

Serial Number: A nameplate is attached to each pump with a serial number. Use the serial number for reference whenever requesting information or service parts.

Discpac Size: Listed data refers to maximum Discpac diameter. Alternate, trimmed Discpac diameters are available for lower performance requirements.

Pump Speed: Performance is rated at 1150, 1750 or 3500 rpm for 60 Hz motors. For specific applications, contact your Discflo sales representative.

Design Pressure: Design pressure refers to the maximum permissible operating pressure at the pump outlet for the temperature specified.

2.1.2 NAMEPLATE

The following information is recorded on the nameplate:

1. Manufacturer’s Name and Address
2. Pump Model and Type
3. Pump serial number
4. Shipping date
5. Design flow and head (TDH)
6. Customer PO number, Seal number, Tag number (where this information is available)

To comply with European Community regulations, the following designation is also given on the pump’s nameplate:

EX II 2 G D c T6
File ref number: 03AT256

2.1.3 COMPONENTS AND SERVICES FURNISHED BY CUSTOMER

Drive: The drive for the pump is to be supplied and installed by the purchaser unless otherwise specified at the time of purchase.

Electrical Service: Provide correctly sized electrical service to the motor including a motor starter, overload protection and lock out capability.

Process Piping: All process piping, fittings and valves are to be supplied and installed by the purchaser.

Seal Flush Media and Media Piping: If the seal requires flush media, the media supply, purchase and installation of piping, fittings, and valves required for the media are the responsibility of the purchaser.



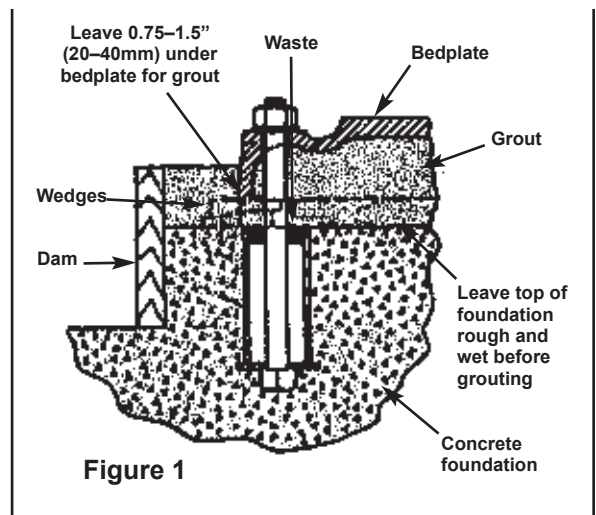
3. INSTALLATION


3.1 Location and foundation

The pump should be located as near to the liquid source as possible so that the suction line is both short and direct. When possible, the pump should be located below the level of the liquid to eliminate the necessity of priming.

The rugged design of the frame and fluid end makes the Disc Pump more tolerant of improper foundations than many other pumps. However, the foundation should be sufficiently rigid and substantial. A concrete foundation, poured on a solid footing of adequate thickness to support the pumping unit, provides the most satisfactory foundation.

The base plate should be installed in a level position. **Figure 1** shows a typical arrangement for bolting channel bases.



 Do not lift any heavy equipment overhead of personnel. Keep a safe distance when lifting and moving equipment. Do not attempt to lift the pump using the pump eyebolts.


NOTE: Check local and national standards for any restrictions or considerations regarding the foundations. A detailed description of proper procedures for grouting base plates may be found in the *Hydraulic Institute Standards*, latest edition.

3.2 Electrical connections

Thoroughly read the motor manufacturer's instructions prior to installation. Where applicable, make sure the installation is suitable for a wet environment.


Provide a main power disconnect with lock out capability. That is, a disconnect which can be locked in the power off position with key removed. This will allow service and maintenance to be performed with no possibility of power being accidentally turned on.

Check the motor nameplate data and make sure that it matches the electrical supply, and that wiring, switches, starters, and overload protection are correctly sized.

 Incorrect electrical installation could cause an electric shock which could result in severe injury or even loss of life. All electrical/electronic installation must be performed by trained and authorized electricians only. All electrical/electronic installation must comply with all applicable local and national codes and standards.

3. INSTALLATION

3.3 Alignment

 Before beginning any alignment procedure, make sure the driver is locked out. Failure to lock out the driver power may result in serious physical injury.

Times at which alignment must be checked and where necessary, adjusted are:

1. Initial alignment is done prior to operation when the pump and driver are at ambient temperature.
2. Final alignment is done after operation when the pump and driver are at operating temperature. Alignment is achieved by adding or removing shims from under the feet of the driver and shifting equipment horizontally as needed.

EX If the pump is not properly aligned, it may pose a risk to personnel, nearby equipment and the environment, when operating the pump in areas with explosion hazard.

3.3.1 ALIGNMENT CHECKS

Initial Alignment (Cold Alignment)

1. Before Grouting Baseplate - To ensure alignment can be obtained.
2. After Grouting Baseplate - To ensure no changes have occurred during grouting process.
3. After Connecting Piping - To ensure pipe strains have not altered alignment. If changes have occurred, alter piping to remove pipe strains on pump flanges.
4. After First Run - To obtain correct alignment when both the pump and driver are at operating temperature.
5. Thereafter, alignment should be checked periodically in accordance with the user's plant operating procedures.

NOTE: Alignment check must be made if process temperature changes, piping changes and/or pump service is performed.

Alignment Criteria

Good alignment is achieved when the dial indicator readings as specified in the alignment procedure are:

1. 0.002 inch Total Indicated Reading (T.I.R.) or less when the pump and driver are at operating temperature (Final Alignment)
2. 0.005 inch per inch of dial indicator separation for the reverse dial indicator or laser method when the pump and driver are at operating temperature (Final Alignment).

During installation, it is necessary to set the parallel alignment in the vertical direction to a different value due to differences in the expansion rates of the pump and driver. **Table 1** shows recommended preliminary (cold) settings for electric motor driven pumps based on different pumpage temperatures.

Driver manufacturers should be consulted for recommended cold settings for other types of drivers, such as steam turbine engines.

Table 1: Cold Setting of Parallel Vertical Alignment

Pumpage Temp (°F)	Set Driver Shaft (inch)
50	0.002 low
150	0.001 high
350	0.009 high
450	0.013 high
550	0.017 high
650	0.021 high
700	0.023 high

3.3.2 SET UP

1. Mount two dial indicators on one of the coupling halves (X) so they contact the other coupling half (Y) (see **Figure 2**).
2. Check setting of indicators by rotating coupling half X to ensure indicators stay in contact with coupling half Y but do not bottom out. Adjust indicators accordingly.

3. INSTALLATION

3.3 Alignment

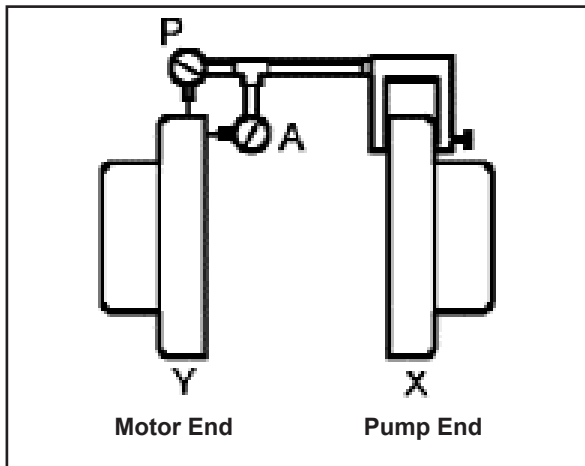
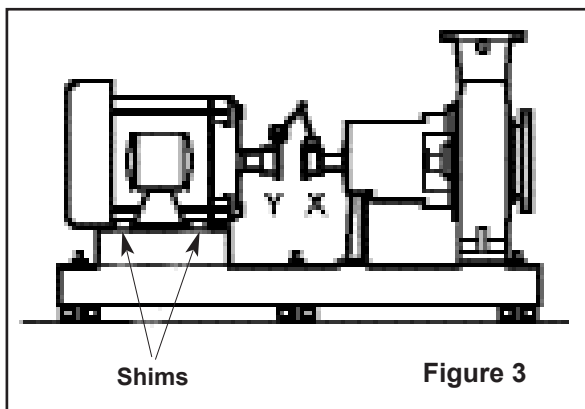


Figure 2: Indicator Dials for Alignment



3.3.3 MEASUREMENT

1. To ensure accuracy of indicator readings, always rotate both coupling halves together so indicators contact the same point on coupling half Y. This eliminates any measurement problems due to run out on coupling half Y.
2. Take indicator measurements with driver feet hold-down bolts tightened. Loosen hold-down bolts prior to making alignment corrections.
3. Take care not to damage indicators when moving driver during alignment corrections

3.3.4 ANGULAR ALIGNMENT

A unit is considered to be in angular alignment when indicator A (Angular indicator) does not vary by more than 0.002 inch as measured at four points 90° apart.

Vertical Correction (Top-to-Bottom)

1. Zero indicator A at top dead center (12 o'clock) of coupling half Y.
2. Rotate indicators to bottom dead center (6 o'clock). Observe needle and record reading.
3. Negative Reading - Coupling halves are further apart at bottom than at top. Correct by either raising driver feet at shaft end (add shims) or lowering driver feet at other end (remove shims) (see **Figure 3**).
4. Positive Reading - Coupling halves are closer at bottom than at top. Correct by either lowering the driver feet at the shaft end (remove shims) or raising the driver feet at the other end (add shims).
5. Repeat steps 1 through 3 until indicator A reads 0.002 inch or less.

Alignment Troubleshooting		
Problem	Cause	Solution
Horizontal misalignment (side-to-side)	Drive feet bolt bound	Loosen pump hold-down bolts and slide pump and driver into horizontal alignment
	Baseplate not level or twisted	Determine the high or low corner and remove or add shims to realign

3. INSTALLATION

3.3 Alignment

Horizontal Correction (side-to-side)

1. Zero indicator A on left side of coupling half Y, 90° from top dead center (9 o'clock).
2. Rotate indicators through top dead center to the right side, 180° from the start (3 o'clock). Observe needle and record reading.
3. Negative Reading - Coupling halves are further apart on the right side than the left. Correct by either sliding the shaft end of the driver to the left or the other end to the right.
3. Positive Reading - Coupling halves are closer together on the right side than the left. Correct by either sliding the shaft end of the driver to the right or the other end to the left (see **Figure 4**).
4. Repeat steps 1 - 3 until indicator A reads 0.002 inch or less.
5. Re-check both horizontal and vertical readings to ensure adjustment of one did not disturb the other. Correct as necessary.

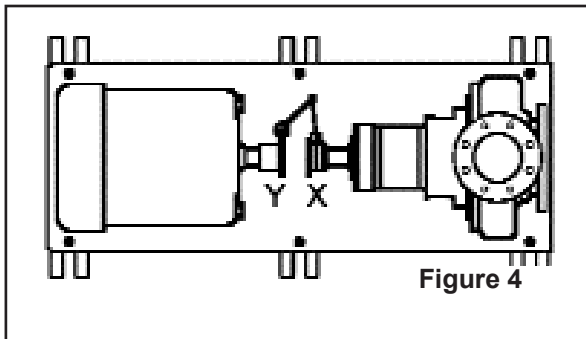


Figure 4

3.3.5 PARALLEL ALIGNMENT

A unit is in parallel alignment when indicator P (parallel indicator) does not vary by more than 0.002 inch as measured at four points 90° apart at operating temperature. Note the preliminary vertical cold setting criteria shown in **Table 1**.

Vertical Correction (Top-to-Bottom)

1. Zero indicator P at top dead center of coupling (12 o'clock) half Y (refer back to **Figure 2**).

2. Rotate indicator to bottom dead center (6 o'clock). Observe needle and record reading.
3. Negative Reading - Coupling half X is lower than coupling half Y. Correct by removing shims of thickness equal to half of the indicator reading under each driver foot.
3. Positive Reading - Coupling half X is higher than coupling half Y. Correct by adding shims of thickness equal to half of the indicator reading from each driver foot (see **Figure 5**).
4. Repeat steps 1 through 3 until indicator P reads within 0.002 inch when hot, or per **Table 1** when cold.

Horizontal Correction (Side-to-Side)

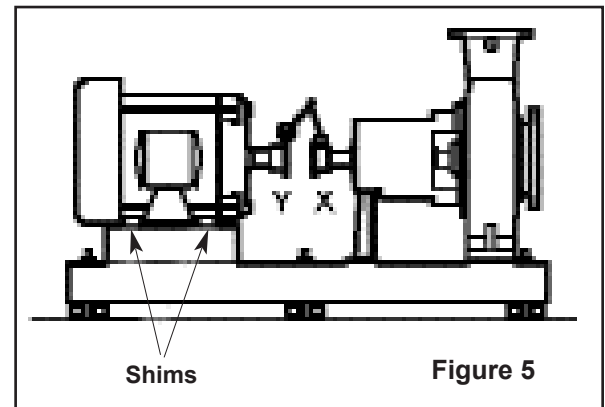


Figure 5

NOTE: *Equal amounts of shims must be added to or removed from each driver foot, otherwise the vertical angular alignment will be affected.*

1. Zero indicator P on the left side of coupling half Y, 90° from top dead center (9 o'clock).
2. Rotate indicators through top dead center to the right side, 180° from the start (3 o'clock). Observe needle and record reading.
3. Negative Reading - Coupling half Y is to the left of coupling half X. Correct by sliding driver evenly in the appropriate direction.
3. Positive Reading - Coupling half Y is to the right of coupling half X. Correct by sliding driver evenly in the appropriate direction.

3. INSTALLATION

3.3 Alignment

NOTE: *Failure to slide motor evenly will affect horizontal angular correction.*

4. Repeat steps 1 through 3 until indicator P reads 0.002 inch or less.
5. Re-check both horizontal and vertical readings to ensure adjustment of one did not disturb the other. Correct as necessary.

3.3.6 COMPLETE ALIGNMENT

A unit is considered to be in complete alignment when both indicators A (angular) and P (parallel) do not vary by more than 0.002 inch as measured at four points 90° apart.

Vertical Correction (Top-to-Bottom)

1. Zero indicators A and P at top dead center (12 o'clock) of coupling half Y.
2. Rotate indicator to bottom dead center (6 o'clock). Observe the needles and record the readings.
3. Make corrections as outlined previously.

Horizontal Correction (Side-to-Side)

1. Zero indicators A and P on the left side of coupling half Y, 90° from top dead center (9 o'clock).
2. Rotate indicators through top dead center to the right side 180° from the start (3 o'clock). Observe the needle, measure and record the reading.
3. Make corrections as outlined previously.
4. Recheck both vertical and horizontal readings to ensure adjustment of one did not disturb the other. Correct as necessary.

NOTE: *With experience, the installer will understand the interaction between angular and parallel alignment and will make corrections appropriately.*

3. INSTALLATION

3.4 Piping Guidelines

3.4.1 BEFORE PUMP INSTALLATION

Review the following guidelines for piping prior to pump installation.

1. Piping runs should be as short as possible to minimize friction losses.
2. If applicable, expansion loops or joints should be designed and installed in suction and/or discharge lines to handle liquids at elevated temperatures, so linear expansion of piping will not draw pump out of alignment.
3. The piping should be arranged to allow pump flushing prior to removal of the unit in those applications handling corrosive liquids. For flush arrangement, refer to **PREPARATION FOR OPERATION** section.
4. All piping must be supported independently of the pump and accurately aligned. The piping flange alignment criteria are shown in the **Table 2**.

Type	Criteria
Axial—minimum	Flange gasket thickness
Axial—maximum	Flange gasket thickness +0.03 inch
Parallel	0.002mm/mm of flange diameter
Concentric	Flange bolts should easily install by hand

CAUTION: *Piping must be properly installed, or damage to personnel, equipment or the environment may occur.*

EX: *If pipework is not properly installed, it may pose a risk to operating personnel, equipment or the environment, when operating the pump in areas with explosion hazard.*

CAUTION: *Piping must not be connected to the pump until the grout has hardened and foundation and pump hold-down bolts have been tightened. Use only fasteners of the proper size and material. Ensure no fasteners are missing.*

CAUTION: *Do not draw piping into place by forcing at the flanged connections of the pump. This may impose dangerous strains on the unit and cause misalignment between pump and driver.*

3.4.2 SUCTION PIPING

Properly selected and installed suction piping is very important for trouble-free operation. It is also necessary to eliminate vibration and cavitation in the pump, which can cause packing problems, mechanical seal damage and/or undue bearing loads leading to premature failure.

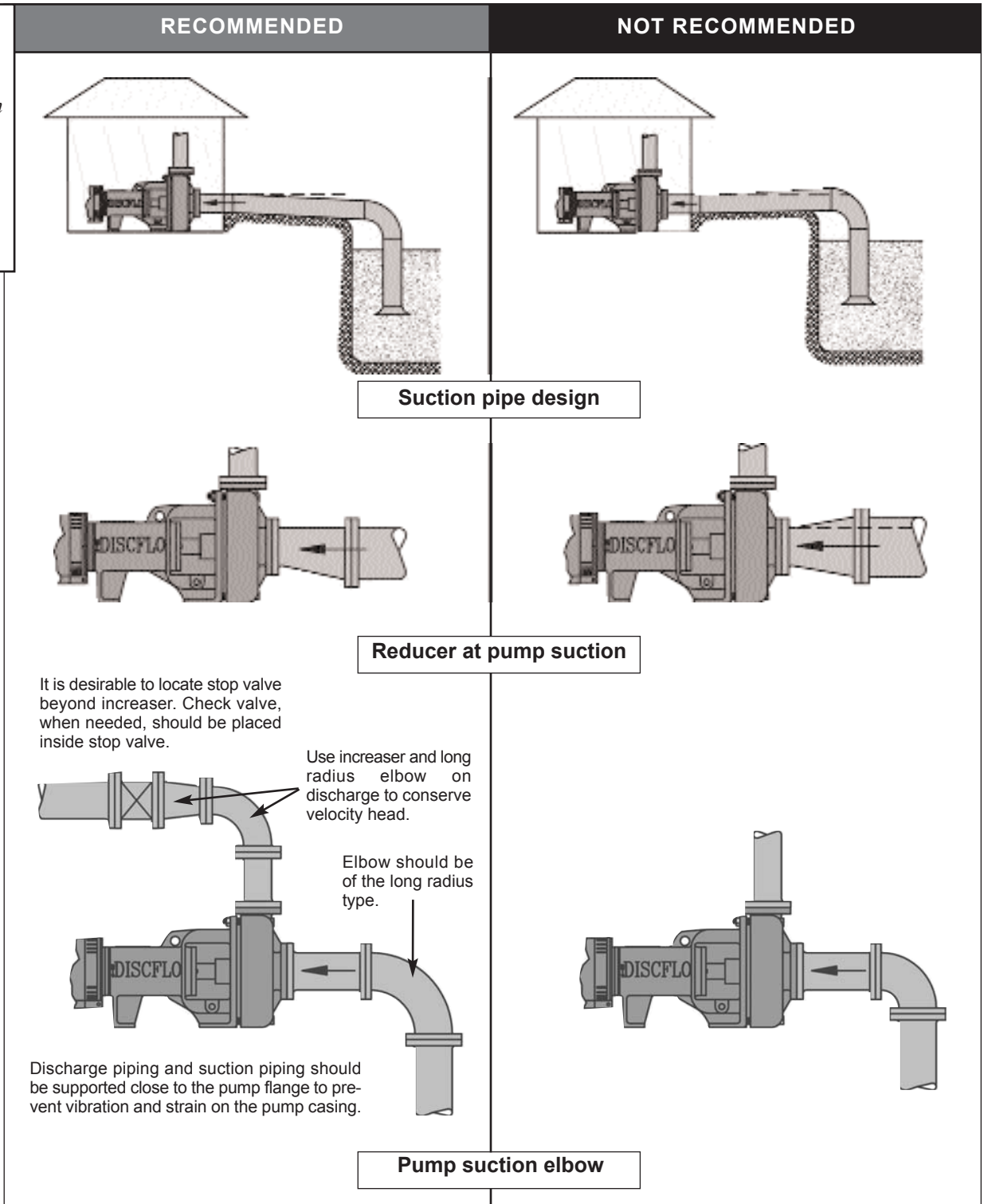
1. Suction piping should be inspected for cleanliness before connection to the pump, to ensure no tramp residue is present.
2. The suction line should be designed to eliminate any air pockets. This include piping that is gradually sloped downward from the source of supply to the pump. Suction elbows and other bends should also be minimized to improve suction head and reduce air pockets.
3. For temporary hookup, a flexible, non-collapsing hose is essential since the suction line pressure is often below atmospheric pressure.
4. The pump should never be adjusted by throttling the suction. However, a positive shut-off valve of a type to cause minimum turbulence should be installed in both the suction and discharge lines to permit closing the line so that the pump can be taken out of service.
5. Use of elbows close to the pump suction flange should be avoided. There should be a minimum of two pipe diameters of straight pipe (five diameters are preferred) between the elbow and suction inlet. Where used, elbows should be long radius.
6. Use a suction pipe one or two sizes larger than the pump suction, with a reducer at the suction flange. Suction piping should never be smaller in diameter than the pump suction.
7. Reducers, if used, should be eccentric, located at the pump suction flange, sloping side down.
8. Separate suction lines are recommended when more than one pump is operating from the same source of supply.

3. INSTALLATION

3.4 Piping Guidelines

CAUTION:

NPSHa must always exceed NPSHr as shown on the Discflo performance curves received with order.



4. PREPARATION FOR OPERATION

4.1 Initial lubrication

CAUTION: *The pump is shipped dry. Oil must be added before operating the pump, otherwise bearing failure and pump seizure may occur.*

4.1.1 OIL LUBRICATION

Oil-lubricated bearing frames are standard, with greasing lubrication available as an option. Pumps are shipped with empty oil reservoirs. Oil is added through the vent or plug on top of the bearing frame to a level midway up gauge window. Do not overfill, as this causes oil leakage and unnecessary bearing wear. We recommend using a good grade of SAE 10W-30 oil. The air vent should be kept clean to prevent pressure

build-up due to normal heating during operation.

Recommended oil quantities:

For 8-inch, 10-inch, 12-inch pumps: use 1.25 quarts.
For 14-inch, 17-inch, 20-inch pumps: use 2.5 quarts.

4.1.2 GREASE LUBRICATION

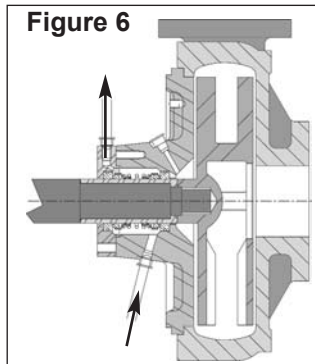
Discflo Pumps with greased bearings come with the bearings pre-packed with a red ball bearing grease or equivalent. The anti-friction bearings on the pump and motor, as shipped from the factory, are furnished with sufficient lubricant for operation. Do not add more lubricant when putting the unit in service. Recommended grease and lubrication frequencies are listed in the **ROUTINE MAINTENANCE** section of this manual.

4.2 Mechanical seal flush requirements

CAUTION: *Handle seal components carefully. Seal seats may break if mishandled or dropped. Keep the backplate centered during removal to avoid contacting the shaft. Contact may damage the shaft or stationary seat.*

4.2.1 DOUBLE MECHANICAL SEALS

Double mechanical seals require an external flush injected into the bottom of the seal box hub and exiting out of the top port of the seal gland (**Figure 6**). Barrier fluid pressure should be 5 - 20 psi above pressure at seal chamber throat.



4.2.2 SINGLE MECHANICAL SEALS

Single mechanical seals are normally cooled by the process fluid. However, this is not recommended for abrasive or slurry applications. If a single seal is used in this situation, the seal area should be flushed externally or with process fluid from the discharge.

4.2.3 CARTRIDGE SEALS

Cartridge seals are installed at the factory. However, it is necessary to ensure the seal is secured to the shaft prior to operating the pump. Do this as follows:

1. Tighten the set screws in the seal locking ring.
2. Remove the centering clips from the seal.


If the cartridge seal is not pre-installed, follow these steps:

1. Slide the cartridge seal onto the shaft or sleeve until it contacts the inboard labyrinth oil seal.
2. Assemble the seal chamber per the instructions in the **MAINTENANCE** Section of this manual.
3. Slide the cartridge seal into the seal chamber and secure using the four studs and nuts.
4. Continue pump reassembly.
5. Set the impeller clearance per the instructions in the **ROUTINE MAINTENANCE** section.
6. Tighten the set screws in the seal locking ring to secure the seal to the shaft.
7. Remove the centering clips from the seal.

4. PREPARATION FOR OPERATION

4.3 Start-up Procedures

4.3.1 INSTALLATION CHECK

 Never operate a pump without coupling guard properly installed. Personal injury will occur if pump is run without coupling guard.


CAUTION: If the fluid to be pumped is hot, the pump should be filled slowly to avoid distortions or heat shocks.

CAUTION: Do not add restriction to the suction line. Operation with restricted suction may cause cavitation and serious damage to pump parts.

CAUTION: Do NOT run the pump backwards under any circumstance! It is essential to check the rotation of the motor before connecting the shaft coupling. Incorrect rotation of the pump will cause catastrophic failure. Pump shaft must turn clockwise when viewed from the motor fan end.

1. Verify baseplate is level and properly grouted.
2. Inspect foundation to ensure it is adequate for pump weight and load.
3. Check bearing frame is properly lubricated.
4. Ensure pump rotates freely by hand (except for those with packed boxes).
5. Check couplings are aligned.
6. Ensure grease fittings on motor are properly lubricated.
7. Check piping - ensure suction piping is free of air pockets and all joints are airtight. Recheck alignment when finished.
8. Check all valves operate freely and in direction of flow.
9. Check oil level is sufficient and correct grade.
10. Ensure Discpac rotation is correct - pump shaft turns clockwise when seen from motor end.
11. Ensure pump and suction line are full of fluid.
12. Open suction valve fully.
13. Open discharge valve to 15–20% of full open.

4.3.2 MOTOR CHECK

 Be sure that all electrical connections comply with local regulations and rules, and only authorized personnel are used.

CAUTION: Do not switch the pump motor on and off more than eight times per hour (for a max. fluid density of 1000 kg/m³).

CAUTION: The pump may overload the motor if operated with a fully open, unrestricted discharge. To prevent damage, open the discharge regulating valve slowly.

CAUTION: Motor load changes when conditions (fluid viscosity, density, temperature) or process (capacity, suction or discharge pressure) vary. Recheck motor load to prevent damage.

1. Prepare the motor (or other drive) for operation according to instructions provided by the motor manufacturer. Lubricate the motor bearings per the manufacturer's instructions.
2. Make sure the electrical supply matches the rating.
3. Check for correct direction of motor rotation (counter-clockwise when facing the pump inlet).

Discpac Diameter vs Horsepower

Before pump operation, review the performance curve and application, giving consideration to motor horsepower and Discpac diameter compared to the expected discharge flow rate and pressure. If pump is operated with less than expected discharge pressure, flow rate will increase and load on motor will increase.

To determine if discharge pressure is sufficient to prevent motor overload, perform the following test:

1. If there is no valve in the system downstream of pump, temporarily install one at a convenient location. The valve should not restrict flow in any way when fully open.
2. Temporarily install an ammeter in the electrical service for the motor. (Use a qualified electrician.)

4. PREPARATION FOR OPERATION

4.3 Start-up Procedures

3. Adjust fluid levels, valves, controls, etc, in the system to simulate anticipated process conditions which will result in lowest discharge pressure and highest pump flow rate.
4. Close the valve in the discharge line and start pump.
5. Slowly open the valve while monitoring the ammeter. If the ammeter indicates full motor load before the valve is fully open, the Discpac diameter must be trimmed or additional restriction is required to prevent the motor from overloading.

Discpac Trimming

If a reduced diameter Discpac is required, contact the factory to obtain. If field trimming of the Discpac is unavoidable, the work must be performed by a skilled machinist. An arbor is required to hold the Discpac in a lathe. This may be obtained from Discflo.

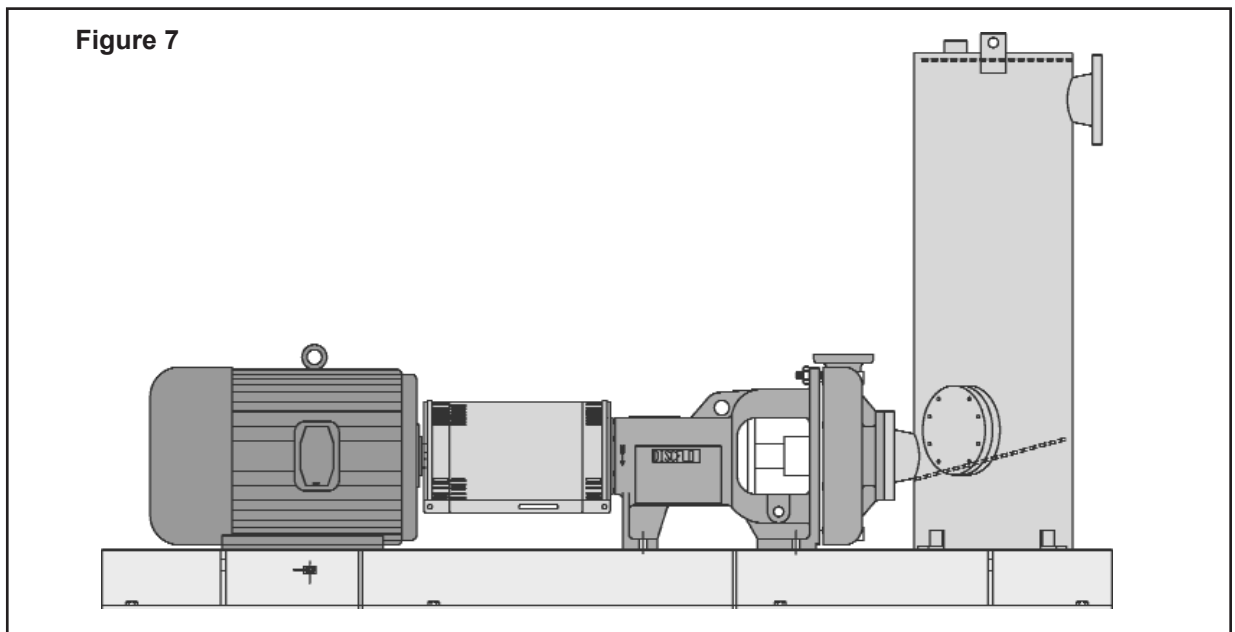
4.3.3 PRIMING

Vent air from suction line and fill with liquid. Start pump with discharge valve cracked open. After discharge pressure stabilizes, gradually open discharge valve to the required position. If flow is lost, close the discharge valve and wait a few seconds for discharge pressure to build.

Continued flow difficulty indicates improper pump sizing or installation. Running the pump too long with improper prime may destroy the sealing faces of the mechanical seal. It may also cause mechanical damage from pulsation and interference between the rotating and stationary components.

For slurries, if suction lift is required, a priming chamber may be installed. This is available as an option from Discflo. **Figure 7** is a typical priming chamber set-up.

Thermal shock may crack the rotating or stationary seat of a mechanical seal if the temperature rises to 180 °F or cools to ambient in less than 30 seconds.



5. OPERATION

5.1 Starting the pump

5.1.1 SAFETY MEASURES

Start the pump only after all the procedures in the **PREPARATION FOR OPERATION** section have been performed.

CAUTION: Operation of the pump without liquid present and no seal flush will damage the shaft seal. Starting the pump dry then admitting liquid could cause damage to the mechanical seal.

CAUTION: On start-up immediately observe pressure gauges. If discharge pressure is not quickly attained, stop driver, reprime and attempt to restart, otherwise damage to the pump may occur.

CAUTION: Observe pump for vibration levels, bearing temperature and excessive noise. If normal levels are exceeded, shut down and resolve, before re-starting, to avoid pump damage.

CAUTION: Do not allow the pump to operate continuously with closed discharge. Heat will build up, leading to damage of product. Pump will not be damaged provided mechanical seal is lubricated.

CAUTION: Repeat the alignment of the coupling at operating temperature. If necessary, realign the pump and/or motor.

EX: Do not run the pump with the regulating valve closed for more than 13 seconds, if there is no bypass line. Otherwise the pump could be heated up, endangering personnel and the surrounding environment, when the pump is operating in areas with explosion hazard.

EX: The operating data should be checked continuously. Running the pump outside the permissible operating zone could place personnel and the environment at risk, when the pump is operating in an area with explosion hazard.

EX: A fluid quantity of a few cm³ per hour will typically leave the mechanical seal in the form of vapor, mist or droplets. If leakage increases after start-up, stop the pump and check the mechanical seal. An increased leakage rate could generate an explosive mixture and place personnel and the surrounding environment at risk, when the pump is operating in areas with explosion hazard.

EX: Although the Disc Pump is designed so that it can run dry indefinitely, users are advised to ensure it contains fluid if it is operating in an area with explosion hazard, to prevent possible danger to personnel and the environment.

EX: The temperature of the bearings should be checked continuously as any increase could damage the bearings and place personnel and the environment at risk, when the pump is operating in an area with explosion hazard.

5.1.2 STARTING PROCEDURE

1. If the pump is equipped with a double seal, start the flush media flowing.
2. Open the suction line and flood the pump casing with liquid before starting the pump drive.
3. Start the pump drive. Check to see that flow is established and that connections and seals are not leaking. Operating the pump with closed discharge is permissible for short periods depending on the type of product and its temperature. Under these conditions, mechanical heat is added to the product and it will eventually vaporize.
4. If normal pump operation includes valve openings and closures (especially automatic air or solenoid operated valves) check for evidence of water hammer. Water hammer is a sudden, extreme increase in pressure due to rapid changes in the velocity of a liquid flowing through a pipe line. If damaging water hammer is present, there will be noticeable line or pump movements and noise when valves are operated. Any water hammer detected

5. OPERATION

5.1 Starting the pump

must be corrected to prevent unwarranted mechanical failures. One method of preventing water hammer is to slow the rate of valve operation to provide gradual openings and closings.

CAUTION: *The pressure caused by water hammer could far exceed normal operating discharge pressure and may be damaging to the pump and system components.*

5. The pump can continue to run dry once pumping is completed if seal is protected by continuous flushing. (See above, in explosion hazard areas, this is not advised.)

5.1.3 TROUBLESHOOTING ON START-UP

If the pump fails on start-up, follow the troubleshooting guidelines:

1. Check that the reading on the pressure gauge on the discharge side is as per the required performance.
2. Recheck the pump installation as per the start-up checklist in the **PREPARATION FOR OPERATION** section.
3. Check Discpac alignment, and if necessary, re-adjust to factory setting.
4. Ensure that actual pump conditions - flow rate, fluid properties, pressure, temperature, piping, etc - are the same as originally specified in the order.

5.1.4 HIGH TEMPERATURE OPERATION

The maximum operating temperature of an oil lubricated bearing frame without cooling is 350°F. With stuffing box cooling: 500°F, with stuffing box cooling and bearing frame cooling: 1000°F.

For temperatures over 212°F, oil lubrication is recommended. On stainless steel pumps and special alloys (not available on Ductile Iron or High Chrome Hard Iron), modifications are required to allow operation up to 1000°F.

5.1.5 STOPPING THE PUMP

1. Close the discharge side regulating valve.
2. Switch off the pump.
3. When the pump is at a standstill, close all other valves.



Be aware that the pump will contain residual liquid. In particular, make sure that the pump does not contain any hazardous substances if it is returned to Discflo.

6. ROUTINE MAINTENANCE

6.1 Safety guidelines



Before starting any maintenance procedure, observe the following safety precautions:

1. Turn off the drive power supply and lock out to prevent accidental starting before disassembling the pump or drive to perform maintenance, using a lock out device.
2. Before disassembling the pump for overhaul, ensure all replacement parts are available.
3. Use proper methods of lifting and securing to avoid physical injury and/or equipment damage.
4. Shut off all sources of liquid to the pump and drain the casing before starting pump disassembly. Remember that liquid may “backup” through the discharge line.
5. If necessary to use heat to remove parts, ensure that all liquid has been drained and any vapor has been removed. A method for accomplishing such removal is to purge casing, seal chamber, etc. with dry compressed air or inert gas.
6. Ensure pump is isolated and pressure is relieved before disassembling pump, plugs or disconnecting piping.



Always remember that the pump shaft and Discpac operate at high speed and can cause severe injury or even loss of life if contacted when operating. Always turn off drive power and lock out before performing any maintenance.

EX: *Ensure that personnel and the environment are not put at risk by the handling of explosive, toxic, hot or caustic fluids, particularly when pump is operating in an explosion hazard area.*

7. Coupling guard must be installed and maintained in first-class condition.
8. Excessive machining can damage ring fits and render parts unusable.
9. Use insulated gloves when using a bearing heater. Bearing will get hot and can cause injury.
10. Use insulated gloves to handle coupling hub. Coupling hub will get hot and can cause injury.

6.2 Bearing maintenance

6.2.1 OIL LUBRICATION

Oilers are set at the factory to the lowest position. This setting will place the oil level just below the center of the bottom ball bearing when the housing is level. Higher levels may cause overheating of the bearings; low levels may provide insufficient lubrication and promote rapid wear. The correct oil level is midway on the sight oil gauge on the side of the frame. See the section, **PREPARATION FOR OPERATION**, for recommended oil quantities.

6.2.2 GREASE LUBRICATION

The anti-friction bearings on the pump and motor, as shipped from Discflo have sufficient lubricant. Do not add more lubricant before putting the pumps into service. Premature bearing failure is more likely to result from over-greasing than under-greasing. The purpose of lubricating bearings is to protect the highly polished surfaces against corrosion, rather than for smooth running. Over supply of grease on the bearings produces heat due to friction, causing grease to ooze out along the shaft.

EX: *Old and improperly lubricated bearings can damage the pump and place personnel and the environment at risk, when operating the pump in areas with explosion hazard.*

If bearings are removed from housing for cleaning, check that they are thoroughly dry before being reinstalled. Use a solvent or cleaning fluid to clean them. Keep bearings away from water, as any moisture is destructive.

The particular brand of grease is unimportant, provided it is lithium based. This type is particularly effective when the bearings are located where there is excessive moisture or danger of water getting into the bearing housing.

6.2.3 LUBICATION FREQUENCY

Lubricate bearings every 30-60 hours of pump operation, depending on pump speed and operating conditions. Discflo recommends using an automatic lubrication system to extend lubrication time and bearing life.



6. ROUTINE MAINTENANCE

6.3 Stuffing box packing for packed pumps

6.3.1 ROUTINE PACKING MAINTENANCE

After starting the pump, adjust gland nuts evenly until leakage is a stream about the size of a pencil lead. This amount of leakage is needed to provide cooling and lubrication and avoid rapid wear of shaft sleeves.

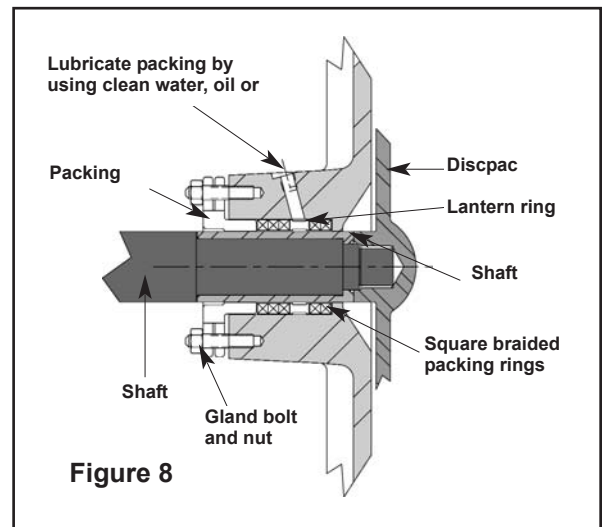
When packing becomes so worn that gland is fully entered and no longer compresses the packing, one ring of packing may be added. After further wear, however, the box should be re-packed.

Replace burned packing. Burned packing is caused by initial over-tightening and trying to run packing without leakage. Once burned, it becomes hard and will not squeeze down on the shaft, resulting in uncontrollable leakage.

The stuffing box can be re-packed as follows:

1. Clean out all old packing from box and remove lantern ring if pump is so equipped. When re-packing, be sure to align the lantern ring with the flush hole. Failure to do this will block the flow of sealing liquid.
2. Inspect sleeve for wear, and if it is scored or grooved, replace it.
3. Fit packing neatly around the shaft with ends fitting in a tight joint.
4. Force first ring firmly and evenly to the box bottom.
5. Lantern ring may be placed in any position in the box as long as it aligns with the flush injection port. The standard ring position (#3) is shown in **Figure 8**. It is also available in positions #1, #2 and #4, depending on the application.
6. Insert remaining rings with joints staggered 180° apart. Compress each ring firmly. Rotate shaft by hand each time a ring is inserted to aid in seating packing. If pump is equipped with a lantern ring, install it to align with the flush port used.
7. When the box is full, compress the packing with the gland. Be sure to adjust gland evenly and also be sure that the gland has entered the box at least 0.125 inch. If the packing will not compress enough to allow this, remove one ring of packing.
8. After pumping starts, adjust gland nuts (usually finger tight only) so that leakage is as described above. Care

should be taken during the first hour of operation to tighten the packing gradually, just enough to maintain this amount of leakage. The “breaking in” period for the packing is important to the satisfactory performance of a stuffing box.



6.3.2 SHAFT SLEEVE COATING WORN

Sleeve surface in stuffing box must be smooth and free of grooves. If grooved, replace shaft sleeve. To check for grooving, remove the packing. Slide a wire with a short section of the tip bent at 90° into the stuffing box. Run the “stylus” tip of the wire along the shaft sleeve. If deep grooves are noted, replace the sleeve.

6.3.3 PACKING BURNED

Replace burned packing. Once it is burned, it becomes hard and will not squeeze down onto the shaft, resulting in uncontrollable leakage. Burned packing is caused by initial overtightening and trying to run the pump without any packing leakage.

CAUTION: Do not overtighten the packing. Excess heat occurs with insufficient water leakage, which leads to burning the packing and sleeve and overloading the motor

6. ROUTINE MAINTENANCE

6.4 Replacing/installing Type 1 and Type 21 mechanical seals

CAUTION: Mechanical seal components may be damaged if they or adjacent parts are handled improperly. Protect lapped faces while working with mechanical seal to avoid damage.

CAUTION: Rotary portion of mechanical seal may be damaged if cover is allowed to come in contact with it.

CAUTION: Ensure that no O-rings or elastomers are damaged during this process. Such damage will cause leakage around the seal.

CAUTION: Always protect and lubricate the mechanical seal if running the disc pump dry. Failure to do so will result in damage to the mechanical seal.

EX: An increased leakage rate could generate an explosive mixture and place people and the environment at risk when operating pump in explosion hazard areas.

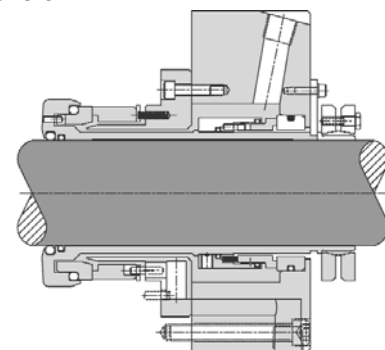
These instructions apply to Type 1 and Type 21 mechanical seals only (see **Figure 9**). For seals other than Type 1 and Type 21, follow seal manufacturers' instructions.

1. Disassemble pump housing to expose defective seal. Note how the existing seal is assembled and be sure to install the replacement seal in an identical manner.
2. Carefully remove old seal head and seat, taking care not to scratch the shaft or seal counterbore.
3. Clean shaft and counterbore surfaces using fine emery cloth or equivalent. Remove rust, burrs, and wipe clean. Avoid making flat spots or reducing shaft diameter.
4. Lubricate the shaft, elastomer inner diameter of the rotating seal head and elastomer outer diameter of the stationary seal seat with an approved seal installation liquid. Clean seal surfaces with a non-filming cleaner.

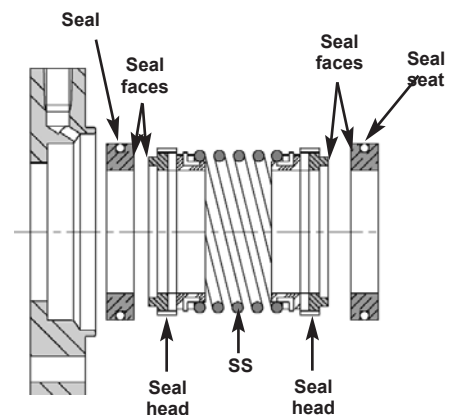
CAUTION: Never use grease or any type of oil as an installation lubricant. Any oil or grease on the seal faces may cause the seal to leak.

5. Press seal seat firmly into counterbore. Do this by hand or with a solid rawhide mallet. During the pressing operation be sure that the seal faces are protected and that there are no direct blows with any metal object. Use a piece of plastic between the face and any driving force.
6. Make sure seal surfaces are free of any foreign matter. Slide rotating seal head by hand pressure along shaft to a completely parallel contact with the stationary seat. Avoid extreme installation pressure or hammering of seal. Make sure spring correctly engages seal head and Discpac shoulders or shaft spring retainer. On double seal units, install gland and gland gasket.

Figure 9



Cartridge seal



Non-cartridge, double mechanical

6. ROUTINE MAINTENANCE

6.5 Re-adjusting the Discpac

For standard operation, the Discpac should be positioned halfway between the front and back of the pump casing. Any exceptions are specified in the pump drawings accompanying this manual. The Discpac is set in the correct position at the factory prior to shipping. However it may be necessary to re-adjust to the correct position after installing the pump.

1. Before adjusting the Discpac, either loosen the seal (if it is a cartridge type seal) or remove the seal from the sleeve (if it is a non-cartridge double mechanical type seal).
2. Turn off and lock out the pump (see **Figure 10**). Loosen the adjusting bolts [3] to move the Discpac forward, then use the jack bolts [2] to move the Discpac backwards. Do not adjust bearing cover bolts [1].
3. Measure the gap between the bearing cartridge and the bearing frame in full forward and full back positions, and calculate the halfway point.
4. Adjust the Discpac to this position or to the position specified in the accompanying drawings.
5. Reset the seal after adjustment.

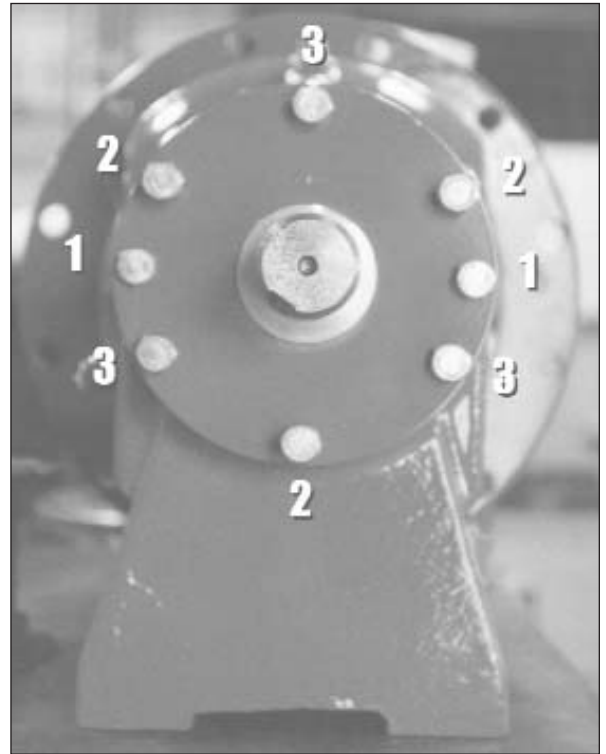


Figure 10: Adjusting the Discpac

7. MAINTENANCE

7.1 Disassembly

EX: *Pump assembly and disassembly must only be performed by authorized and qualified personnel. If not, the pump could be damaged and people and the environment placed at risk when operating in explosion hazard areas.*

7.1.1 PREPARING FOR DISASSEMBLY

Prepare the pump for disassembly by doing the following:

1. Disconnect power to the motor
2. Drain the system between the suction side and the discharge side shut-off valves, and drain fluid from pump.
3. Disconnect and remove sensors and monitors, if any.
4. Dismantle shaft seal supply lines, if any.
5. If oil lubricated bearings are used, drain the oil from the bearing housing.
6. Unbolt the pump from the pipework.
7. Release the motor fastening bolts and move the motor to allow enough space for removing the back pull-out assembly (not required if spacer coupling is used).
8. Dismantle the coupling and unbolt the foot support.

7.1.2 REMOVING CASE / STUFFING BOX (FLUID END)

1. Remove 12 each casing nuts (21).
2. Remove pump casing (1)
3. Restrain pump drive shaft (5) at the coupling end to prevent rotation while removing the Discpac (2). Turn the Discpac counter-clockwise, as viewed from the suction end.
4. For the **10-inch, 12-inch, 14-inch** models, remove two each stuffing box retainer bolts (31). There are no stuffing box retainer bolts on the **12-inch, 17-inch, 20-inch** models.
5. Remove stuffing box (3) from frame on the back side in the area where the box fits into the frame (4).

FOR PUMPS WITH MECHANICAL SEALS:

If the disassembly being performed does not require replacement of the mechanical seal, the stationary seat must not be removed from the stuffing box.

If the disassembly is being performed to replace or install a mechanical seal, packing or shaft sleeve, no further disassembly is required. See the **ROUTINE MAINTENANCE** section of this manual for more information.

FOR PACKED PUMPS

6. Pull packing (24) and lantern ring (25) from stuffing box bore, only if packing is to be replaced.
7. Remove shaft sleeve (6), only if it is to be replaced. A wedge may be driven between end of sleeve and shoulder on shaft to free the sleeve. If the pump has a mechanical seal that does not need to be replaced, care must be taken to avoid damaging or dropping the rotary seal faces when removing the sleeve.

FOR PUMPS WITH CARTRIDGE SEALS

If a cartridge seal is used, replace spacer clips in the seal to ensure proper spring tension and loosen set screws on shaft sleeve. Do not remove bolts on the stuffing box. Pull box and seal off as one unit.

7.1.2 REMOVING PUMP / BEARING FRAME SHAFT (POWER FRAME)

9. Remove deflector (13).
10. Remove the inboard bearing cover (10).
11. Loosen outboard bearing retainer bolts (20A).
12. The complete shaft and bearing subassembly can now be pulled out of the bearing frame casting from the back (motor) side.
13. Remove snap ring (18) from outboard bearing retainer and remove bearing retainer (11) and housing (12) from bearings.
14. Remove lock nut and washer (9A & 9B) from shaft. Then remove one each inboard (7A) and two each outboard (7B) bearings.

NOTE: *If you have problems with the motor, contact your local motor repair shop or the motor manufacturer.*

Numbers in parentheses refer to parts listed in Part 8 of this manual.

7. MAINTENANCE

7.2 Inspection of components

7.2.1 CLEANING

All parts should be cleaned before re-assembly. This is especially important at the retaining ring and O-ring grooves, threads, gasket surfaces, and bearing lubricated areas. All burrs should be removed with emery paper or similar. Keep water off parts and assembly at all times.

7.2.2 SHAFT (5)

Check for run-out to see that shaft has not been bent. If run out exceeds 0.002 inch, replace shaft. Bearing seals and oil seal area must be smooth and free of scratches or grooves. Shaft threads must be in good condition. Replace shaft if necessary.

7.2.3 SHAFT SLEEVE (6)

Sleeve surface in stuffing box must be smooth and free of grooves. If grooved, replace shaft sleeve. To check for grooving, remove packing and slide a wire with a short section of the tip bent at 90° into the stuffing box. Run the “stylus” tip of the wire along the shaft sleeve. If deep

grooves are noted, replace the sleeve.

7.2.4 MECHANICAL SEAL

Seal faces, gaskets, and shaft sealing members must be in perfect condition or excessive leakage may occur. Replace worn or damaged parts.

7.2.5 ANTI-FRICTION BEARINGS (7A, 7B)

Replace if worn, loose, rough or noisy when rotated. New bearings should not be unwrapped until ready for use. Replacement bearings must be of proper size and type as supplied with original equipment.

7.2.6 SEALS

It is recommended that all O-rings (16, 16A, 16B), gasket seals (15, 15A) and lip seals (17A, 17B) be removed during disassembly and replaced. In those cases where new seals are not available, the old ones can be reused if they are not torn or otherwise damaged.

7.3 Assembly

7.3.1 SHAFT/BEARING SUB-ASSEMBLY

1. Heat bearings to 200°–250°F. A half hour in an oven at this temperature works well. Do not exceed 250°F, as higher temperatures may damage bearings.
2. Remove from oven and slip bearings into position and allow to cool. Front bearing should be placed thrust side against shoulder. Oil bearing should be placed with inner race retainer side out.
3. Pack bearings with grease (for non oil-bearing pumps).
4. For reassembly of shaft and power frame, reverse Steps for Disassembly, beginning with last step and working back. Replace lip seals (17A and 21A in the **8-inch, 10-inch, 12-inch** models; 17A and 17B in the **14-inch, 17-inch, 20-inch** models).
5. For cartridge seal reassembly, refer to **PREPARATION FOR OPERATION** section for shaft sealing procedure.

7.3.2 POWER FRAME SUB-ASSEMBLY

1. Lubricate the inside of the frame where the stuffing box cover slips in with an anti-seize compound. Install stuffing box cover (3). Secure with two each bolts and clips.
2. Lubricate shaft (5) threads and face of shaft sleeve (6) followed by Discpac O-ring (16). Thread Discpac (2) to shaft and tighten to approximately 40 ft/lb.
3. Rotate the shaft: the Discpac should turn freely without rubbing. If necessary, adjust outboard bearing retainer bolt (20A) and jack screws (20B) to provide clearance between Discpac and case. For most pumps, this running clearance is 0.10-0.15 inch. Pumps with rear expeller ribs on the Discpac can be adjusted up to 0.015 inch from the rear cover.
4. Install casing gasket (15). Hold it in place with grease if necessary.
5. Install casing (1) on frame using studs (19) and nuts (21). Put a small quantity of anti-seize lubricant on the threads on nut-end of the studs. Tighten nuts to 35 ft/lb using a criss-cross tightening pattern.



8. PARTS LIST

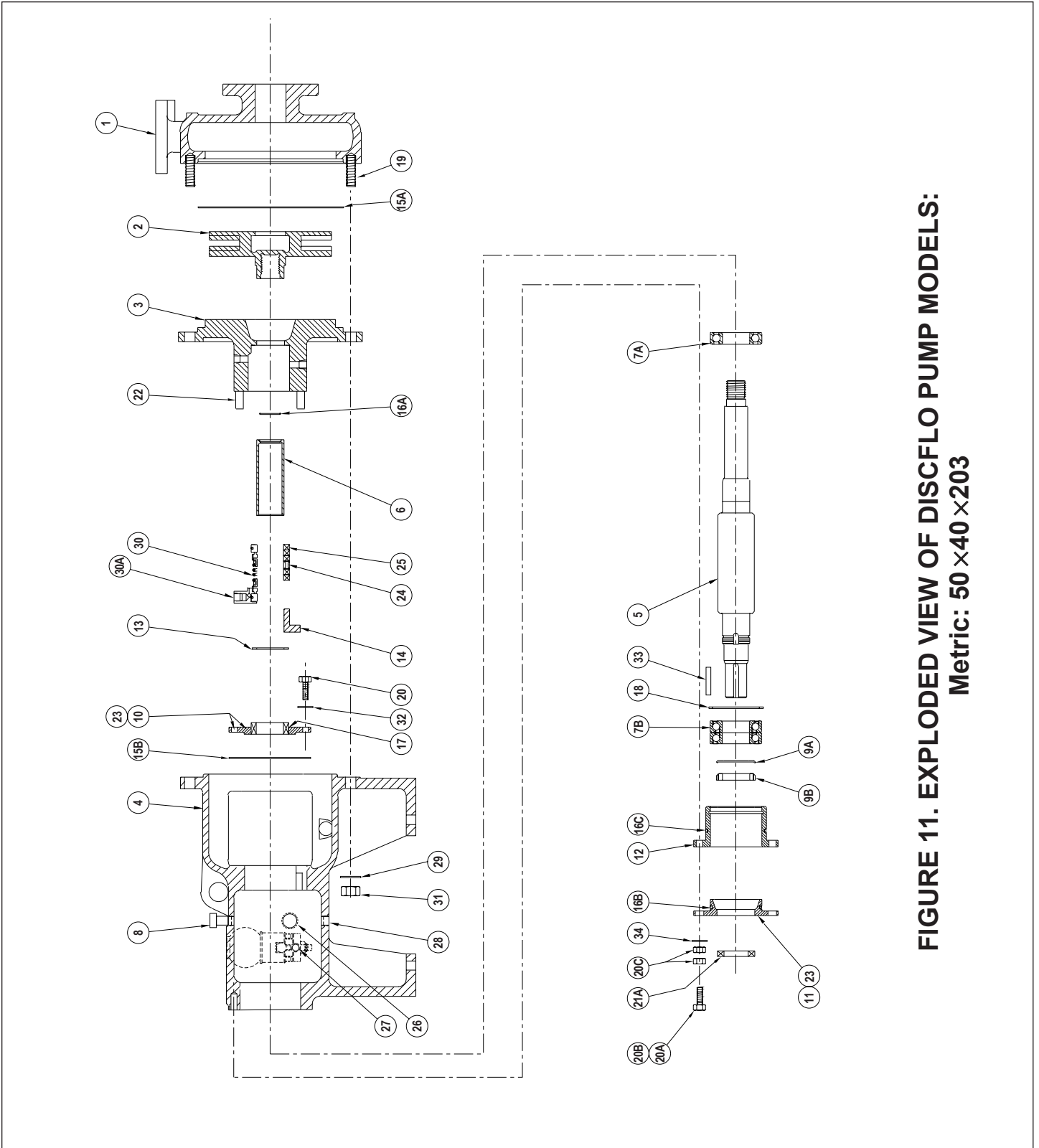
8.1 Parts list for 8-inch models:

This covers the following Standard models:
2015-8

Item	Description
1	Casing
2	Discpac
3	Backplate
4	Bearing Frame
5A	Drive Shaft
6	Shaft Sleeve
7A	Inboard Bearing
7B	Outboard Bearings
8	Oil Filler Vent
9A	Lockwasher
9B	Bearing Locknut
10	Inboard Bearing Cover
11	Outboard Bearing Cover
12	Outboard Bearing Housing
13	Deflector
14	Gland Packing *
15	Casing Gasket
15A	Gasket-Front Bearing Cover
16	O-ring Discpac
16A	O-ring, Outboard Bearing Cover
16B	O-ring, Outboard Bearing Housing
17A	Lip Seals Front (isolator)

Item	Description
18	Snap Ring
19	Stud - Casing (x8)
20	Bolt , Inboard Bearing Cover (x4)
20A	Bolt, Outboard Bearing Cover (x2)
20B	Bolt, Jack Screw (x3)
20C	Nuts (x6)
21	Nut, Casing (x8)
21A	Lip Seals Rear (isolator)
22	Seal Gland Stud *
23	Grease Nipples *
24	Mechanical Seal/Packing *
25	Lantern Ring *
26	Oil Level Sight Glass
27	Oiler *
28	Drain Plug
29	Washer (x8)
30	Gasket (mechanical seal gland)
31	Bolt - Backplate (x4)
32	Washer (x8)
33	Shaft Key
	* PART IS OPTIONAL

8. PARTS LIST



**FIGURE 11. EXPLODED VIEW OF DISCFLO PUMP MODELS:
Metric: 50 x40 x203**

8. PARTS LIST

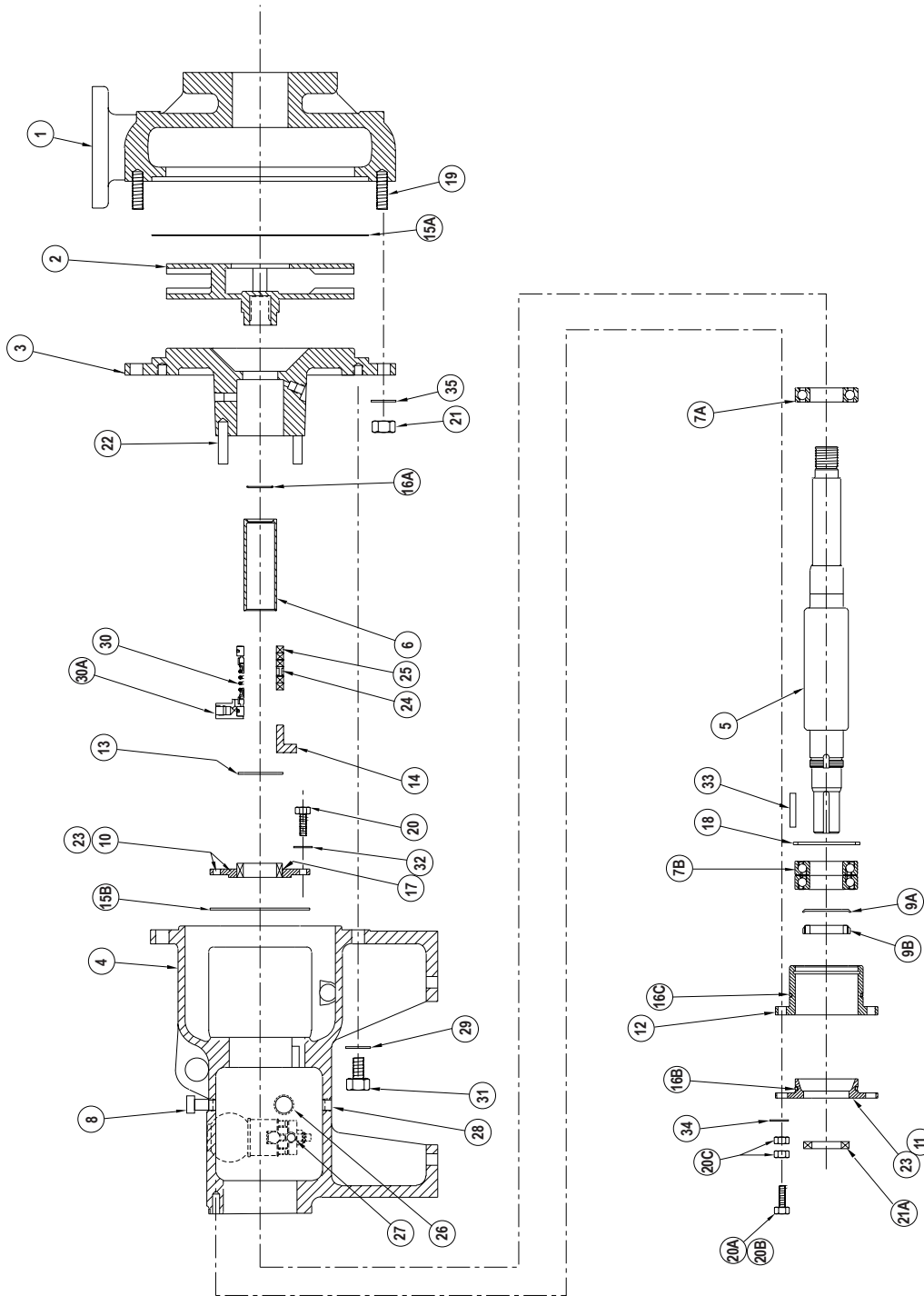
8.2 Parts list for 10-inch models:

This covers the following Standard models:
302-10

Item	Description
1	Casing
2	Discpac
3	Backplate
4	Bearing Frame
5	Drive Shaft
6	Shaft Sleeve
7A	Inboard Bearing
7B	Outboard Bearings
8	Oil Filler Vent
9A	Lockwasher
9B	Bearing Locknut
10	Inboard Bearing Cover
11	Outboard Bearing Cover
12	Outboard Bearing Housing
13	Deflector
14	Gland Packing *
15	Casing Gasket
15A	Gasket-Front Bearing Cover
16	O-ring Discpac
16A	O-ring, Outboard Bearing Cover
16B	O-ring, Outboard Bearing Housing
17A	Lip Seals Front (isolator)

Item	Description
18	Snap Ring
19	Stud - Casing (x8)
20	Bolt , Inboard Bearing Cover (x4)
20A	Bolt, Outboard Bearing Cover (x2)
20B	Bolt, Jack Screw (x3)
20C	Nuts (x6)
21	Nut, Casing
21A	Lip Seals Rear (isolator)
22	Seal Gland Stud *
23	Grease Nipples *
24	Mechanical Seal/Packing *
25	Lantern Ring *
26	Oil Level Sight Glass
27	Oiler *
28	Drain Plug
29	Washer (x8)
30	Gasket (mechanical seal gland)
31	Bolt - Backplate (x8)
32	Washer (x4)
33	Washer (x8)
34	Washer (x8)
35	Shaft Key
	* PART IS OPTIONAL

8. PARTS LIST



**FIGURE 12 EXPLODED VIEW OF DISCFLO PUMP MODELS:
Standard: 302-10**

8. PARTS LIST

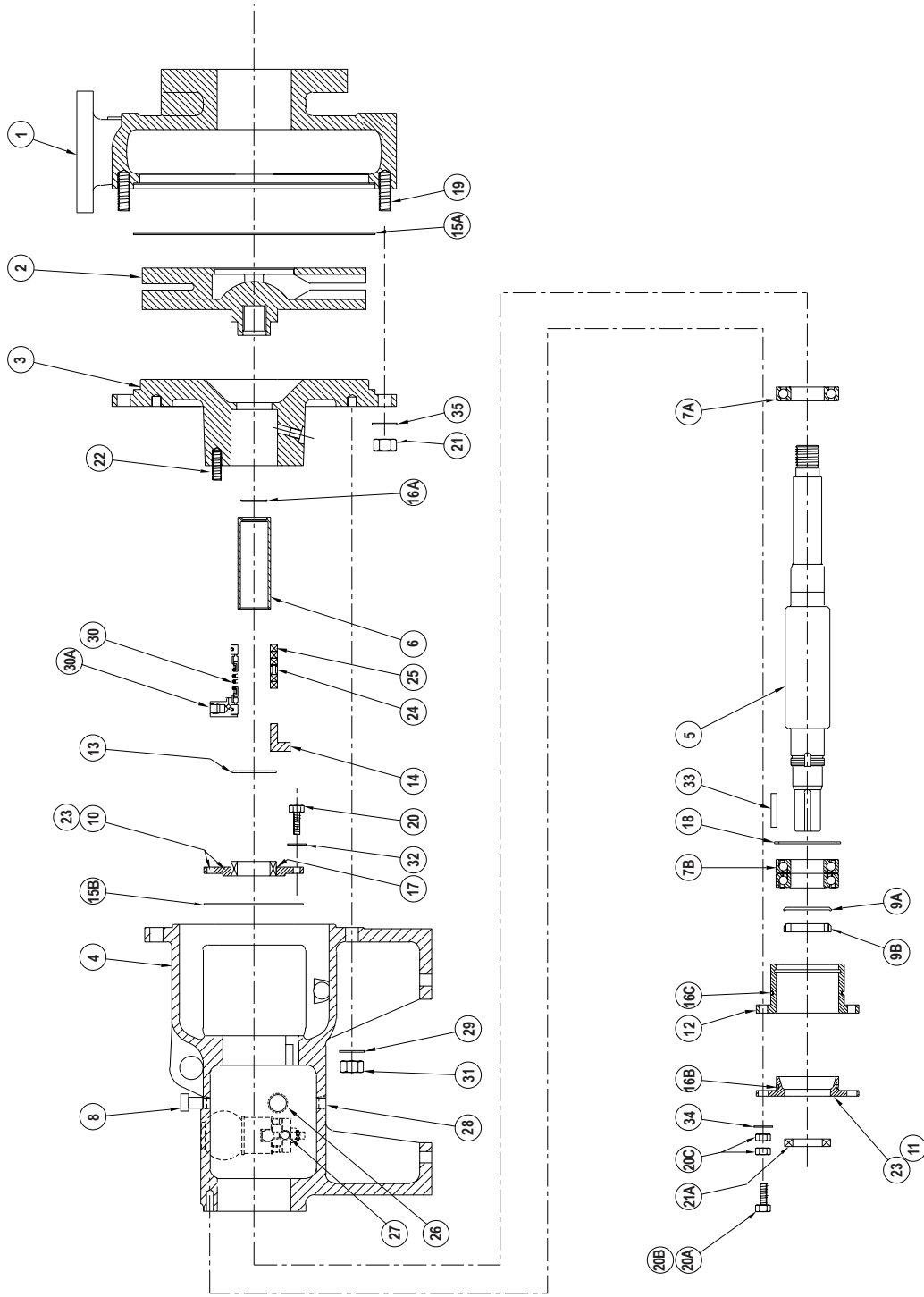
8.3 Parts list for 12-inch models:

This covers the following Standard models:
402-12, 403-12, 604-12

Item	Description
1	Casing
2	Discpac
3	Backplate
4	Bearing Frame
5	Drive Shaft
6	Shaft Sleeve
7A	Inboard Bearing
7B	Outboard Bearings
8	Oil Filler Vent
9A	Lockwasher
9B	Bearing Locknut
10	Inboard Bearing Cover
11	Outboard Bearing Cover
12	Outboard Bearing Housing
13	Deflector
14	Gland Packing *
15	Casing Gasket
15A	Gasket-Front Bearing Cover
16	O-ring Discpac
16A	O-ring, Outboard Bearing Cover
16B	O-ring, Outboard Bearing Housing
17A	Lip Seals Front (isolator)

Item	Description
18	Snap Ring
19	Stud - Casing (x8)
20	Bolt , Inboard Bearing Cover (x4)
20A	Bolt, Outboard Bearing Cover (x2)
20B	Bolt, Jack Screw (x3)
20C	Nuts (x6)
21	Nut, Casing
21A	Lip Seals Rear (isolator)
22	Seal Gland Stud *
23	Grease Nipples *
24	Mechanical Seal/Packing *
25	Lantern Ring *
26	Oil Level Sight Glass
27	Oiler *
28	Drain Plug
29	Washer (x8)
30	Gasket (mechanical seal gland)
31	Bolt - Backplate (x8)
32	Washer (x4)
33	Washer (x8)
34	Washer (x8)
35	Shaft Key
	* PART IS OPTIONAL

8. PARTS LIST



**FIGURE 13. EXPLODED VIEW OF DISCFLO PUMP MODELS:
Standard: 402-12, 403-12, 604-12**



8. PARTS LIST

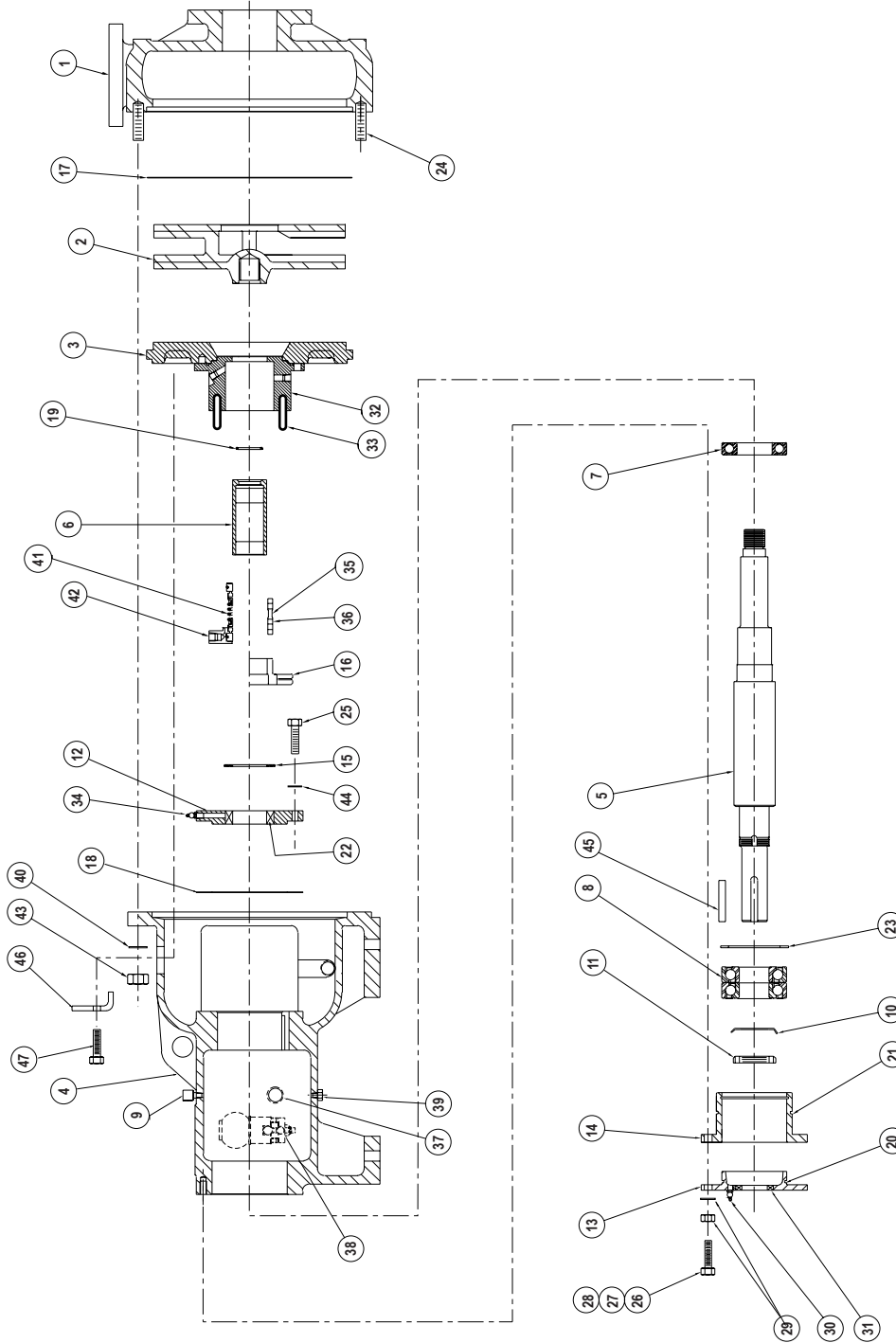
8.4 Parts list for 14-inch models:

This covers the following Standard models:
402-14, 403-14, 604-14, 806-14

Item	Description
1	Casing
2	DISCPAC
3	Stuffing Box
4	Bearing Frame
5	Drive Shaft
6	SHAFT SLEEVE
7A	INBOARD BEARING
7B	OUTBOARD BEARINGS
8	Vent - Bearing Frame
9A	Locknut Washer
9B	Bearing Locknut
10	Inboard Bearing Cover
11	Outboard Bearing Retainer
12	Outboard Bearing Housing
13	Deflector
14	Gland Packing
15	CASING GASKET
15A	GASKET - FRONT BEARING COVER
16	O-RING DISCPAC
16A	O-RING - OUTBOARD BEARING RETAINER
16B	O-RING - OUTBOARD BEARING HOUSING
17A	LIP SEALS FRONT (ISOLATOR)
17B	LIP SEALS REAR (ISOLATOR)

Item	Description
18	SNAP RING
19	Stud - Casing
20	Bolt - Inboard Bearing Retainer
20A	Bolt - Outboard Bearing Retainer
20B	Bolt - Jack Screw
21	Nut - Casing
21A	Nut Jack Screw
22	Seal Gland Stud
23	Grease Nipples
24	MECHANICAL SEAL/PACKING
25	Lantern Ring
26	Oil Level Sight Glass
27	Oiler
28	Drain Plug
29	Bolts - Bearing Frame
30	GASKET (MECHANICAL SEAL GLAND)
31	Bolt - Stuffing Box Retainer
32	Retainer - Stuffing Box
ITEMS IN CAPITALS ARE RECOMMENDED SPARE PARTS.	

8. PARTS LIST



**FIGURE 14. EXPLODED VIEW OF DISCFLO PUMP MODELS:
Standard: 402-14, 403-14, 604-14, 806-14**

8. PARTS LIST

8.5 Parts list for 17-inch models:

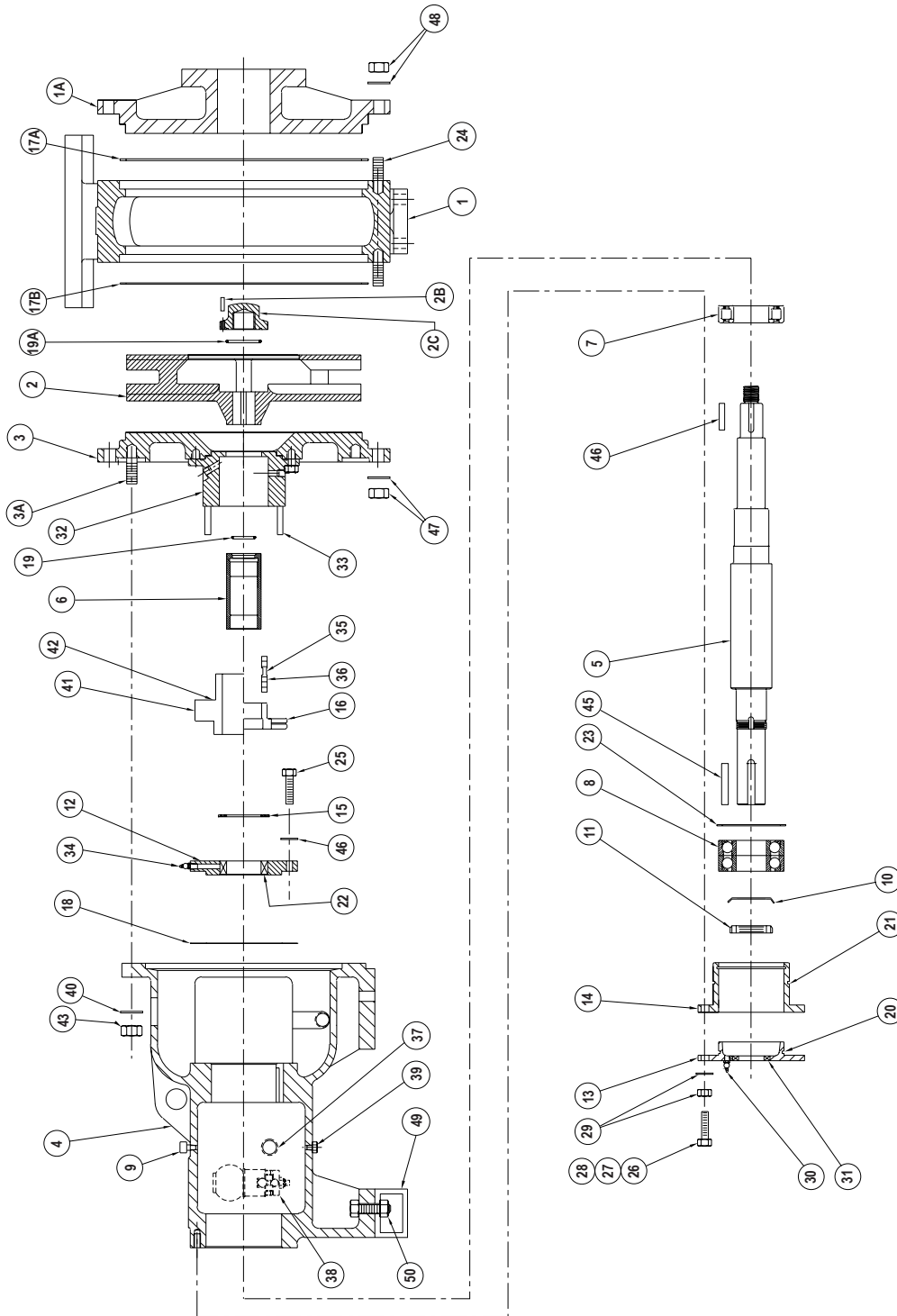
This covers the following Standard models:
603-17,604-17, 804-17, 806-17, 1008-17

Item	Description
1	Casing
2	DISCPAC
3	Stuffing Box
4	Bearing Frame
5	Drive Shaft
6	SHAFT SLEEVE
7A	INBOARD BEARING
7B	OUTBOARD BEARINGS
8	Vent - Bearing Frame
9A	Locknut Washer
9B	Bearing Locknut
10	Inboard Bearing Cover
11	Outboard Bearing Retainer
12	Outboard Bearing Housing
13	Deflector
14	Gland Packing
15	CASING GASKET
15A	GASKET - FRONT BEARING COVER
16	O-RING DISCPAC
16A	O-RING - OUTBOARD BEARING RETAINER
16B	O-RING - OUTBOARD BEARING HOUSING
17A	LIP SEALS FRONT (ISOLATOR)
17B	LIP SEALS REAR (ISOLATOR)
18	SNAP RING

Item	Description
19	Stud - Casing
20	Bolt - Inboard Bearing Retainer
20A	Bolt - Outboard Bearing Retainer
20B	Bolt - Jack Screw
21	Nut - Casing
21A	Nut Jack Screw
22	Seal Gland Stud
23	Grease Nipples
24	MECHANICAL SEAL/PACKING
25	Lantern Ring
26	Oil Level Sight Glass
27	Oiler
28	Drain Plug
29	Bolts - Bearing Frame
30	GASKET (MECHANICAL SEAL GLAND)
31	Discpac Key
32	O-ring - Discpac Bolt
33	Discpac Bolt
34	Jacking Bolt
35	Riser
36	Casing Suction Cover (all 432mm models incorporate oversized suction covers)
ITEMS IN CAPITALS ARE RECOMMENDED SPARE PARTS.	



8. PARTS LIST



**FIGURE 15 EXPLODED VIEW OF DISCFLO PUMP MODELS:
Standard: 603-17, 604-17, 804-17, 806-17, 1008-17**

8. PARTS LIST

8.6 Parts list for 20-inch models:

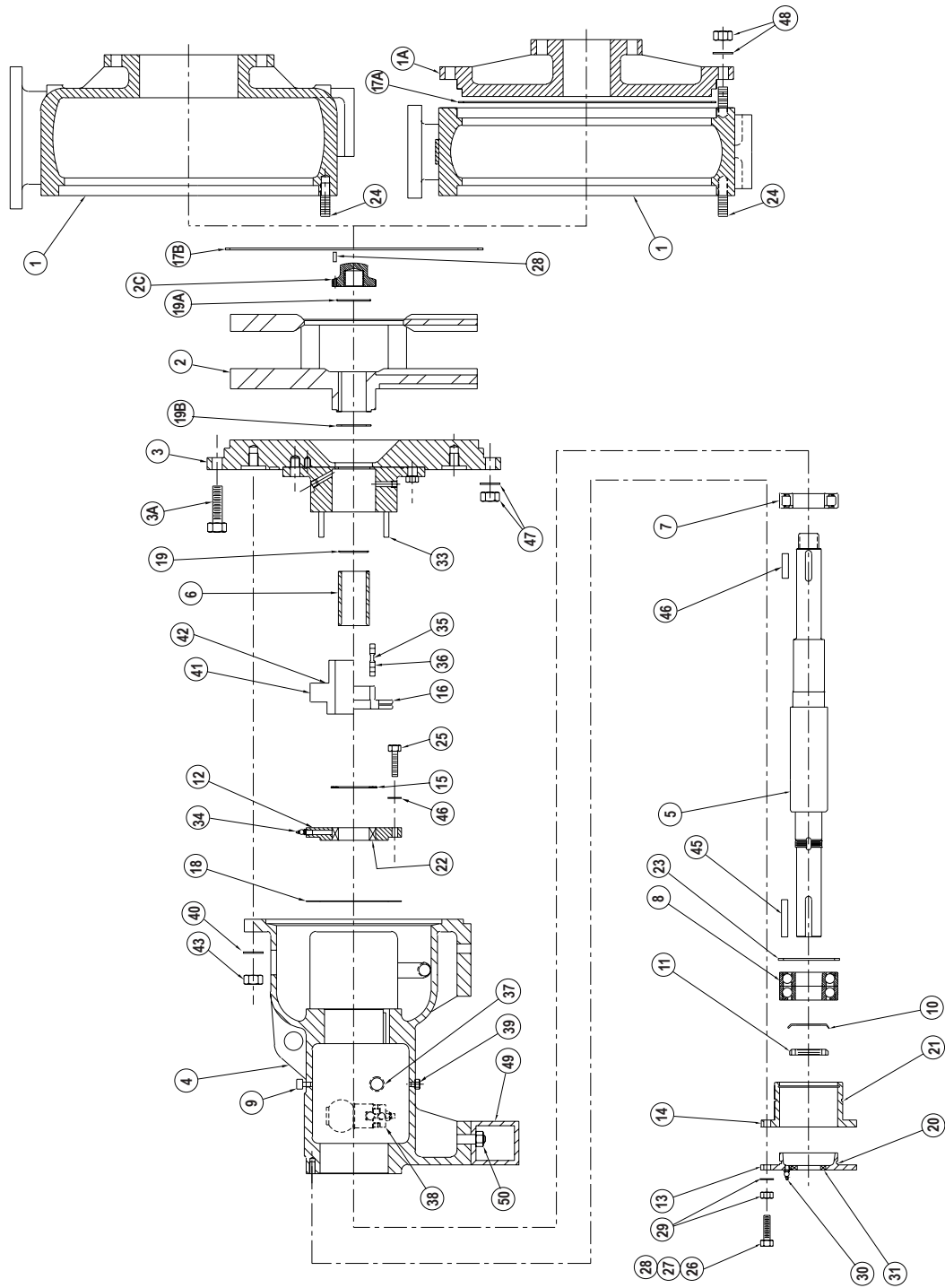
This covers the following Standard models:
603-20, 804-20, 806-20, 1006-20, 1008-20, 1208-20

Item	Description
1	Casing
2	DISCPAC
3	Stuffing Box
4	Bearing Frame
5	Drive Shaft
6	SHAFT SLEEVE
7A	INBOARD BEARING
7B	OUTBOARD BEARINGS
8	Vent - Bearing Frame
9A	Locknut Washer
9B	Bearing Locknut
10	Inboard Bearing Cover
11	Outboard Bearing Retainer
12	Outboard Bearing Housing
13	Deflector
14	Gland Packing
15	CASING GASKET
15A	GASKET - FRONT BEARING COVER
16	O-RING DISCPAC
16A	O-RING - OUTBOARD BEARING RETAINER
16B	O-RING - OUTBOARD BEARING HOUSING
17A	LIP SEALS FRONT (ISOLATOR)
17B	LIP SEALS REAR (ISOLATOR)
18	SNAP RING

Item	Description
19	Stud - Casing
20	Bolt - Inboard Bearing Retainer
20A	Bolt - Outboard Bearing Retainer
20B	Bolt - Jack Screw
21	Nut - Casing
21A	Nut Jack Screw
22	Seal Gland Stud
23	Grease Nipples
24	MECHANICAL SEAL/PACKING
25	Lantern Ring
26	Oil Level Sight Glass
27	Oiler
28	Drain Plug
29	Bolts - Bearing Frame
30	GASKET (MECHANICAL SEAL GLAND)
31	Discpac Key
32	O-ring - Discpac Bolt
33	Discpac Bolt
34	Jacking Bolt
35	Riser
36	Casing Suction Cover (all 432mm models incorporate oversized suction covers)
37	Discpac Spacer Ring
	ITEMS IN CAPITALS ARE RECOMMENDED SPARE PARTS.



8. PARTS LIST



**FIGURE 16. EXPLODED VIEW OF DISCFLO PUMP MODELS:
Standard: 603-20, 804-20, 806-20, 1006-20, 1008-20, 1208-20**

9. TROUBLE-SHOOTING

The following table is intended as a quick guide to trouble-shooting your Discflo pump. If you require further help, contact your distributor or Discflo direct at the address below.

CAUSES/SYMPTOMS	Noise or vibration	No flow	Insufficient flow	Insufficient pressure	Excessive power required	Intermittent flow	Short bearing life
Pump not primed		•	•				
Speed too low			•	•			
Excessive discharge head		•	•				
Insufficient NPSH	•	•	•			•	
Discpac clogged		•	•			•	
Wrong rotation direction	•		•	•			
Plugged suction or discharge	•	•	•	•			
Suction line not immersed deep enough		•	•			•	
Discpac damaged	•	•	•	•			
Shaft packing or seal defective		•	•	•			
Specific gravity or viscosity too high		•	•		•		•
Bent shaft	•				•		•
Improper motor wiring or voltage					•		
Rotating elements bind	•				•		•
Leaky suction line or shaft seal			•				
Misalignment	•				•		•
Bearings worn	•						•
Discpac out of balance	•						•
Suction/discharge piping not anchored	•						
Improper foundation	•						
Insufficient discharge head	•			•	•		•
Improper lubricant or level							•
Discpac clearance too large			•	•	•		



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