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Installation and Service Instructions

D series



 **Tuthill**

made for your process

Installation, Operation, Safety & Warranty Information

1. Gear pumps can produce high differential pressures that may cause system damage and expose personnel to hazards associated with an unintentional release of fluid. Exceeding design limits may cause pump to burst and may cause pump and/or motor to fail.
2. Pump-Head and motor & drive are designed to be operated together. Before any disassembly, disconnect power to motor and do not allow pump-head to be pressurized.
3. Do not pressurize or operate pump unless the pump/motor assembly contains a complete set of correctly installed fasteners in good condition. Each threaded hole must contain a fastener.
4. Do not operate pump/motor unless it is secured in its desired location.
5. Do not modify any part of pump/motor assembly. Modification may weaken pressure-containing parts and create hazards to personnel. Use only factory-authorized replacement or repair parts.
6. Do not allow pump to be subjected to an internal pressure approaching its burst pressure of 1500 psig at room temperature. Internal pressure (measured at either suction or discharge ports) should not exceed 500 psig (safety factor of 3.0). Specific codes, standards, operating practices and conditions may dictate a lower internal pressure (higher safety factor). Verify leak-tight installation of fluid connections prior to operation where leakage could be hazardous.
7. Do not exceed a fluid temperature of 350°F. Fluid temperatures above 100°F reduce the strength of pressure-containing parts. At 350°F pump burst pressure is 1000 psig.
8. The pump should not be used where the pumped fluid causes corrosion to metal pressure-containing parts or attacks the pump seals or plastic body. These conditions will cause a significant reduction in the ability of the pump to contain pressurized fluid and may cause hazardous leakage.

Motor & Drive Assemblies

1. In normal operation electric motors may develop surface temperatures that will burn the skin.
2. Electric motors produce waste heat that must not be allowed to accumulate in the surrounding air. Unless otherwise specified, an electric motor will operate continuously without overheating at its published performance limit at an ambient (air) temperature not exceeding 40°C (104°F).
3. Electric motors are not liquid tight and should not be exposed to sprays, splashes, drips or immersion, nor should they be exposed to the weather.
4. Do not block motor ventilation openings (if present). Do not allow objects to enter motor openings.
5. Motor must be disconnected from power supply immediately if any condition prevents motor rotation.

AC Motors

1. AC motors must be operated only from the power source(s) (voltage and frequency) specified on the motor nameplate.
2. Connect dual voltage motors to power source according to connection diagram on motor nameplate.
3. Thermally protected motors (see motor nameplate) automatically turn themselves off when winding temperature exceeds allowable limits; however, motor will restart without warning when winding temperature drops, unless power source is disconnected from motor. Thermal overload protection must not be relied upon to control motor under any but abnormal or unexpected conditions.

Brush-Type Permanent Magnet DC Motors (PMDC) - Including AC/DC Series - Wound Universal Motors

1. PMDC motors are designed to operate over a range of speeds by varying the input voltage; unless otherwise specified, a PMDC motor may be operated at input voltage in the range specified by the motor rating (see nameplate).
2. Regardless of input voltage, motor current may exceed the motor rating only for intermittent duty applications. Operation with excessive motor current may result in motor overheating.
3. Continuous duty current limits for PMDC motors are based upon a power supply form factor of 1.0 (ripple free).
4. PMDC motors are not thermally protected (motor will not automatically turn itself off when overheated).

Brushless DC (BLDC) Motors

1. BLDC motors are designed to operate over a range of speeds by varying the input voltage; do not operate motor beyond input voltage range of motor (see nameplate).
2. Regardless of input voltage, motor current must never exceed the value specified for the motor; even momentary operation with excessive motor current may cause permanent damage to motor.
3. Power supply ripple and noise (peak-to-peak) must never exceed 10% of the input voltage supplied; otherwise, permanent damage to motor will result.

Installation

- **Pump Installation & Plumbing** - Locate the pump as close and below the liquid source as possible. Suction and Discharge lines should be as large as the pump ports and as short as possible. If long suction runs are required, use larger tubing. Avoid any restrictions; valves, elbows or sharp turns whenever possible to avoid loss of flow or performance.
- **Fitting Installation** - Apply a paste-type thread sealant or Teflon® tape (two wraps maximum) no more than 3 threads from the end of the fitting before assembling to pump ports. Tighten fittings no more than 5 total turns and no more than 2 turns beyond finger-tight, whichever is less. Take care not to damage or misalign the pump-head when installing the fittings. Hold the pump-head, not the motor, to resist the wrenching torque.
- **Filters** - On the suction side a filter of 25 microns or less is desirable. If the system is closed loop recirculating the filter may be placed on the discharge side. The smallest micron filter should be used without restricting flow or performance.

Operation

Magnetic Coupling

Magnetic coupling makes the “zero leak” feature possible. It also offers protection from damage caused by excessive pressures or foreign particles wedged in the gear teeth. Decoupling occurs when the two magnets are forced out of pole-to-pole alignment.

- If the pump decouples, the motor will continue to operate at no load speed but the gears in the pump will stop rotating.
- To recouple, stop the motor completely and restart.
- If decoupling persists, check system for excessive pump pressure. If problem persists, the pump will have to be disassembled, check for foreign particles wedged in the gear teeth. Disassemble and clean parts thoroughly following repair procedure. After reassembly, rotate motor fan (Pump and motor should rotate freely with no magnet rub or internal friction).
- Operating pressure – The differential pressure across the pump should be set well below the decoupling pressure (See catalog for decoupling pressures). This will prevent inadvertent decoupling caused by transient pressure surges.

Internal Bypass

Adjustment may be made while the pump is operating. With a screwdriver the bypass pressure is adjusted higher by turning the adjusting screw clockwise, and lowered by turning counter-clockwise. Bypass pressure should be set below normal decoupling pressure and above the operating pressure. See catalog for factory set bypass pressure. (Some models not available with internal bypass.)

Self-Priming

Tuthill pumps are capable of self-priming, make certain the gears are “wetted” with the pumping fluid.

Running Dry

Dry running will cause permanent damage; make certain there is fluid in the pump while in operation.

Running in Reverse

The inherent design of these gear pumps require that the pump be run in clockwise rotation. Intermittent reverse rotation for purging may be acceptable. Continuous reverse rotation (counter-clockwise) is not recommended and premature failure will occur.

Product Warranty

Tuthill Pump Group warrants its products against defective material and workmanship for one year from date of shipment from its Alsip plant. This warranty does not include products damaged by wear, tampering, improper installation, or abuse. Nor does it cover consequential damages or other losses due to pump failure.

Due to the unpredictable nature of the fluids process pumps encounter, pumps are not warranted for any specific life.

Important Information

For your protection, please read and observe the following instructions. Transportation companies assume all liability from the time of shipment is received by them until the time it is delivered to the consumer. Our liability ceases at the time of shipment. All shipments leaving our plant have been carefully inspected. If a shipment arrives with the crating or packaging damaged, have the carrier note the condition on the receipt. Check as soon as possible for concealed damage. If it is found that the shipment has been damaged in transit, please Do Not return to us, but notify and file a claim with the carrier at once.

FAILURE TO FOLLOW THIS PROCEDURE WILL RESULT IN THE REFUSAL BY THE CARRIER TO HONOR ANY CLAIMS WITH A CONSEQUENT LOSS TO THE CONSUMER.

If UPS or Parcel Post has been damaged, retain the damaged material and notify us at once. We will file a claim. Goods may not be returned for credit unless authorized by our sales department.

Suggested Service Pak Tools

60129-1	Bearing Extractor Tool	60158-1	Medium Blade Screwdriver
60098-2	Bearing Installation Tool	60157-1	Bypass Nut Driver
60098-4	Body Bearing Installation Tool (.11 - .19 Size Only)	Optional	Rubber Gloves
60154-1	T10 Torx Driver	Optional	Masking Tape
60155-1	T15 Torx Driver	60149-1	D Series Tool Kit (Includes all tools shown above except 60098-4)
60169-1	Hex Key Wrench 9/64"		

Service Pak includes: 2 Gears, 3 O-Rings, 5 Bearings, Silicone Lubrication and Instruction Sheet.

CAUTION

Warranty will not extend to goods altered or repaired by anyone other than the manufacturer or authorized representative.

Service Paks are designed to be installed by someone familiar with precision mechanical assemblies and tools. Observe reasonable safety precautions, including the use of safety eye-wear when performing the steps listed below.

Important: Check the Service Pak parts you have received. Tuthill has changed the Driven Magnet to a “slip fit” design for the Driving Gear Assembly (12). This design does not require a Magnet Clamp Screw (5). If you have received a Service Pak with the “slip fit” design and your Pump has a Magnet Clamp Screw (5) design Driven Magnet (7) you will need to contact the factory and order a “slip fit” Driven Magnet (7). See pictorials at the end of these instructions.

Disassembly Instructions (Refer to Pages 3 & 4)

1. Provide a clean surface for work area.
2. Remove three Mounting Screws (3) and separate Pump-Head from Drive Housing.
Note: If the Gears are not being replaced and will be reused, after removing the Cap (16) in the next step mark the Gears orientation with a permanent marker. This will allow the Gears to be reassembled in the same orientation. Remove two cap screws (17) with a 9/64 Hex Socket Wrench. Models manufactured prior to 2001 use a T20 Torx Driver.
3. Remove two Cap Screws (17) in the Cap (16) holding the other parts in place and remove the Cap (16), Driven Gear (13), Cavity Plate (15) and two Dowel Pins (14). If the pump is furnished with a Bypass take care not to damage the Poppet (20) sealing surface. Remove Poppet Assembly (20) from Bypass Adjusting Screw (18). Turn Bypass Nut (19) counter-clockwise 1 ½ turns. Hold Bypass Nut (19) against rotation and turn Bypass Adjusting Screw (18) counter-clockwise to remove from Cap (16).
4. Remove six Mounting Plate Screws (1) and remove the Mounting Plate (2) and Magnet Cup (4).
Note: Instructions for “slip fit” Design. Pull the Driven Magnet (7) off the Driving Gear Assembly (12) shaft (no Screw is used in this design). Instructions for Magnet Clamp Screw Design. To prevent damage to the Driving Gear (12) REMOVE Cap (16) BEFORE installing or removing the Magnet Clamp Screw (5). NEVER install or remove the Magnet Clamp Screw (5) with Cap (16) in place. Hold the Driven Magnet (7), Magnet Clamp (6), and Magnet Hub (8) from rotation and turn Magnet Clamp Screw (5) clock-wise (left hand threads) to remove. Magnet Clamp (6) and Magnet Hub (8) are not part of a DX Driven Magnet (7).
5. Remove three O-Rings (9) from the Cap (16) and Body (10). O-Rings (9) may be removed with a blast of compressed air or with a sharp pin.

Important: Do not nick or scar the sides of the bearing bores in the steps below.

6. Clamp the Bearing Extractor Tool in a vise and screw the Bearing (11) on the tool and gently tap with a soft mallet while supporting and pulling the Cap (16) or Body (10) to free the Bearing (11). Repeat process until all five Bearings (11) are removed. See Figure 1.
7. Inspect all parts for damage and wear. If wear on Cap (16), Cavity Plate (15) and Body (10) is excessive rebuilding the pump may not be recommended (consult factory).

Assembly Instructions (Refer to Pages 3 & 4)

1. Clean all parts. Any foreign material clinging to the Driven Magnet (7) can be removed with masking tape.
2. Body Bearing Installation for .11 and .19 size pumps only: Use installation tool 60098-4. Body Bearings (11) should be installed to .135/.145 below the face of the body (10). Install the cap bearings per step # 3.
3. Cap bearings (.11 – 2.3) and Body bearings (.23 to 2.3 only) use installation tool 60098-2. Press bearings into the Cap (16) and Body (10). Bearings (11) should be .002/.005 below the face of the Cap (16) and Body (10). See Figure 2.
4. Apply a thin coat of silicone lubricant (furnished in Service Pak) to three new O-Rings (9) and install in the Cap (16) and Body (10) O-Ring grooves. Omit silicone lubricant if it is incompatible with your pumped fluid.
Note: Instructions for “slip fit” Design. Install Driving Gear Assembly (12); then slip fit Driven Magnet (7) on shaft (no screw required for this design). Instructions for Magnet Clamp Screw Design. Install Driving Gear Assembly (12), Magnet Hub (8), Driven Magnet (7), Magnet Clamp (6) and Magnet Clamp Screw (5). Hold Driven Magnet (7) to prevent rotation and tighten Magnet Clamp Screw (5) counter-clockwise (left hand threads) to 200 in/oz torque (a rubber glove can be used to facilitate holding the Driven Magnet (7)). When performing the following assembly operations DO NOT apply forces to the Driven Magnet (7). Pushing or pulling the Driven Magnet (7) may damage the Driving Gear Assembly (12).
5. Install two Dowel Pins (14) into Body (10) and slip the Cavity Plate (15) over the Dowel Pins (14) against the Body (10) face. The Cavity Plate (15) will fit properly in only one orientation. The Screw holes in the Body (10) and Cavity Plate (15) must align.
6. Install Driven Gear Assembly (13) with the longer shaft extension into the Body (10).
7. If pump is furnished with a Bypass, install Bypass Adjusting Screw (18) through the Bypass Nut (19) and turn clockwise until the Bypass Adjusting Screw (18) is flush with the Bypass Nut (19). Attach Poppet Assembly Spring (20) onto Bypass Adjusting Screw (18).
8. Align Cap (16) with the Driving (12) and Driven (13) Gear Assembly shafts and Dowel Pins (14). Assemble carefully and make certain the Poppet Assembly (20) goes fully into the Poppet hole and seats. See Figure 3.
9. Install two Cap Screws (17) in Cap (16) and torque alternately to 320 in/oz. Torque to 640 in/oz for PTFE O-Rings.
10. Rotate the Driven Magnet (7) by hand to check for any binding during rotation. The Driven Magnet (7) should turn freely. If there is binding determine and remove cause.
11. Install Magnet Cup (4) and Mounting Plate (2) with six Mounting Plate Screws (1). Turn alternately until tight to 320 in/oz.
12. Assemble Pump-Head to Motor and Drive Housing with three Mounting Screws (3). Pump/Motor assembly is now complete.

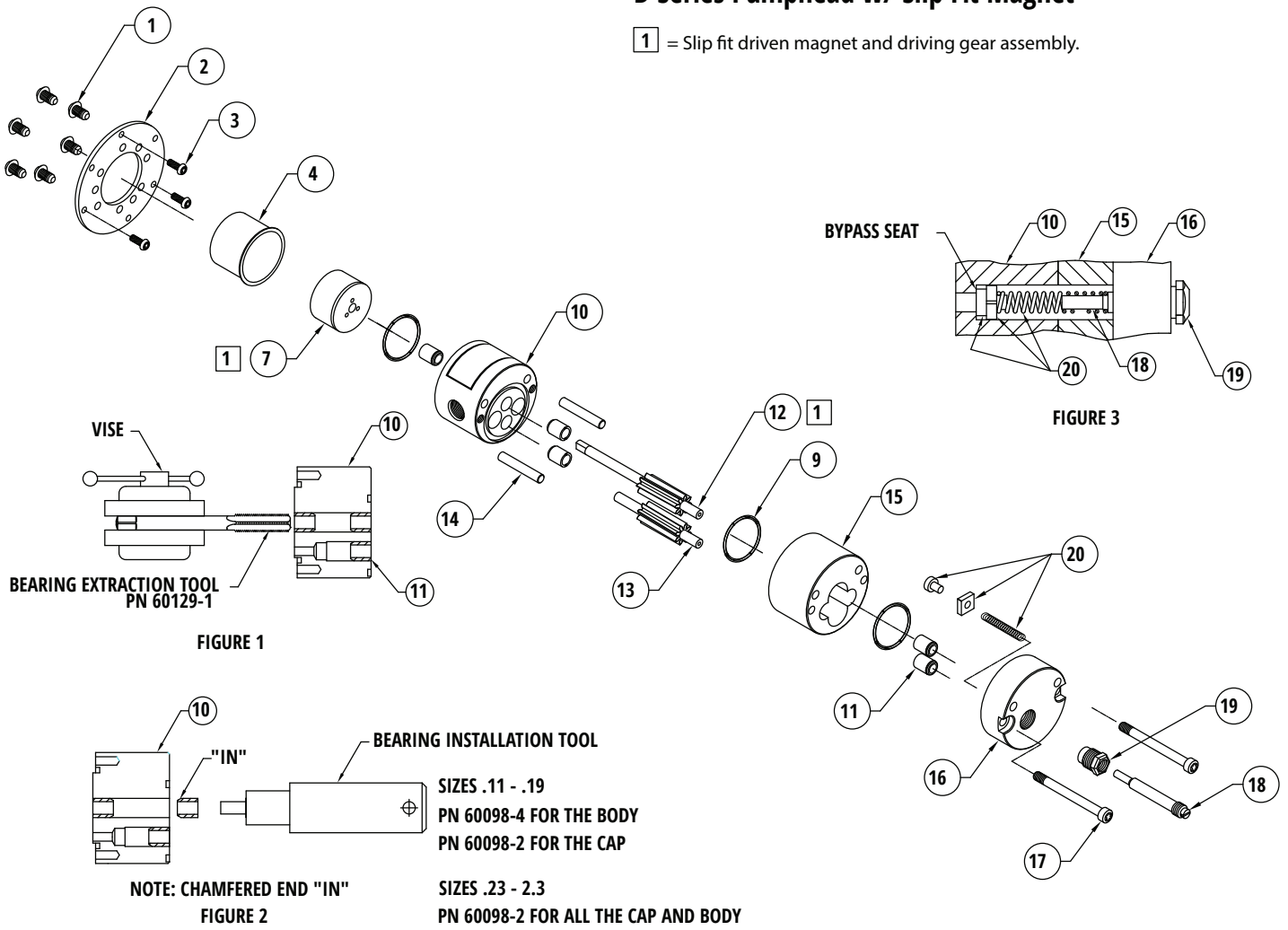
Note: New parts may exhibit slight interference with mating surfaces. An initial “run-in” period may be required to allow the gears to seat. Rebuilt pumps may initially decouple below normal differential pressure or produce less than normal flow-rate until mating parts have fully seated during initial period of operation.

Parts List & Drawing

1. Mounting Plate Screws	6. Magnet Clamp	11. Bearing	16. Cap
2. Mounting Plate	7. Driven Magnet	12. Driving Gear Assembly	17. Cap Screw
3. Pump Mounting Screws	8. Magnet Hub	13. Driven Gear Assembly	18. Bypass Adjusting Screw
4. Magnet Cup	9. O-Ring	14. Dowel Pin	19. Bypass Nut
5. Magnet Clamp Screw	10. Body	15. Cavity Plate	20. Bypass Spring, Guide & Poppet Assembly

D Series Pumphead w/ Slip Fit Magnet

1 = Slip fit driven magnet and driving gear assembly.



D Series Pumphead w/ Open Magnet

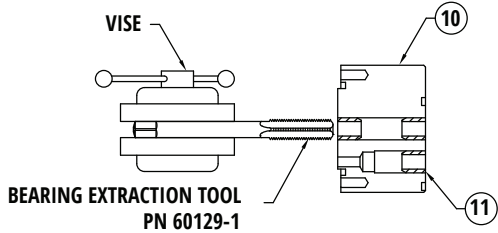
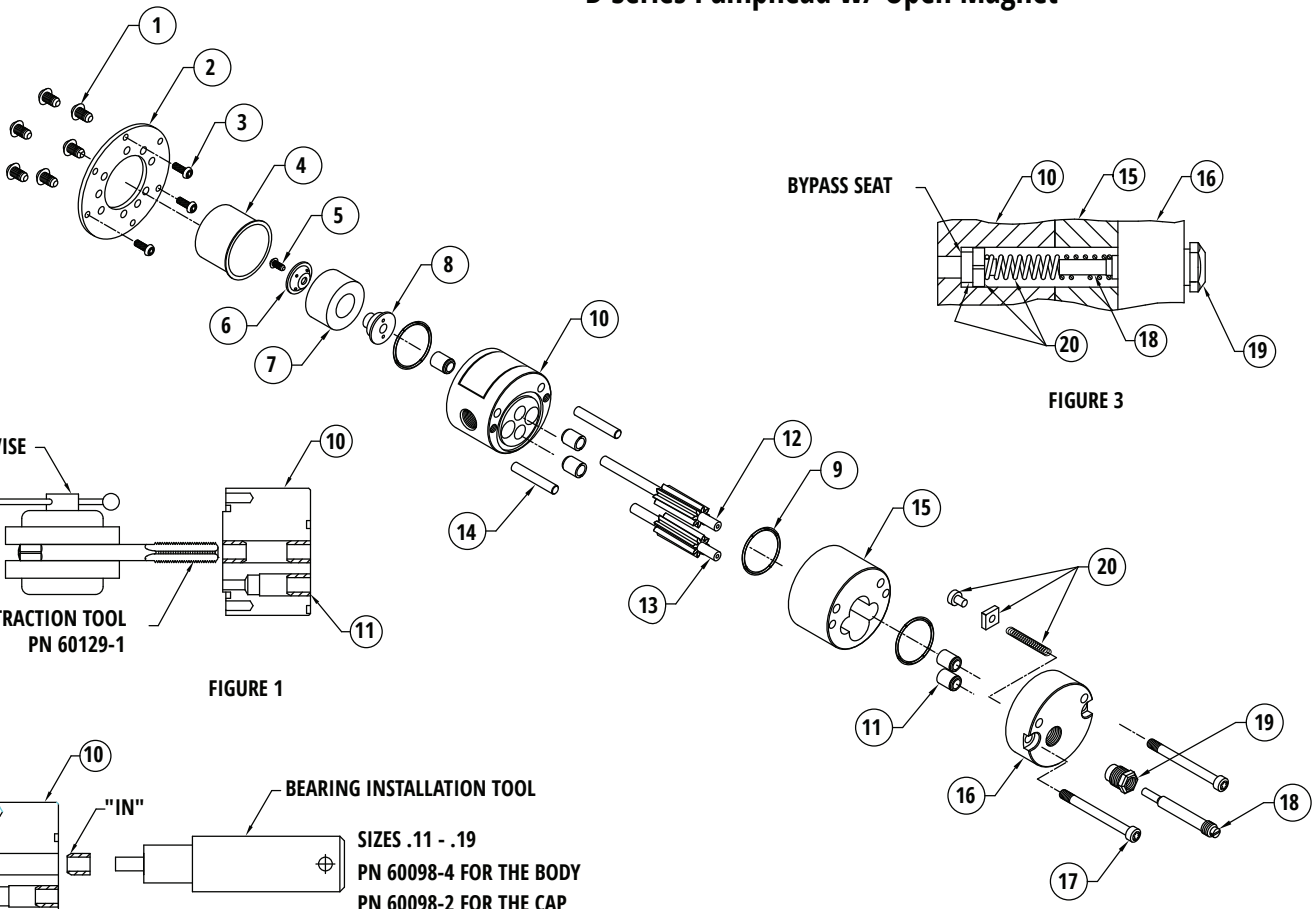


FIGURE 1

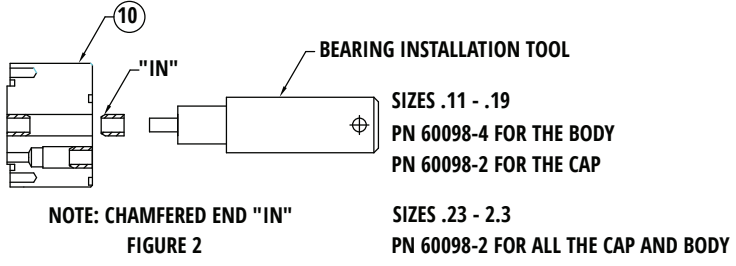


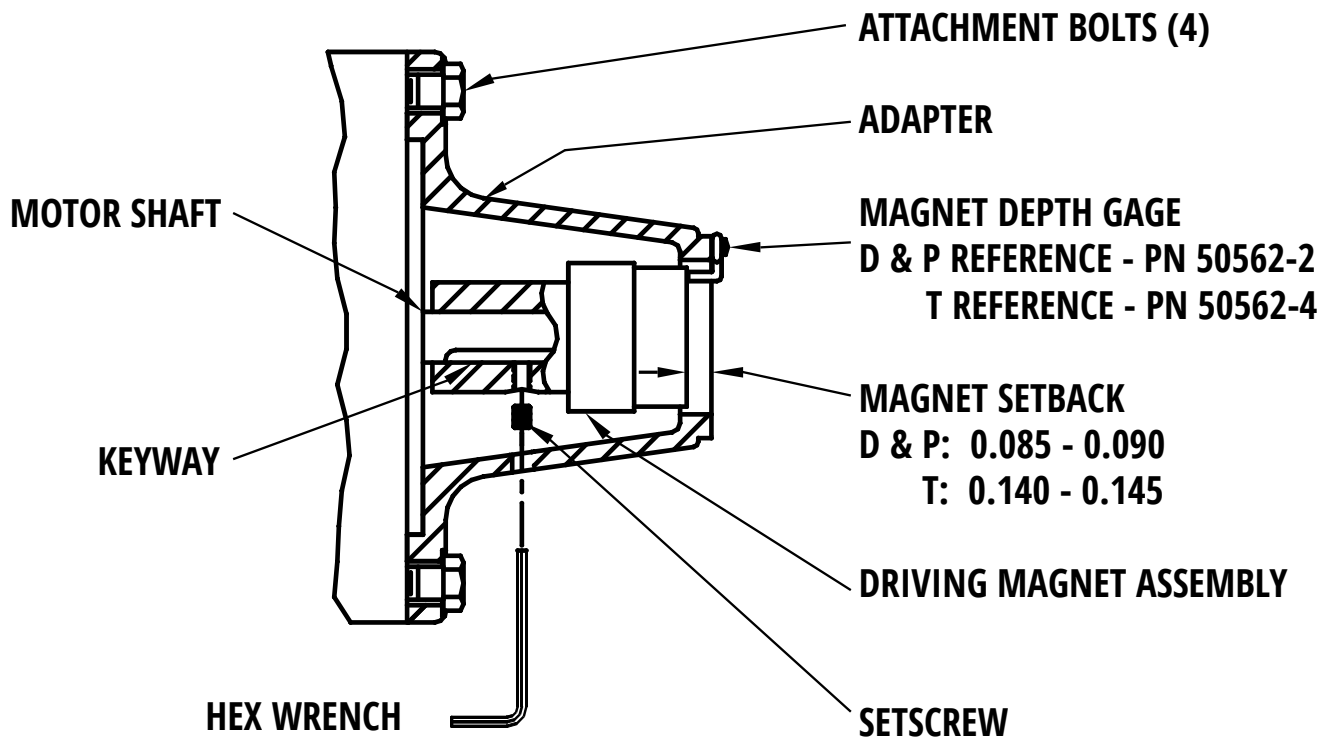
FIGURE 2

FIGURE 3

DB, DG, DX, PB, PG, TX, & TW Motor Mate Kit C-Face Assembly Instructions

Install the driving magnet assembly on the motor shaft with the setscrew in line with the shaft keyway. Turn the setscrew clockwise with the hex wrench so the setscrew protrudes into the keyway but is not tight. Install the motor adapter and tighten the four bolts. With the shaft held in the "extended" position if necessary, slide the driving magnet assembly forward until it touches the magnet depth gage. Tighten the setscrew against the flat bottom of the keyway taking care that the driving magnet position touching the magnet depth gage does not change. Remove the magnet depth gage and install the pumphead to the adapter with the pumphead mounting screws.

IMPORTANT: Motor rotation must be clockwise when looking at the motor shaft. Standard pumps can be damaged by extended operation in reverse rotation.





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BEDU POMPEN B.V.
Poort van Midden Gelderland Rood 10
6666 LT HETEREN
Nederland
Telefoon +31 (0)88 4802 900
E-mail info@bedu.nl

WWW.BEDU.NL

BEDU BELGIUM B.V.B.A.
Industriepark-West 75
9100 SINT-NIKLAAS
België
Telefoon +32 (0)3 80 87 980
E-mail info@bedu.be

WWW.BEDU.BE

