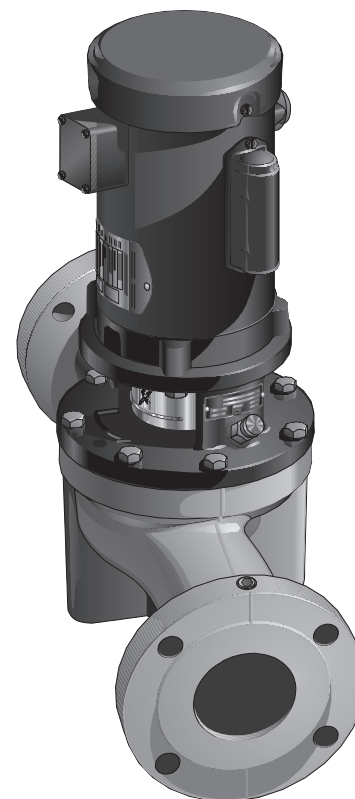


VersaFlo® TP

Direct Coupled In-Line Single Stage Circulator Pumps

Installation and operating instructions



L-TP-TL-001	10/06
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PRINTED IN THE USA

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Please leave these instructions with the pump for future reference.

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Safety Warning

Read This Booklet

This booklet is designed to help a certified installer begin operation of and troubleshoot Grundfos VersaFlo™ TP pumps. This booklet should be left with the owner of the pump for future reference and information regarding its operation. Should the owner experience any problems with the pump, a certified professional should be contacted.

Electrical Work

All electrical work should be performed by a qualified electrician in accordance with the latest edition of the National Electrical Code, local codes and regulations.

Shock Hazard



A faulty motor or wiring can cause electrical shock that could be fatal, whether touched directly or conducted through standing water. For this reason, proper grounding of the pump to the power supply's grounding terminal is required for safe installation and operation.

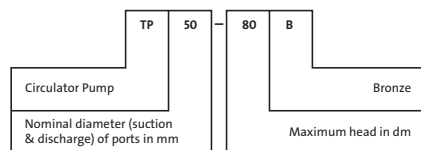
The ground wire should be a copper conductor at least the size of the circuit conductors supplying power to the motor. Do not ground to a gas supply line.

In all installations, the above-ground metal plumbing should be connected to the power supply ground as described in Article 250-80 of the National Electrical Code.

1. Pre-Installation Checklist

1.1 Confirm You Have the Right Pump

- Read the pump nameplate to make sure that it is the correct one.
- Compare the pump's nameplate data and its performance curve (for head, GPM, etc.) with the application in which you plan to install it.
- Will the pump do what you expect it to do?*
- The nomenclature for the VersaFlo TP line of Grundfos pumps is:



1.2 Check the Condition of the Pump

The shipping carton your pump came in is designed around your pump during production to prevent damage. As a precaution, it should remain in the carton until you are ready to install it. At that point, look at the pump and examine it for any damage that may have occurred during shipping. Examine any other parts of the shipment as well for any visible damage.

1.3 Electrical Requirements

Check the motor nameplate to determine the proper voltage, phase, and frequency required. The voltage must be within $\pm 10\%$ of the specified motor nameplate voltage. Dual voltage motors must be internally wired to match the electrical supply. A wiring connection diagram is affixed to the motor.

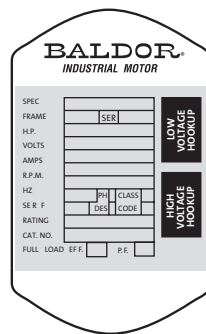


Fig. 1

Nameplate Wiring Diagram
(in this case, for a dual voltage motor)

1.4 Is the Application Correct for This Pump?

Compare the pump's nameplate data or its performance curve with the application in which you plan to install it. Will it perform the way you want it to perform? Also, make sure the application falls within the following limits:

Approved applications:

- Open or closed water systems
- Glycol solutions up to 50% (requires optional RUVV mechanical seal)
- HVAC hot and cooled water
- Condenser or cooling tower heat exchanger circulation
- Commercial solar
- Commercial heating and fan coil systems
- Geothermal systems
- Agricultural temperature conditioning
- Snow melting

Correct it by...

If no voltage at motor, check feeder panel for tripped circuits.
Replace blown fuses or reset circuit breaker. If new fuses blow or circuit breaker trips, the terminal box wiring must be checked.
Replace burned heaters or reset. Inspect starter for other damage. If heater trips again, check the supply voltage and starter holding coil.
If no voltage, check the control circuit fuses. If there is voltage, check the holding coil for shorts. Replace bad coil.
Replace worn or defective parts.
If the motor windings are open or grounded, replace the motor.
When the meter is connected, the needle should jump toward "0" ohms and slowly drift back to infinity. Replace capacitor if defective.
Correct wiring and change leads as required.
Refill the pump, replace lug and start the pump. Long suction lines must be filled before starting the pump.
Clean and replace. Re-prime the pump.
Reduce suction lift by lowering pump, increasing suction line size or by removing high friction-loss fittings.
Repair all leaks and retighten all loose fittings.
Convert PSI to feet ($\text{PSI} \times 2.31 = \text{ft.}$). Refer to the specific pump curve for shutoff head for that pump model. If actual head is close to curve, the pump is probably OK. If not, remove pump and inspect.
Readjust switch or replace if defective.
Readjust setting (refer to level control manufacturer's data). Replace if defective.
Check diaphragm for leak. Check tank and piping for leaks with soap and water solution. Check air-to-water volume.
Tank volume should be approximately 10 gal. for each gpm of pump capacity. The normal air volume is 2/3 of the total tank volume at the pump cut-in pressure.
If voltage varies more than $\pm 10\%$, contact power company. Check wire sizing.
Increase heater size or adjust trip setting.
Must be within $\pm 5\%$. If not, check motor and wiring.
If an open or grounded winding is found, repair or replace the motor.
Tighten loose terminals. Replace damaged wire.
If shaft does not rotate, remove pump and inspect. Disassemble and repair.
When the ohmmeter is connected to the capacitor, the needle should jump towards "0" ohms and slowly drift back to infinity; or, with the capacitor meter the UF reading should be $\pm 10\%$ of capacitor rating. Replace if defective.

5.2 Diagnosing Specific Problems

If the pump...	It may be caused by...	Check this by...
Does not run	1. No power at motor.	Check for voltage at terminal box.
	2. Fuses are blown or circuit breakers are tripped.	Turn off power and remove fuses and check for continuity with an ohmmeter.
	3. Motor starter overloads are burned or have tripped.	Check for voltage on the line and load side of the starter.
	4. Starter does not energize.	Energize control circuit and check for voltage at the holding coil.
	5. Defective controls.	Check all safety and pressure switches for operation. Inspect contact in control devices.
	6. Motor is defective.	Turn off power. Disconnect the wiring. Measure the lead-to-lead resistance with an ohmmeter (set at R x 1). Measure lead-to-ground values with a megohmmeter (R x 100K). Record the measured values.
	7. Defective capacitor. (Single-phase motors)	Turn off the power, then discharge the capacitor. Disconnect the leads and check them with an ohmmeter (R x 100K).
Pump runs, but at a reduced capacity or Doesn't deliver water	1. Wrong rotation (Three-phase only)	Check for proper electrical connections in terminal box.
	2. Pump is not primed or is air-bound.	Turn pump off, close isolation valves, remove priming plug. Check fluid level.
	3. Strainers, check valves, or foot valves are clogged.	Remove strainer, screen, or valve and inspect.
	4. Suction lift too large.	Install compound pressure gauge at the suction side of the pump. Start pump and compare reading to performance data.
	5. Suction and/or discharge piping leaks.	Pump shaft spins backwards when turned off. Air in suction pipe.
	6. Worn pump.	Install pressure gauge, start the pump, gradually close the discharge valve and read pressure at shut-off.
Pump cycles too much	1. Pressure switch is not properly adjusted or is defective.	Check pressure setting on switch and operation.
	2. Level control is not properly set or is defective.	Check voltage across closed contacts.
	3. Three-phase current is unbalanced.	Check setting and operation.
	4. Tank is too small.	Pump air into tank or diaphragm chamber. Check tank size and air volume in tank.
Fuses blow or Circuit breakers trip	1. High or low voltage.	Check voltage at the starter panel or terminal box.
	2. Starter overloads are set too low.	Cycle pump and measure amperage.
	3. Three-phase current is unbalanced.	Check the current draw on each lead to the motor.
	4. Motor is shorted or grounded	Turn off power and disconnect incoming power supply from terminal box. Measure winding and lead-to-ground resistance as explained on the previous page.
	5. Wiring or connections are faulty.	Check for proper wiring and loose terminals.
	6. Pump is stuck.	Turn off power and manually rotate pump shaft.
	7. Defective capacitor. (Single-phase only)	Turn off power, discharge capacitor and check with ohmmeter set at highest R value or check with capacitor meter.

Temperature range

- Minimum +5°F (-15°C)
- Maximum +284°F (140°C)

Maximum working pressure:
145 PSI (10 bars)

1.5 Read This Guide Thoroughly

Even if you are very familiar with the installation of this pump, a quick glance through the remaining sections of this guide may help you avoid a potential problem.

For TPE pump installation, see Grundfos Pumps publication L-EC-TL-001.

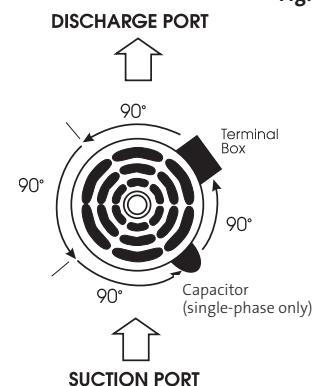
2. Installation Procedures

2.1 Electrical Preparation

2.1.1 Terminal Box Position

Before installing the pump, you must determine the most convenient position for the terminal box, which can be rotated in 90° increments. To rotate the terminal box, remove the four bolts securing the motor to the pump, lift and rotate the motor, and retighten the bolts. (See page 9.)

Fig. 2



2.1.2 Single-Phase Motors

These motors are multi-voltage with built-in automatic resetting thermal protection to prevent overheating.

2.1.3 Three-Phase Motors

A motor starter is required to ensure the motor is protected from damage caused by low voltage, phase failure, current imbalance, and overloads.

- Motor starter — should be properly sized, have a manual reset, and ambi-

ent-compensated extra quick trip in all three legs.

- Overload — should be sized and adjusted to trip at the full-load current rating of the motor. If the motor is lightly loaded, the overload should be re-sized or adjusted to a lower value. **Under no circumstances should the overloads be set to a higher value than the full load current shown on the motor nameplate.** Overloads for auto transfers and resistant starters should be sized in accordance with the recommendations of the manufacturer.
- Fused disconnect — recommended for each pump where service and standby pumps are installed. An alternating switch should be used so each pump can be equally operated to even the wear.

2.1.4 Other Wiring Considerations

The pump must be grounded. Wire sizes should be based on the ampacity (current carrying properties of a conductor) as required by the latest edition of the National Electrical Code or local regulations.

In most cases, direct on line (D.O.L.) starting is approved due to the extremely fast run-up time of the motor and the low moment of inertia of the pump and motor. If D.O.L. starting is not acceptable, an auto transformer or resistant starter should be used.

2.2 Piping Considerations

Whenever possible, avoid high pressure-loss fittings (elbows, branch tees, etc) directly on either side of the pump. The pump and piping should be adequately supported on both sides to reduce thermal and mechanical stresses on the pump.

Pipe, valves, and fittings should be at least the same diameter as the discharge pipe to reduce excessive fluid velocities and friction losses. They should also have a pressure rating equal to or greater than the maximum system pressure.

A bypass or pressure relief valve should be installed in the discharge pipe if there is any possibility the pump may operate against a closed valve in the discharge line. Circulation through the pump is required to ensure adequate cooling and lubrication of the pump.

Minimum Pumping Rates:

TP32,TP40,TP50.....	.8 GPM
TP80	.12 GPM
TP100	20 GPM

The bypass should be routed back to a heat dissipating source or to drain, depending on the liquid being pumped and local codes.

2.3 Installing the Pump

2.3.1 Pump Location

The pump should be installed in a dry, well-ventilated area which is not subject to freezing or large variations in temperature.

The pump should never be mounted within six inches of any obstruction or hot surface.

Pumps to be installed outdoors or in a dusty environment should be ordered with a totally-enclosed-fan-cooled motor (TEFC) attached to prevent motor failure.

2.3.2 Position in Piping System

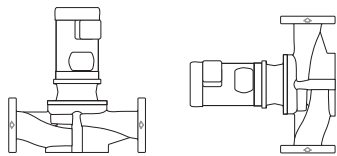
Do not mount the pump at the highest or lowest point in the piping system.

If the pump is installed at the highest point in the piping system, it may experience reduced performance and increased noise due to air trapped in the pump.

If the pump is located at the lowest point in the piping system, the dirt and sediment in the system may collect inside the pump, causing premature wear to the shaft seal.

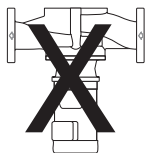
2.3.3 Proper Orientation

VersaFlo TP pumps can be mounted either vertically or horizontally, and all positions in between. **However, the motor shaft must never fall below the horizontal plane.**



Recommended

DO NOT mount motor with shaft below horizontal plane



2.3.4 Direction of Flow for Specific Applications

Arrows on the flanges of the pump volute show the flow direction of water through the pump.

Pumps used to circulate domestic water should ALWAYS be installed in a vertical section of the circulating pipe and pump upwards, and an effective air vent should be used in the same vertical section of pipe.

If the pump must be installed in a vertical pipe pumping down, an air vent should be installed at the highest point before the pump.

2.3.5 Suggested Accessories

Isolation valves — should be installed on each side of the pump to avoid having to drain the system if the pump needs to be cleaned or repaired.

Check valve — should be installed in the discharge pipe.

Plugged tee or capped pipe — should be installed in the suction line to fill the pump and pipe before start-up, especially if the system is not pressurized.

Vibration isolators — should be used in noise-sensitive areas to prevent vibration from being transmitted to the structure.

Relief valve of bypass line — should be installed to allow sufficient water to circulate through the pump to provide adequate cooling and lubrication of the pump's bearings and seals.

2.4 Electrical Hookup

Turn the incoming POWER OFF and make the proper electrical connections according to the diagram on the motor and the latest edition of the National Electrical Code.

Do not start the pump — even to check the direction of rotation — until it has been filled with water. The pump may be seriously damaged if it is run dry.

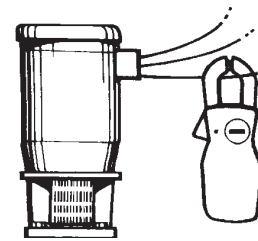
3. Starting the Pump the First Time

3.1 Prime the Pump

3.1.1. In Closed/Open System Where Water Source is Above the Pump

1. Close the pump isolation valves and open the air vent screw.
2. Gradually open the suction isolation valve until a steady stream of airless water runs out the air vent hole.

Fig. 7



1. Burned contacts on motor starter.
2. Loose terminals in starter/terminal box or possible wire defect.
3. Too high or too low supply voltage.
4. Motor windings are shorted or grounded. Check winding and insulation resistances.
5. Pump is damaged causing a motor overload.

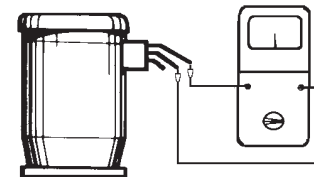
5.1.3 Winding Resistance

5.1.3.1 How to Measure

Turn off power and disconnect the supply power leads in the pump terminal box. Using an ohmmeter, set the scale selector to R x 1 and zero adjust the meter by touching the two ohmmeter leads together.

Touch the leads of the ohmmeter to two motor leads.

Fig. 8



Single phase motors - touching the leads of the ohmmeter to the two outgoing "hot" motor leads (either a single motor lead or combination of leads joined together) will measure the main winding's resistance.

Three phase motors - touching the leads of the ohmmeter to any two hot leads will measure that winding's resistance. Repeat for all three possible lead combinations (L₁ and L₂, L₂ and L₃, L₁ and L₃).

5.1.3.2 Evaluation

If all ohm values are normal, the motor windings are neither shorted nor open.

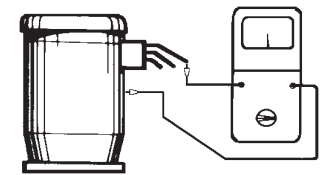
If any one ohm value is less than normal (-25%), that motor winding may be starting too short. If any one ohm value is greater than normal (+25%), the winding may be starting too open. If some values are high and some are low, the leads may be connected incorrectly, or they may have a break in the insulating jacket.

5.1.4 Insulation Resistance (Lead to Ground)

5.1.4.1 How to Measure

Turn off power and disconnect the supply power leads in the pump terminal box. Using an ohmmeter, set the scale selector to R x 100 and zero adjust the meter by touching the two ohmmeter leads together. Touch one ohmmeter lead to a motor lead and one to ground. Repeat for each lead.

Fig. 9



5.1.4.2 Evaluation

The resistance values for new motors must exceed 1,000,000 ohms. If they do not, replace the motor.

4.1.8 Service Conditions

Severity of Service	Ambient Temperature (maximum)	Atmospheric Contamination	Grease Interval (hrs.)	Approved Types of Grease
Standard	104°F (40°C)	Clean, little corrosion	5500	Shell Dolium R
Severe	122°F (50°C)	Moderate dirt, corrosion	2750	Chevron SR#2
Extreme	>122°F (50°C) or class H ins.	Severe dirt, abrasive dust, corrosion	550	Or compatible equivalent grease

If the pump fails to operate or there is a loss of performance, refer to the Troubleshooting section on pages 11 through 14.

4.1.9 Rapid Cycling

Pump cycling should be monitored to make sure the pump is not starting more than 20 times per hour. If it is, premature motor failure is quite likely, due to the increased heat build-up in the motor. Make any adjustments to controls necessary to reduce the frequency of stops and starts.

4.1.10 Freeze Protection

If the pump is installed in an area where freezing could occur, the pump and system should be drained during freezing temperatures to avoid damage.

To drain the pump, close both isolation valves and loosen the suction and discharge flanges. Allow water to flow out of the pump before reconnecting the pump to the flanges. Do not tighten the flanges completely until the pump is ready to be used again.

5. Troubleshooting

5.1 Preliminary Checks

5.1.1 Supply Voltage

5.1.1.1 How to Measure

Use a volt meter, (set to the proper scale) measure the voltage at the pump terminal box or starter.

On single-phase units, measure between power leads L1 and L2 (or L1 and N for 115 volt units). On three-phase units, measure between:

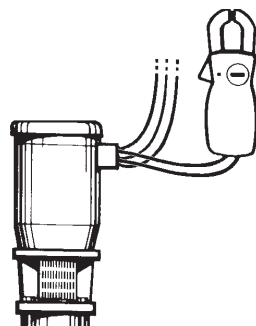
- Power leads L1 and L2
- Power leads L2 and L3
- Power leads L3 and L1

Evaluation

When the motor is under load, the voltage should be within $\pm 10\%$ of the nameplate voltage. Larger voltage variation may cause winding damage and indicate a poor electrical supply. The pump should not be operated until these variations have been corrected.

If the voltage constantly remains high or low, the motor should be changed to the correct supply voltage.

Fig. 6



5.1.2 Current Measurement

5.1.2.1 How to Measure

Use an ammeter, (set on the proper scale) to measure the current on each power lead at the terminal box or starter.

Current should be measured when the pump is operating at constant discharge pressure.

5.1.2.2 Evaluation

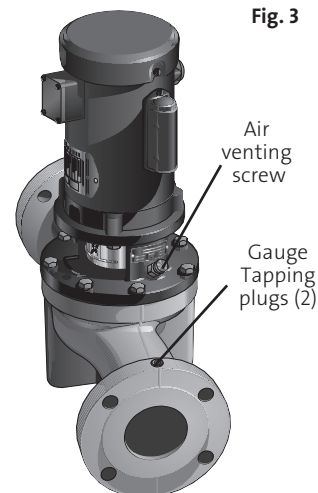
If the amp draw exceeds the listed service factor amps (SFA) or if the current imbalance is greater than 5% between each leg on three-phase units, check the following:

3. Tighten the air vent screw and completely open the isolation valves.

3.1.2 In Open Systems

1. The suction pipe and pump must be filled and vented of air before starting the pump.
2. Close the discharge side isolation valve and open the air vent screw and suction valve.
3. Fill the suction line through the plugged tee or capped pipe (if one is installed). If not possible, remove one of the gauge tapping plugs in the pump flanges and pour water into the hole using a funnel or hose with an adapter.

Fig. 3



All air in the pump and suction line must be purged before starting the pump.

3.2 Check the Direction of Rotation

- a. Switch the POWER OFF.
- b. Check to make sure the pump has been filled and vented.
- c. Remove the coupling guard and rotate the pump shaft to be certain it turns freely. Replace the coupling guard.
- d. Verify that the electrical connections are in accordance with the wiring diagram on the motor.
- e. Switch the power on and observe the direction of rotation.



When viewed from the motor end, the pump should rotate counter-clockwise.

- f. To reverse the direction of rotation, TURN OFF the power supply and complete the following which applies.
 - On three-phase motors, interchange any two power leads at the load side of the starter. On single-phase motors, refer to the connection diagram on the motor nameplate. Change the wiring as required.
- g. TURN ON the power and again check for proper motor rotation.

3.3 Starting and Adjusting

- a. Make sure that:
 - The pump has been primed.
 - The rotation is counter-clockwise when viewed from the motor end.
 - The piping connections are tight and adequately supported.
- b. Open the suction line valve completely (if one is installed).
- c. Close the isolation valve in the discharge pipe. It should be opened gradually after the pump is turned on. Opening the valve too fast may result in water hammer in the discharge pipe.
- d. Start the pump.
- e. Gradually open the isolation valve in the discharge piping as explained in step c. Open the valve completely.
- f. Check the voltage and amperage at the motor and record them. Adjust the motor overloads if required.
- g. If pressure gauges have been installed, check and record the values as the pump operates.
- h. Check all controls for proper operation. If the pump is controlled by a pressure switch, check and adjust the cut-in and cut-out pressures. If low-water level controls are used, be sure the low-level switch is properly adjusted so the pump cannot run if the pump breaks suction.

4. Maintenance

4.1 Servicing the Pump Head

4.1.1 Step 1: Remove the Pump Head

1. Turn OFF the power to the motor.
2. Close any isolation valves on either side of the pump.

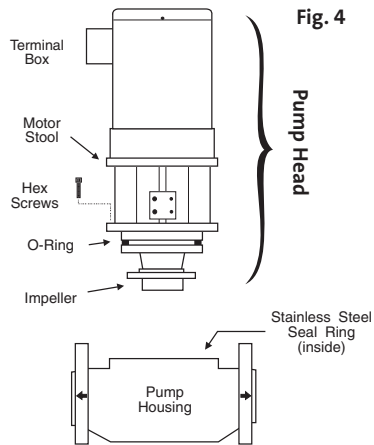


Fig. 4

Pump Head

3. Disconnect the electrical leads and conduit from the terminal box.
4. Loosen and remove the hex bolts connecting the pump head assembly to the pump housing. **Note the position of the motor terminal box relative to the pump housing.**
5. Remove the pump head assembly from the pump housing.
6. Clean the machined surfaces in the pump housing.
7. Inspect the pump housing and stainless steel ring for any damage. Check to be sure the seal ring is mounted securely in the pump housing.
8. Repair or replace parts as needed.

4.1.1.1 Assembly

With the motor/motor stool assembly upside down as shown (fig. 5)

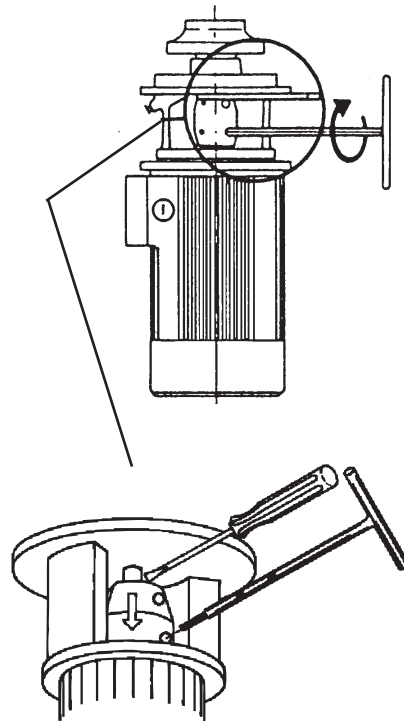
1. Carefully pass the shaft with the rotating shaft seal and impeller through the shaft hole in the motor stool (the seal rings must not be exposed to blows or knocks).
2. Fit the shaft pin in the shaft pin hole.
3. Fit the coupling halves and the coupling allen bolts loosely to the pump and motor shafts so that the gaps on both sides of the coupling halves are even.
4. Insert a screwdriver above the coupling, push the pump shaft towards the motor as far as possible. The pump and motor shaft should touch each other. Tighten coupling allen bolts to the following specifications:

M6 **9.6 ft lbs**

M8 **22.6 ft lbs**

5. Clean the recess of the pump housing/ motor stool lubricate o-ring with soapy water if necessary.
6. Fit the pump head in the pump housing with the terminal box in the required position, be careful to align impeller with neck ring.
7. Replace the motor stool bolts and tighten to the following specifications.
M8 **18.4 ft lbs**
M10 **34.7 ft lbs**
8. Check the shaft for free rotation and replace the coupling guards.
9. The pump is now completely assembled.

Fig. 5



4.1.2 Step 2: Re-Install the Pump Head

1. Lubricate the O-ring with soapy water.
2. With the motor terminal box in the desired position, carefully place the pump head assembly into the pump housing. Be careful not to damage the impeller or mating seal ring. Once the pump head O-ring is engaged with the

pump housing, do not attempt to rotate the pump head, since doing so may damage the O-ring.

3. Make sure the pump head assembly is properly seated on the pump housing. DO NOT force the two together.
4. Tighten two of the hex bolts opposite each other until the pump head is secure to the pump housing.
5. Check to make sure the motor shaft turns freely.
6. Insert and tighten the rest of the hex bolts evenly to secure the pump head assembly.

Hex Bolt	Torque
13 mm	19 ft lbs
17 mm	35 ft lbs

4.1.3 Motor Replacement

If the motor is damaged due to bearing failure, or electrical failure, the following instructions detail how to remove the motor for replacement. It must be emphasized that motors used on VersaFlo TP pumps are specifically selected to our rigid specifications.

Replacement motors must be of the same NEMA frame size, should be equipped with the same or better bearings and have the same service factor. Failure to follow these recommendations may result in premature motor failure.

4.1.3.1 Disassembly

1. Remove the coupling guard screens.
2. Using the proper metric allen wrench, loosen the four cap screws in the coupling, fully remove coupling halves.
3. With the correct size wrench, loosen and remove the four bolts which hold the motor to the discharge section of the pump end.
4. Lift the motor straight up until the shaft is free from the coupling.

4.1.4 Pump Lubrication

Grundfos VersaFlo TP in-line centrifugal pumps installed in accordance with these instructions and sized for correct performance will operate efficiently and provide years of service.

The pumps are lubricated by the fluid they pump, and do not require any additional lubrication. **However, this also means the pump should never be operated for any prolonged periods of time without fluid**

flowing through the pump. The motors will require periodic lubrication as noted in the following paragraphs.

4.1.5 Motor Lubrication

Electric motors are prelubricated at the factory and do not require additional lubrication at start-up. Motors without external grease fittings have sealed bearings that cannot be relubricated. Motors with grease fittings should only be lubricated with approved types of grease.

Do not over grease the bearings. Over greasing will cause increased bearing heat and can result in bearing/motor failure. Do not mix petroleum grease and silicon grease in motor bearings.

Bearing Grease will lose its lubricating ability over time, not suddenly. The lubricating ability of the grease (over time) depends primarily on the type of grease, the size of the bearings, the speed at which the bearings operate and the severity of the operating conditions.

Good results can be obtained if the following recommendations are used in your maintenance program.

4.1.6 Lubrication Schedule

For motor frame sizes smaller than 210TC, add 0.3 oz. (8.4g) or 0.6 in. (2 tsp.) at the intervals listed above.

4.1.7 Periodic Safety Checks

At regular intervals depending on the conditions and time of operation, the following checks should be made:

1. Pump meets required performance and is operating smoothly and quietly.
2. There are no leaks, particularly at the shaft seal.
3. The motor is not overheating.
4. Remove and clean all strainers or filters in the system.
5. Verify the tripping of the motor overload protection.
6. Check the operation of all controls. Check unit control cycling twice and adjust if necessary.
7. If the pump is not operated for unusually long periods, the unit should be maintained in accordance with these instructions. In addition, if the pump is not drained, the pump shaft should be manually rotated or run for short periods of time at monthly intervals.