

Please read and save this Repair Parts Manual. Read this manual and the General Operating Instructions carefully before attempting to assemble, install, operate or maintain the product described. Protect yourself and others by observing all safety information. The Safety Instructions are contained in the General Operating Instructions. Failure to comply with the safety instructions accompanying this product could result in personal injury and/or property damage! Retain instructions for future reference.

# Electric Motor-Driven Submersible Pumps

Refer to Specifications Information and Repair Parts Manual for product specific information

## Safety Guidelines

**⚠ DANGER** Failure to follow any warnings! cautions can result in personal injury, pump damage, and/or property damage.

This manual contains information that is very important to know and understand. This information is provided for SAFETY and to PREVENT EQUIPMENT PROBLEMS. To help recognize this information, observe the following symbols:

**⚠ DANGER** Danger indicates an imminently hazardous situation which, if not avoided, WILL result in death or serious injury.

**⚠ WARNING** Warning indicates a potentially hazardous situation which, if not avoided, COULD result in death or serious injury.

**⚠ CAUTION** Caution indicates a potentially hazardous situation which, if not avoided, MAY result in minor or moderate injury.

**NOTE:** indicates important information that, if not followed, may cause damage to equipment.

## Unpacking


When unpacking unit, inspect carefully for any damage that may have occurred during transit. Check for loose, missing or damaged

parts. (See "Repair Parts Illustration" and "Repair Parts List" sections.) Do not attempt to assemble or operate pump if any parts are missing or damaged. Determine that all parts are properly installed.

## General Safety Information

1. Know pump application, limitations, and potential hazards.

**⚠ WARNING** Pump should only be used with liquids compatible with pump component materials.

 Do not use to pump flammable or explosive fluids such as gasoline, fuel oil, kerosene, etc. Do not use in flammable and/or explosive atmospheres.

When pumping hazardous or dangerous materials, use only in room or area designated for that purpose. For your protection, always wear proper clothing, eye protection, etc. in case of any malfunction. For proper handling techniques and cautions, contact your chemical supplier, insurance company and local agencies (fire dept., etc.). Failure to comply with this warning could result in personal injury and/or property damage.

2. Make certain that power source conforms to requirements of your

equipment.

3. Provide adequate protection and guarding around moving parts.
4. Disconnect power before servicing. If power disconnect is out of sight, lock in open position and tag it to prevent unexpected application of power. Failure to do so could result in fatal electric shock!
5. Release all pressure within system before servicing any component.
6. Drain liquids from system before servicing.
7. Secure discharge line before starting pump. An unsecured discharge line will whip, possibly causing personal injury and/or property damage.
8. Check hoses for weak or worn condition before each use. Make certain that all connections are secure.
9. Periodically inspect pump and system components. Perform routine maintenance as required (See "Maintenance" section).
10. Provide a means of pressure relief for pumps whose discharge line can be shut off or obstructed.
11. **Personal Safety:**
  - a. Wear safety glasses at all times when working with pumps.

# Electric Motor-Driven Submersible Pumps

## General Safety Information (Cont.)

- b. Wear a face shield and proper apparel when pumping hazardous chemicals.
  - c. Keep work area clean, uncluttered, and properly lighted; replace all unused tools and equipment.
  - d. Keep visitors at a safe distance from work area.
  - e. Make workshop child-proof - with padlocks, master switches, and by removing starter keys.
12. This unit is not intended to be used in showers or saunas.
  13. When wiring an electrically driven pump, follow all electrical and safety codes, as well as most recent United States National Electrical Code (NEC) and Occupational Safety and Health Act (OSHA).

**▲WARNING** *Risk of electric shock!*

14. **THREE-PHASE MOTORS:** These units are for permanent installation using a power supply with a ground. To reduce risk of electric shock, electric motor must be adequately grounded to a metal raceway system by using ground wire provided.

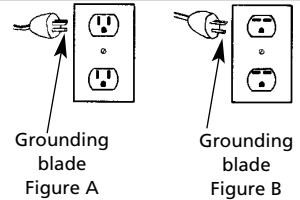
Refer to most recent National Code (NEC) Article 250 (Grounding) for additional information. **ALL WIRING SHOULD BE DONE BY A QUALIFIED ELECTRICIAN.**

On three-phase power, voltages on all three lines should be balanced within 1%. Unbalanced voltages cause motor overheating and poor performance.

**▲WARNING** *Risk of electric shock! Never connect green (or green and yellow) wire to a live terminal!*

### 15. SINGLE PHASE

**MOTORS:** These units can be wired for either portability, with flexible 3-wire cord, or permanent installation using a supply with a ground. To reduce risk of electric shock, motor must be securely and adequately grounded! This can be accomplished by either 1) inserting plug (portable) directly into a properly installed and grounded 3-prong grounding type receptacle (as shown in Figure A for 110-120 volt, or Figure B for 220-240 volt); 2) permanently wiring unit with a grounded, metal raceway system; 3) Other suitable means. The green (or green and yellow) conductor in cord is ground- ing wire.



**Figure 1 - Grounding Methods**

Where a 2-prong wall receptacle is encountered, it must be replaced with a properly grounded 3-prong receptacle installed in accordance with National Code, local codes and ordinances. To ensure a proper ground, grounding means must be tested by a qualified electrician.

16. Use only 3-wire extension cords that have 3-prong grounding type plugs and 3-pole receptacles that accept equipment plug.
17. All wiring should be performed by a qualified electrician.
18. Protect cord from sharp objects, hot surfaces, oil, and chemicals. Avoid kinking cord. Replace or repair damaged or worn cords immediately.
19. Use wire of adequate size to minimize voltage drop at motor.
20. Disconnect power before servicing a motor or its load. If power disconnect is out of sight, lock it in open position and tag it

# Electric Motor-Driven Submersible Pumps

## General Safety Information (Cont.)

to prevent unexpected application of power.

**⚠ WARNING** *Do not handle a pump or pump motor with wet hands or when standing on a wet or damp surface, or in water.*

**⚠ WARNING** *All single phase pump motors are equipped with an automatic resetting thermal protector and may restart unexpectedly. Protector tripping is an indication of motor overloading as a result of operating pump at low heads (low discharge restriction), excessively high or low voltage, inadequate wiring, incorrect motor connections, or a defective motor or pump.*

21. Do not use power cord to lift or support weight of pump. Always use handle provided to lift pump.

## Preinstallation

### SUMP PITS

A pit may be constructed of tile, concrete, steel or plastic. Check local codes for approved materials. Pit should have a hard bottom. A patio block will form a solid foundation for pump and still allow seepage water to enter pit from below. A pit cover will prevent debris from possibly clogging or damaging pump, it will also prevent persons from falling

in and causing injury.

If you are installing a new sump pit:

1. Locate pump approximately 6" from basement wall in lowest point of basement floor.
2. With chalk, mark out diameter on floor.
3. Cut through floor with masonry drill or other concrete cutting tool and excavate below floor to required depth.
4. Level bottom and set sump tile in place. Tie in any sub-floor drains. Backfill and mortar tile or sump pit in place. Top should be flush with floor for surface drainage.
5. It is recommended that bottom of tile be provided with a concrete base. However, a concrete block or bricks may be used to provide a support for pump.

## Installation

**⚠ WARNING** *Pumps should not be used in flammable or explosive atmospheres. In order to safely use this product, familiarize yourself with this pump and also with liquid (chemical, etc.) that is going to be pumped through unit. This pump is not suitable for many liquids.*

*For installations where property damage might result from an inoperative or leaking pump due to power out-*

*ages, discharge line blockage, or any other reason, a backup system(s) should be used.*

*Failure to follow any warning can result in personal injury and/or property damage.*

## LOCATION

- Use only UL listed Hazardous Location motors for service in Hazardous Locations as defined in Article 500 of NEC.
  - Temperature around motor should not exceed 104°F (40°C). Minimum temperature is -20°F (-29°C).
1. Pump should be located and should rest on a level solid foundation. Do not suspend pump by means of discharge pipe or power cord. Keep pump inlet clear. Do not install pump directly on clay, earth or sand surfaces. Clean tank/sump of small stones, gravel, sand, dirt, silt, etc., which could clog or damage pump, or seal, and cause pump failure. Keep pump inlet clear.
  2. Locate pump in center of pit so that pump housing and any float control (where applicable) will not come in contact with side of pit and create operational problems.
  3. Discharge piping should be as short as possible to reduce pipe friction losses. It is recommended

# Electric Motor-Driven Submersible Pumps

## Installation (Cont.)

that discharge pipe diameter should be equal to or larger than discharge size of pump. Smaller pipe diameters will restrict capacity of pump and reduce performance. These pumps are provided with an NPT discharge connection. Assure airtight pipe connections with use of a pipe joint sealant.

4. It is recommended that a nipple be installed in discharge outlet first and balance of piping attached to nipple. Install a union in discharge line, preferably just above top of pump, to allow easy removal of pump for cleaning or repair. To reduce motor noise and vibration transmission to surrounding structure, a short length of rubber hose can be connected into discharge line, using suitable clamps.
5. In installations where piping is long, vertical discharge is above 7 or 8 feet, or a small tank/sump has been provided, use of a check valve is recommended to prevent backflow of water into tank/sump. Where a check valve is used, drill a relief hole (1/8" or 3/16" diameter) in discharge pipe. This hole should be located below floor line between

pump discharge and check valve. Unless such a relief hole is provided, pump could "air lock" and will not pump water even though it will run. Do not bend, kink or cut power cord.

6. Support piping independently of pump to avoid universal or excessive stresses on pump casing, which would cause impeller misalignment and possible pump failure.
7. **WIRING:** For proper connections, refer to diagram located on nameplate or inside terminal of motor. Make sure connections are correct for voltage being supplied to motor.

Whenever possible, pump should be powered from a separate branch circuit of adequate capacity to keep voltage drop to a minimum during starting and running. For longer runs, increase wire size in accordance with Wire Selection Guide.

Make sure unit is properly grounded. A motor to be used with single-phase power cannot be used with three-phase power and vice versa. If unsure about above information or wiring diagrams, consult an electrician familiar with motor wiring.

**⚠ WARNING** *A wrong connection can burn out pump motor, cause an short, or produce an shock. Failure to follow above warning can result in property damage and/or personal injury. Always wire motor with a three-wire system, ensuring that a ground wire runs to a good ground such as a grounded water system or conduit. Also, ensure that a good ground is provided at supply end of line.*

8. Do not allow cord to interfere with float control motion (where applicable) or to drape over pump motor. With plastic zip ties or clamps, secure cord to discharge pipe. This will provide protection for cord and make a neat installation.
9. Install any auxiliary components (e.g. pressure switch, float).
10. After all piping and controls have been installed, run water into sump/tank to test pump (see "Operation" section).
11. Unit is ready for operation.

## Operation

**⚠ CAUTION** *Do not run pump dry as permanent damage to mechanical seal will result.*

1. Activate unit.

**IMPORTANT:** Proper Rotation: Power supply should be applied momentar-

# Electric Motor-Driven Submersible Pumps

## Operation (Cont.)

ily to pump at first and direction of rotation checked. When viewing bottom of pump, motor shaft (impeller) should be rotating counterclockwise. If it is not, disconnect power and re-check wiring to motor (see "Installation" section).

To change rotation on three-phase models, interchange any two incoming line (power) leads. Other models, consult driver information that came with driver.

**⚠ CAUTION** *Wrong rotation will give low performance, low head, and could damage unit and/or injure personnel.*

**NOTE:** Never shut off discharge flow while pump is operating.

2. On initial start-up (after 15 minutes running time), check power consumption

to be sure motor is not overloaded.

3. If motor is overloaded, install a valve on discharge to increase back pressure. Close valve until pump motor is below full nameplate, or within Service Factor (SF) amps.

## Maintenance

**⚠ WARNING** *Make certain that unit is disconnected from power source before attempting to service or remove any components!*

**NOTE:** Always flush pump thoroughly after use or if unit is not going to be used for any prolonged length of time to prevent crystallization and/or damage to seal and pump.

## ROUTINE

1. Pump should be drained when subjected to freezing temperatures.

2. Clean strainer at regular intervals.
3. Periodically check to see if connections are tight.
4. Pump should be checked daily, weekly, monthly, etc. for proper operation. If anything has changed since unit was new, unit should be removed and repaired or replaced. Only qualified electricians or service personnel should attempt to repair this unit. Improper repair and/or assembly can cause an electrical shock hazard.

# Electric Motor-Driven Submersible Pumps

## Troubleshooting Chart

Symptom	Possible Cause(s)	Corrective Action
Motor will not start or run	<ol style="list-style-type: none"> <li>1. Improperly wired</li> <li>2. Blown fuse or open circuit breaker</li> <li>3. Loose or broken wiring</li> <li>4. Stone or foreign object lodged in impeller</li> <li>5. Motor shorted out</li> <li>6. Thermal overload has opened circuit</li> <li>7. Voltage too low at motor terminals due to line drop</li> <li>8. Defective float switch (where applicable)</li> <li>9. Float jammed (where applicable)</li> </ol>	<ol style="list-style-type: none"> <li>1. Check wiring diagram on motor</li> <li>2. Replace fuse or close circuit breaker after reason for overload has been determined and corrected</li> <li>3. Tighten connections, replace broken wiring</li> <li>4. Disassemble pump and remove foreign object</li> <li>5. Replace</li> <li>6. Allow unit to cool. Restart after reason for overload has been determined</li> <li>7. Consult local power company. Increase wire size. Check for poor connections</li> <li>8. Replace switch</li> <li>9. Reposition pump away from sides</li> </ol>
Motor runs slowly; will not get up to speed	<ol style="list-style-type: none"> <li>1. Motor wired improperly</li> <li>2. Capacitor burned out (single-phase units only)</li> <li>3. Voltage too low at motor terminals</li> </ol>	<ol style="list-style-type: none"> <li>1. Check and recheck wiring diagram on motor. Make internal wiring changes in wiring compartment</li> <li>2. Replace capacitor</li> <li>3. Increase wire size. Check for poor connections. Check for voltage unbalance (3-phase)</li> </ol>
Motor overheats while running under load	<ol style="list-style-type: none"> <li>1. Unbalanced supply voltage</li> <li>2. Faulty connection</li> <li>3. High or low voltage</li> </ol>	<ol style="list-style-type: none"> <li>1. Check for faulty connections. Voltage on all three lines should be balanced within 1%. Excessive single phase loads</li> <li>2. Clean, tighten, or replace</li> <li>3. Check voltage at motor, should not be more than 10% above or below rated</li> </ol>
Little or no discharge	<ol style="list-style-type: none"> <li>1. Total head too high</li> <li>2. Impeller plugged</li> <li>3. Rotation incorrect</li> <li>4. Impeller damaged</li> <li>5. Discharge piping too small</li> <li>6. Motor wired incorrectly</li> </ol>	<ol style="list-style-type: none"> <li>1. Shorten discharge head</li> <li>2. Disassemble pump and clean impeller</li> <li>3. Correct (See wiring diagram on motor)</li> <li>4. Replace</li> <li>5. Match to discharge outlet size on pump</li> <li>6. Check wiring diagram</li> </ol>

# Electric Motor-Driven Submersible Pumps

## Troubleshooting Chart (Continued)

Symptom	Possible Cause(s)	Corrective Action
Little or no discharge (cont.)	7. Casing gasket leaking	7. Replace
	8. Discharge line valve closed	8. Open
	9. Strainer clogged	9. Clean debris from strainer and tank/sump
	10. Pump air-locked	10. Drill 1/8" hole in discharge piping between pump and check valve
Pump vibrates and/or makes excessive noise	1. Mounting plate or foundation not rigid enough	1. Reinforce
	2. Foreign material in pump	2. Disassemble pump and clean
	3. Impeller damaged	3. Replace
	4. Worn motor bearings	4. Replace
	5. Cavitation present	6. Install gate valve on discharge side of pump and reduce flow as necessary to match suction conditions available
Pump won't shut off	1. Defective switch	1. Replace switch
	2. Clogged discharge	2. Remove pump and clean pump and piping
	3. Float jammed (where applicable)	3. Reposition pump away from sides
Pump starts and stops too often	1. Backflow of water from piping	1. Install check-valve
	2. Very low discharge head or pit too small	2. Increase discharge head by restricting discharge with use of gate valve (1/2 open), or make pit larger

