

INSTALLATION AND OPERATING INSTRUCTIONS

INSTALLATION RECORD

Date of Installation: _____
 Model Number: _____
 Serial Number: _____
 Depth of the Well: _____
 Depth of Water: _____
 Pump Setting: _____
 Wire Size: _____
 Riser Pipe Size: _____

MOTOR RECORD

Model Number: _____
 Serial Number: _____
 H.P.: _____
 Volts: _____
 Amp: _____



CAREFULLY STORE THIS MANUAL.
 These Instructions must be delivered with the pump to the operator.



Read this manual carefully. Failure to follow these instructions and comply with all applicable codes may cause serious body injury and/or property damage

I. INSTALLATION & OPERATING INSTRUCTIONS

It is important that all submersible pumps be installed by experienced persons and that all electrical connections comply with the relevant electrical supply authority requirements.



The electrical connections and checks must be made by a qualified electrician and comply with applicable local standards.

These instructions are provided for guidance only, and assume a familiarity with submersible pump installation and commissioning procedures.

II. IMPORTANT!!!

While this pump will handle moderate amounts of sand and abrasive materials, it must be understood that the life of the

pump will be shortened. Therefore, do not install this pump in wells which continue to produce sand. The motor has been completely prefilled at the factory and requires no further attention.

III. INSPECT THE EQUIPMENT

Before going on the job, open all packages and check all equipment to be certain everything is included and that no parts have been damaged during shipment. The pump should be checked for visible damage and nameplate inspected to be sure they are the correct voltage and phase.



Ensure the motor voltage and phase matches the supply voltages & phase.

IV. TEMPERATURES

The submersible motors on all PEARL units are constructed so that they will not be damaged by exposure to temperatures below freezing. It may happen that in some cases the solution in the motor may be frozen in transit to the installation site. If so, the motor should be warmed sufficiently to defrost it before installing in the well. If temperatures go higher than 105°F, please consult the PD Water Systems.

V. WELL CONDITIONS

To guard against installing a pump in aggressive or abrasive

water, it is suggested that an analysis of the well water be submitted to an authorized testing authority prior to installation of the pump. Damage to the pump or motor caused by abrasive or aggressive water is not covered by the guarantee.

- a) Know the approximate replenishment rate of the well before selecting a pump. Select a pump with a maximum of 10% less discharge than the replenishment rate of the well.
- b) Where wells are sunk into aquifers comprising of sand or fine gravel, it is important that they be adequately screened to prevent the ingress of these materials into the water being pumped. It is also important that the well be cleaned prior to the installation of the pump, and that the pumps must not be used for "bailing" or developing the well.
- c) In the event that the water is entering the well from a level above the pump ("a cascading well"), or where the pump is installed in a large diameter well, or in a river or other open water sources, a sleeve may be required over the pump to ensure that all water being pumped is drawn over the full length of the motor's surface. Minimum water velocity past a motor for adequate cooling should be 0.3 ft/sec @ 70 F water temperature.
- d) To assist in protecting the integrity and quality of your well water supply we suggest a well cap be fitted to the top of your well casing at all times. This may also assist pump installation.
- e) The well casing must be 4" inside diameter or larger to accept the submersible. Do not install pump nearer than 5 feet to bottom of well as warranty applies only when pumping clean well water.

VI. COUPLING THE PUMP WITH THE MOTOR

 **NOTE:** Before coupling pump to motor ensure pump and motor models are as specified.

For ease transportation and to minimize potential transport damage, PEARL 4" submersible deep well pumps are supplied in component form, ie. Motor and liquid end boxed separately. For correct coupling, proceed as follows:

- Remove cable guard after removing the lock screws.
- Insert a screwdriver into the shaft end to ensure the pump is free to rotate. Some small resistance is normal.
- Position the pump and motor so that they are aligned along the same axis.
- Insert the motor shaft into the pump coupling, using the screwdriver to rotate the shaft to align the coupling to the motor shaft.
- On each motor stud fit the four nuts which secure the pump to the motor, tightening them a little at a time in a diagonal sequence.
- Align the motor cable along the pump, then secure the cable guard with the setscrews into the side of the pump.

CAUTION: BE SURE THE MOTOR HP SIZE IS EQUAL TO (OR EXCEEDS) THE MOTOR HP REQUIRED FOR THE PUMP.

 Ensure the motor voltage & phase matches the supply voltages & phase.

VII. INSTALLATION

NOTE: FOR SEALING OF PIPE THREADS ONTO YOUR PEARL SUBMERSIBLE DEEP WELL PUMP USE THREAD TAPE ONLY. DO NOT USE PIPE SEALING COMPOUND AT ALL.

1. DROP PIPE

Galvanized pipe is recommended for suspending metallic fitted submersible pumps into the well. Schedule 40 galvanized pipe is suitable for settings to 600 feet. For deeper settings, use Schedule 40 pipe for the bottom 600 feet and Schedule 80 for the remainder. Take great care to keep pipes clean and free from pebbles, scale and thread chips. Make sound, air tight connections at all fittings.

*Maximum pump pressure is the highest pressure that is available from the pump and is measured at the top of the well.

 All pipe and fittings must be suited to the maximum pressures available from the pump.

The starting torque of the pump motor tends to give a twist which could cause the pump shell to rub against the inside walls of the well casing - especially if rigid PVC or polythene pipe is used. Torque stops can be obtained and installed to dampen this twisting.

2. SAFETY CABLE

As a precautionary measure, a safety line should be connected to all pumps regardless of the type of drop pipe used. This line should be fastened to the pump and at the top of the well casing.

Before fitting the submersible drop cable to the motor, make sure that the cable socket is clean and dry. To facilitate the fitting of the cable, lubricate the rubber parts of the cable plug with non-conducting silicone paste

3. DEPTH OF INSTALLATION

For the maximum allowable submergence consult the motor specifications from the motor supplier. Ensure that the pump is installed at least 10 feet above the bottom of the well, and three (3) feet below the maximum draw down level.

WARNING: If during the initial operation the pump lowers the well water level down to below the suction inlet it will be necessary to lower the pump, where feasible or install a level probe protection device to prevent the pump from running under aerated water conditions.

 **NOTE:** OVER PUMPING OF THE WELL (AERATED WATER) WILL CAUSE DAMAGE TO PUMP AND OR MOTOR NOT COVERED BY GUARANTEE

 Before lowering the pump unit, smooth out any rough spots or sharp edges on the top lip of the well casing to prevent damage to the pump or power cables when lowering the unit into the well.

4. CHECK VALVE

All PEARL submersible deep well pumps are supplied with a check valve, for installations greater than 240 feet head, or when used as a pressure system, it is recommended that an additional check valve be fitted approximately no more than 180 feet vertically above the pump and every 180 feet vertically thereafter. The fitting of this check valve will limit potential water hammer and consequent pump damage.

5. PRESSURE SYSTEM INSTALLATION AND PUMP CONTROLS

PEARL submersible deep well pumps may be used as a pressure system in conjunction with pressure tanks providing a suitable draw off capacity. When selecting a pressure tank, make sure that the rated tank pressure is at least 10% greater than the pump pressure at the well head and the tank draw off capacity is large enough to limit pump starts to an absolute maximum of those listed on the table below.

While small capacity tanks may be used, extreme care must be taken to ensure the pump unit does not 'cycle'. It may be necessary to fit more than one pressure tank to provide the required draw off or to help prevent pump cycling.

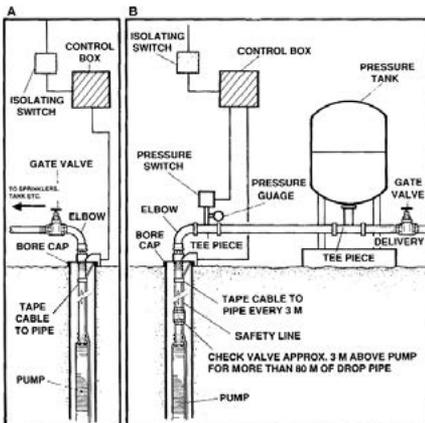
MOTOR RATING	AVERAGE NUMBER OF STARTS PER 24HR DAY	
	SINGLE PHASE	THREE PHASE
HP		
Up to 3/4	300	300
1 to 2	100	300
7 1/2 to 30	50	100
40 and above	-	100

The installation of a 'drilled check valve' to the pressure tank may assist in the prevention of pump 'cycling' problems. For further information on these contact your PEARL Dealer.

NOTE: Any automatic switching of the pump giving excessive starts per hour will shorten the life of the pump and damage caused may affect warranty cover.

6. TYPICAL SUBMERSIBLE INSTALLATION

- A) Pump connected for manual operation.
 B) Pump installed as an automatic pressure system incorporating pressure tank and pressure switch.



WARNING: Failure to use correct starting equipment and overloads may damage your submersible motor. This damage may not be covered by warranty.

Various switching devices and the use of these products is recommended. Alternative systems may be connected directly into the supply line to 240 volt motor control boxes, provided the switching device used has an adequate current rating. If the current rating of the switch is not adequate, a contactor must be wired into the supply and the switching device used to control the contactor's coil. In any case, where a single phase motor has a control (starter) box, no additional switching devices should be wired between the motor and box.

In the case of three phase motors, all switching devices should be wired to the starter's control coil, and under no circumstances they should be used to directly break the supply circuit to the pump.



ALL THREE PHASE MOTORS MUST BE CONNECTED WITH APPROVED OVERLOADS.

VIII. ELECTRICAL CONNECTION

All wiring should conform to the requirements of local and national electrical codes. If in doubt, contact your electricity supply authority. Cables should be insulated and sheath type, rated for continuous immersion in water.



POWER CONNECTIONS AND WIRING MUST BE CARRIED OUT BY AN AUTHORIZED ELECTRICIAN.

For full motor connection details consult the relevant motor installation & operating instructions.

WARNINGS:

- Before installing or servicing your pump check to ensure that electrical power is turned off and disconnected.
- Single phase motors with in-built thermal overloads may restart automatically and unexpectedly. Ensure that warning A. above is observed at all times.

1. MOTOR PROTECTION

All electrical connections should be checked before the pump is installed in the well. If possible, it is a good practice to run the pump briefly in a container of water (water level must be well over the suction inlet screen) to check on operation before installation in the well. The drop cable should be secured to the drop pipe at ten (10) feet intervals using waterproof plastic tape.

The normal thermal overload relays or heaters used for standard motors will not trip fast enough to protect a submersible motor, and special extra quick-trip protection must be used.

For single-phase motors, this protection is provided by the specially designed and selected protection in the control box.

For three-phase submersible motors, protection must be provided by the thermal overload relays in the magnetic motor starter.

WARRANTY OF THREE-PHASE SUBMERSIBLE MOTORS IS VOID IF PROPER QUICK-TRIP PROTECTORS ARE NOT USED ON ALL THREE LINES.

FOR TWO-WIRE MOTORS: A separate fused disconnect switch with properly sized fuses must be provided between the power supply and the pressure switch. Always run a separate circuit from the entrance panel to a fused disconnect switch. NEVER connect a submersible to a plug outlet. Select the correct size cable from a authorized Cable Selection Chart.

2. DIRECTION OF ROTATION - THREE PHASE MOTORS ONLY



Before finalizing wiring connections, check that motor rotates in a counter-clockwise direction (looking into the discharge outlet). Three-phase motors will operate in reverse rotation if improperly connected to the power supply or magnetic starter

A three-phase pump motor unit running backwards will develop about 50% of its rated output. To check rotation, momentarily touch the three motor leads to the magnetic starter before installation. The motor should “kick” in a clockwise direction. Three-phase motors may be reversed by interchanging any two of the three motor leads at the magnetic starter.



The dry rotation should not exceed a period of one to two seconds, otherwise seizing may occur due to inadequate lubrication.

3. THREE PHASE CONNECTION

Three phase models must be wired with a contactor with approved overloads set correctly. PEARL recommends the use of overloads which also have the ability to detect “single phasing” or “dropped phase”

ATTENTION!

IMPORTANT INFORMATION FOR INSTALLERS OF THIS EQUIPMENT!

This equipment is intended for installation by technically qualified personnel. Failure to install it in compliance with national and local electrical codes may result in electrical shock or fire hazard, unsatisfactory performance, and equipment failure.

4. GROUNDING SINGLE AND THREE PHASE PUMPS

WARNING: Failure to ground electrically operated equipment may result in serious electric shock. Refer to local code requirements.



All pump motors are equipped with a GROUND lead which must be connected to the GROUND of the incoming power supply.

Furthermore, control boxes and starters must also be GROUNDED. If testing is used outside a well, the motor must be connected to the power supply GROUND lead to prevent a lethal shock hazard.



Do not use metal drop pipe as the GROUND return under any circumstances.

5. INITIAL START-UP

Before connecting the pump outlet pipe from the well, a bend and gate valve should be screwed into the top of the well cap.



Never runs this pump without discharge flow for more than a few seconds, as the water will heat and cause damage to the pump or pipe lines not covered by guarantee.

DO NOT LIFT THE PUMP/MOTOR SET BY THE MOTOR LEADS AND NEVER RUN THE PUMP DRY OUT OF WATER AS SUBMERSIBLE CAN BE DAMAGED

If a barrel is available, give the pump a one minute running test before installation. Never start the pump at full flow for the first time. We recommend that the gate valve be only slightly open to start the pump.

Never open the gate valve abruptly, as this may raise sand or silt deposits. For the first ten to twenty minutes of operation, it is suggested to keep the gate valve only slightly open, to maintain a low flow. This low flow will prevent, in the case of excessive sand in the water, the pump seizing. Immediately the pump has been started, catch some of the discharge water in a large container and allow solids to settle out. If little or no sand appears, open the valve one third and pump until the discharge water is clear.

In the event of excessive amounts of sand being pumped the pump should be shut down and the well should be attended to before restarting the pump.

PEARL submersibles pumps are not guaranteed against failure due to pumping sand. Pumping of sand, even small quantities of very fine sand will shorten the effective life of any pump. The pump should be run for a period of at least 30 minutes and then the water level in the well checked to ensure that the water level in the well has not dropped to a dangerously low level. Continuous monitoring of well water level is recommended.

Continuing operation at low water level will cause damage to the pump and motor mechanical parts due to alternating shock pressures on the pump.

When the pump has been connected correctly and it is submerged in the liquid to be pumped, it should be started with the discharge valve closed off to approx. 1/3 of its maximum volume of water. Check the direction of rotation. If there are impurities in the water, the valve should be opened gradually as the water becomes clearer. The pump should not be stopped until the water is completely clean, as otherwise the pump parts and the non-return valve may choke up. As the valve is being opened, the drawdown of the water level should be checked to ensure that the pump always remains submerged.

The dynamic water level should always be above the suction interconnector of the pump.

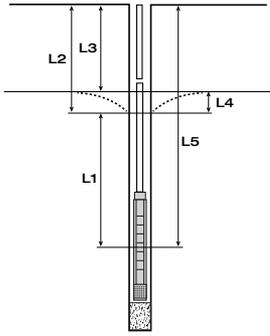


Fig. 1 Comparison of various water levels

- L1: Minimum installation depth below dynamic water level. Minimum 1 metre is recommended.
- L2: Depth to dynamic water level.
- L3: Depth to static water level.
- L4: Drawdown. This is the difference between the dynamic and the static water levels.
- L5: Installation depth.

If the pump can pump more than yielded by the well, it is recommended to fit the dry-running protection. If no water level electrodes or level switches are installed, the water level may be drawn down to the suction interconnector of the pump and the pump will then draw in air.

 Long time operation with water containing air may damage the pump and cause insufficient cooling of the motor.

IX. DELIVERY AND STORAGE

1. DELIVERY

PEARL submersible pumps are supplied from the factory in proper packing in which they should remain until they are to be installed. During unpacking and prior to installation, care must be taken when handling the pump to ensure that misalignment does not occur due to bending.

 The pumps should remain in the packing until they are placed in vertical position during installation.

 The loose data plate supplied with the pump should be fixed close to the installation site.

The pump should not be exposed to unnecessary impact and shocks.

2. STORAGE AND HANDLING

The pump should not be exposed to direct sunlight. If the pump has been unpacked, it should be stored horizontally, adequately supported, or vertically to prevent misalignment of the pump. Make sure that the pump cannot roll or fall over. During storage, the pump can be supported as shown in fig. 2.

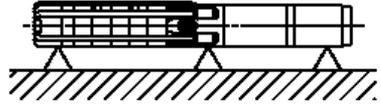


Fig. 2 Pump position during storage

2.1 FROST PROTECTION

If the pump has to be stored after use, it must be stored in a frost-free location, or it must be ensured that the motor liquid is frost-proof.

X. FINAL OPERATION CHECK

Secure all piping to pressure tank and cycle the system to be certain that all controls function correctly. Check out the air pumping equipment and operation of the air volume control on the pressure tank. If used with a "float-type" pressure tank, or bladder tank, precharge the tank with air to about 2 PSIG lower than the switch-on setting. e.g. 28 pounds on a 30-50 # switch setting.

XI. OPERATION AND MAINTAINENCE

 The pump must not be operated with the delivery valve shut off (closed head) for more than a few seconds otherwise the motor will overheat, possibly causing permanent damage, not covered by guarantee

While PEARL submersible pumps do not require regular maintenance, it is a good practice to monitor the conditions and performance of the pump and motor. This diagnosis may be carried out by checking the maximum pressure (shut valve for a very short period) generated by the pump, and by checking the amperage draw of the motor at standard duty flow rate.

Both these figures should be compared to pressures and current draws recorded when the unit was initially installed. Any reduction in pressure may indicate wear in the pump, while any increase in motor current indicates a possible overload condition. Consult the pump service chart for further diagnosis of possible causes.

XII. PUMP SERVICE CHART

The following chart offers a means of diagnosing general pump problems.

PROBLEM	POSSIBLE CAUSES
Overload protector trips	Control box or thermals in the sun or heat source. Incorect thermals or control box fitted. Low line voltage. Phase failure (3 phase only). Faulty motor.
No water delivered	Water level in bore too low. Check valve installed backwards or stuck closed. Inlet creen on pump clogged. Hole in delivery piping below bore top Motor failure. Broken pump shaft or coupling.
Low water delivered	Pump rotating backwards (3 PH only) Water level too low in bore. Discharge piping clogged, corroded or ruptured. Pump installed too low in bore and covered in sad or other solids. Inlet screen partially clogged. Worn pump. Check valve stuck partially closed. Motor related problem.
Pump starts and stops too often	Water logged pressure tank. Pressure switch differential adjustment incorrect. Pressure tank too small. Other control problems (eg. probes too close).
Fuses blow but overload does not trip	Fuses too small. Fuse receptacles dirty or corroded. Loose connection in fuse box. Defective motor starter or control box. Incorrectly grounded motor.
Electric shock from water pipe or electrical components	Incorrectly wired incoming power leads. Ground wire connected to motor control equipment. Defective motor starter or control box. Incorrectly grounded motor.
Pressure gauge fluctuates with flow surges	Water level too low in bore.
Pump and/or motor corrosion due to electrolysis	Pump earthing to ground through poor splice connection or cable chaffing. Unsatisfactory pH levels. Active single wire earth return electrical distribution system.

