Submersible Deep Well Pump

4” B SERIES

INSTALLATION AND OPERATING INSTRUCTIONS

These Instructions must be delivered with the pump to the operator.

WARNING: Failure to follow these instructions and comply with all applicable codes may cause serious bodily injury and/or property damage.

Installation & Operating Instructions

It is important that all submersible deep well 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.

Bore Conditions

1. To guard against installing a pump in aggressive or abrasive water, it is suggested that an analysis of the bore water be submitted to an authorised 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. The water analysis parameters listed below are intended as a guide only as various combinations of the below items and others may act as a corrosive fluid:

   PH - 6 to 8
   Total dissolved solids (PPM) - 1,000 maximum
   Chlorides (PPM) - 500 maximum
   Fe (PPM) - 2 maximum
   $C0_2$ (PPM) - 50 maximum
   O_2 (PPM) - 2 minimum
   Sand content - 25 gr/m_3 maximum

WATER QUALITY: The above guide is NOT an indication of safe drinking water. A water analysis for this purpose should be undertaken.

2. Know the approximate replenishment rate of the bore before selecting a pump. Select a pump with a maximum of 10% less discharge than the replenishment rate of the bore.
3. Where bores 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 bore be cleaned prior to the installation of the pump, and that the pumps must not be used for “bailing” or developing the bore.
4. In the event that the water is entering the bore from a level above the pump (“a cascading bore”), or where the pump is installed in a large diameter bore, or in a river or other open water sources, a shroud 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 0.08m/sec @ 20_oC water temperature.
5. To assist in protecting the integrity and quality of your bore water supply we suggest a bore cap be fitted to the top of your bore casing at all times. This may also assist pump installation.

Coupling the pump with the motor

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

For ease of transportation and to minimise potential transport damage, HIDRAL 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 KW SIZE IS EQUAL TO (OR EXCEEDS) THE MOTOR KW REQUIRED FOR THE PUMP.

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

Installation

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

1. Drop Pipe

Polythene drop pipe may be used, providing the pressures and depths indicated in the tables below are not exceeded. For depths in excess of 120 metres, threaded steel pipe, or suitable alternativke, should be used.

Class 6 (60 metre Head) Pipe

*Max Pump Pressure		Max. Pump Depth	
kPa	PSI	Metres	Feet
0	0	60	200
140	20	45	150
280	40	30	100
415	60	18	60

Class 9 (90 metre Head) Pipe

*Max Pump Pressure		Max. Pump Depth	
kPa	PSI	Metres	Feet
0	0	90	300
140	20	75	250
280	40	70	200
415	60	50	160

Class 12 (120 metre Head) Pipe

*Max Pump Pressure		Max. Pump Depth	
kPa	PSI	Metres	Feet
0	0	120	400
140	20	105	350
280	40	90	300
415	60	80	260

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

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 bore 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 bore casing.

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 one (1) metre, preferably 3 metres above the bottom of the bore, and one (1) metre below the maximum draw down level.

WARNING: If during the initial operation the pump lowers the bore 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 BORE (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 bore casing to prevent damage to the pump or power cables when lowering the unit into the bore.

4. Check Valve

All HIDRAL submersible deep well pumps are supplied with a check valve, and no additional check valves are required for open discharge conditions up to a maximum of 80 metres head. For installations greater than 80 metres head, or when used as a pressure system, it is recommended that an additional check valve be fitted approximately no more than 60 metres vertically above the pump and every 60 metres vertically thereafter. The fitting of this check valve will limit potential water hammer and consequent pump damage.

5. Pressure System Installation and Pump Controls

HIDRAL 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 bore 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	
HP	KW	Single Phase	Three Phase
Up to 3/4	Up to .55	300	300
1 to 5 1/2	.75 to 4.0	100	300
7 1/2 to 30	5.5 to 22	50	100

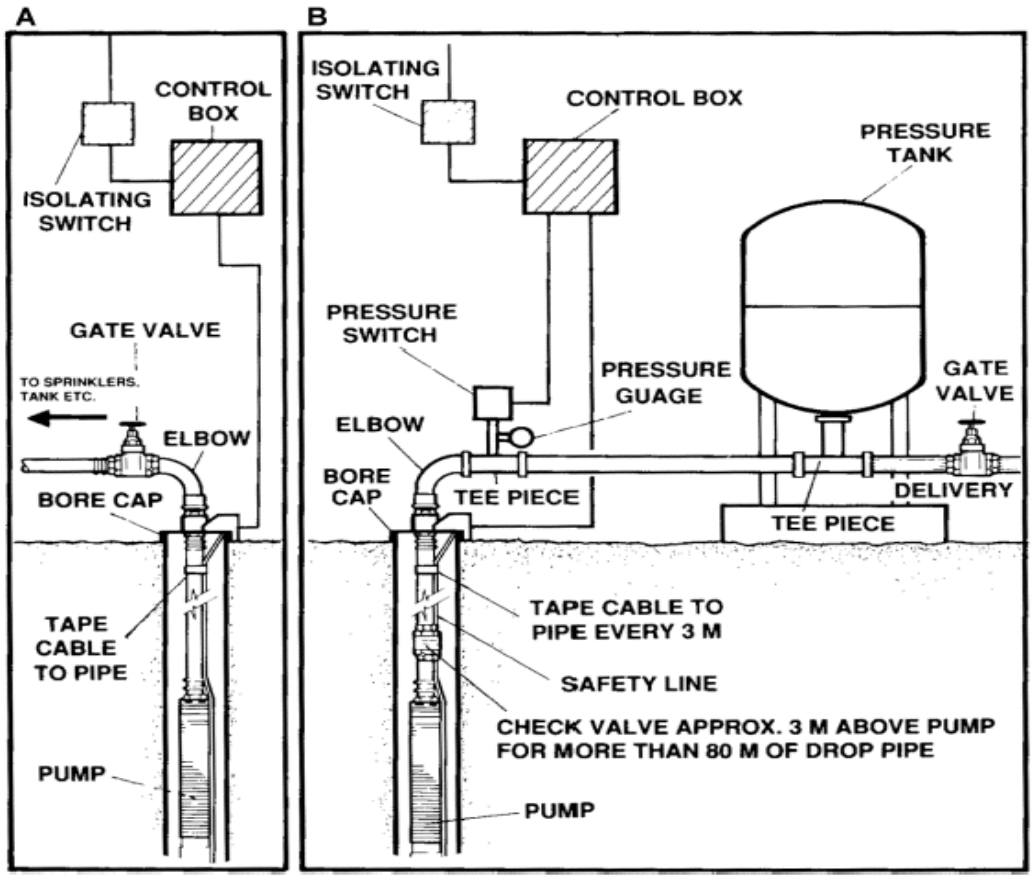
The installation of a 'drilled check valve' to the pressure tank may assist in the prevention of pump 'cycling' problems. For further information on these contact your HIDRAL Dealer.

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

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 on no account should they be used to directly break the supply circuit to the pump.

ALL THREE PHASE MOTORS MUST BE CONNECTED WITH APPROVED OVERLOADS.

6. 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, conforming to AS3100 and rated for continuous immersion in water.

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

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

WARNINGS:

A. BEFORE installing or servicing your pump check to ensure that electrical power is turned off and disconnected.

B. Single phase motors with in-built thermal overloads may restart automatically and unexpectedly. Ensure that warning A. above is observed at all times.

All electrical connections should be checked before the pump is installed in the bore. 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 bore. The drop cable should be secured to the drop pipe at three (3) metre intervals using waterproof plastic tape.

7. Direction of rotation - Three phase motors only

Before finalising wiring connections, check that motor rotates in direction of arrow (clockwise when shaft is viewed from wiring connection end). To alter rotation, change any two power leads at motor terminals.

Any three phase motor connected to a supply line for the first time may rotate in either direction. It is, therefore necessary to find out it the motor is rotating in the correct direction. If the rotation is to be checked on the surface, proceed as follows:

- Pour clean water into the discharge by holding the non-return valve open so that the shaft bearings and

impellers become wet.

- Turn the power on and off for a very short time and check the shaft rotation.
- The correct rotation is anti-clockwise by looking down from the discharge.

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

- To correct a reversed rotation, change any two leads (except earth) from the three phase supply at the motor starter.

8. Three Phase Connection

Three phase models must be wired with a contactor with approved overloads set correctly.

We recommend the use of overloads which also have the ability to detect “single phasing” or “dropped phase” conditions in the power supply.

When the unit is connected and operating the phase balance should be checked. This should be within the 5% variation. “Rolling” the leads may help to improve a small unbalance, but major phase unbalance will usually be attributable to an input power unbalance. This must be addressed before the pump is used.

9. Earthing single and three phase pumps

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

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

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

10. Initial start-up

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

Never run 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.

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 bore should be attended to before restarting the pump.

HIDRAL submersibles 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 bore checked to ensure that the water level in the bore has not dropped to a dangerously low level. Continuous monitoring of bore 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.

Operation and maintenance

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 HIDRAL 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.

Pump service chart

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

Problem	Possible Causes
1. Overload protector trips	- Control box or thermals in the sun or near heat source. - Incorrect thermals or control box fitted. - Low line voltage. - Phase failure (3 phase only). - Faulty motor
2. No water delivered	- Water level in bore too low. - Check valve installed backwards or stuck closed. - Inlet screen on pump clogged. - Hole in delivery piping below bore top. - Motor failure. - Broken pump shaft or coupling.
3. Low water delivered	- Pump rotating backwards (3 phase only). - Water level too low in bore. - Discharge piping clogged, corroded or ruptured. - Pump installed too low in bore and covered in sand or other solids. - Inlet screen partially clogged. - Worn pump. - Check valve stuck partially closed. - Motor related problem.
4. 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).
5. Fuses blow but overload does not trip	- Fuses too small. - Fuse receptacles dirty or corroded. - Loose connection in fuse box. - Defective incoming power leads. - Ground wire connected to wrong terminal. - Motor failure.
6. 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.
7. Pressure gauge fluctuates with flow surges	- Water level too low in bore.
8. 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.