DAVEY

Submersible Borehole Pump

100mm (4”) SERIES J

INSTALLATION AND OPERATING INSTRUCTIONS



WARNING : The pump and associated pipework operate under pressure. Under no circumstances should the pump or associated pipework be disassembled unless the internal pressure of the unit has been relieved. Failure to observe this warning will expose persons to the possibility of personal injury and may also result in damage to the pump, pipework or other property.

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

Please pass these instructions on to the operator of this equipment.

Installation & Operating Instructions

It is important that all submersible borehole 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.
Should additional information or clarification of certain points be required in Australia, contact our Customer Service Centre on 1300 2 DAVEY (1300 232 839). For New Zealand contact the Davey Products Pty Ltd office on (09) 444 3622.

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°C 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, Davey 4” submersible borehole pumps are supplied in component form, ie. motor and liquid end boxed seperately. For correct coupling, proceed as follows:

- Remove cable guard after removing the lock screws.
- Remove the check valve or unscrew the poppet retainer and remove the check valve poppet dependant upon model and 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. Where the nut is to have the stainless strainer fitted, ensure that these nuts and the motor jam nut have the flats aligned parallel to the motor adaptor circumference.
- Align the motor cable along the pump, then secure the cable guard with the setscrews into the side of the pump.

- Where supplied, fit the stainless steel suction strainer.
- Replace the check valve or check valve poppet and retainer.

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 DAVEY SUBMERSIBLE BOREHOLE 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 do not result in operating pressure which exceed the pipe rating.



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 may be 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 Davey submersible borehole 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

Davey submersible borehole 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. Also make sure that the tank draw off capacity is large enough to limit the pump's starts to an absolute maximum of those relevant to the motor used.

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.

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 Davey Dealer.

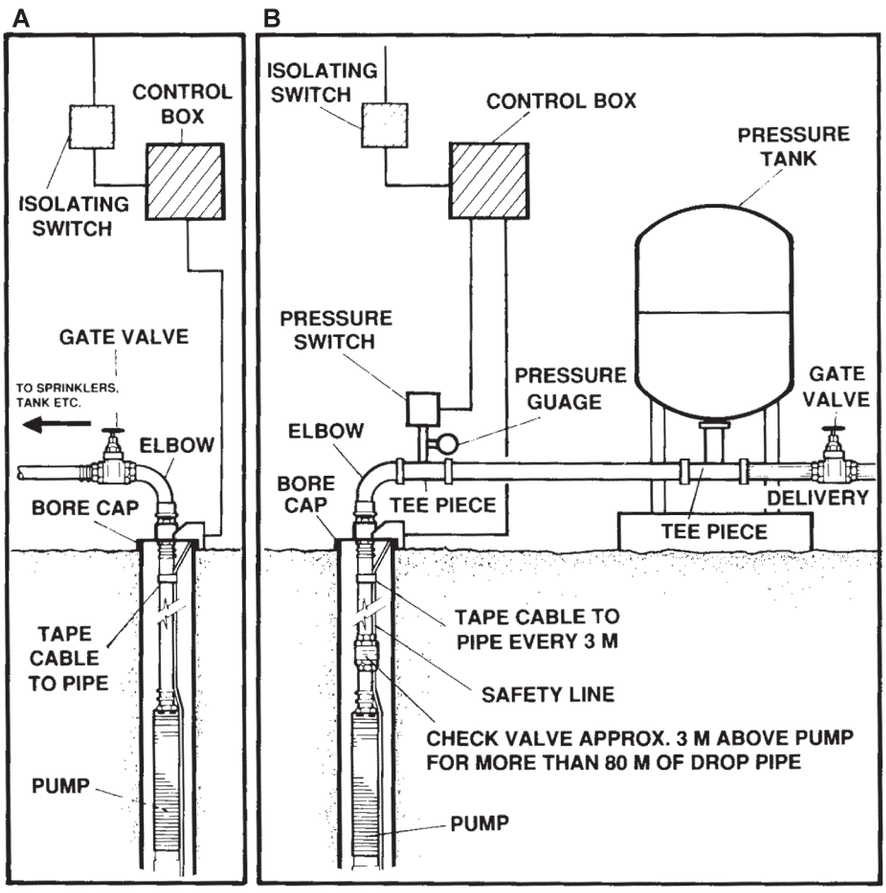
NOTE: Any automatic switching of the pump giving excessive starts per hour will shorten the life of the pump and damage caused may effect warranty cover.

PRESSURE SWITCH WIRING: Starting current (inrush current) from large motors may damage pressure switch. Pressure switches installed with motors of 1-1/2hp (1.1kW) or larger should be wired through a magnetic contactor to aviod burning out pressure switch. Consult your Davey Dealer for further information.

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.

Davey supply a range of control boxes incorporating 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 QUICK TRIP 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 'quicktrip' overloads set correctly.

Davey 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.
Davey 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.
If in doubt about the draw down level of the bore, install low level probe controls, available from Davey.

11. Minimum Flow Conditions

Premature pump failure may result if pumps are run <u>continuously</u> at flow rates LESS than the following:

Model	Flow Rates I/Min.	(GPH)
J25 Series	15	198
J40 Series	30	396
J60 Series	44	581
J80 Series	50	660
J110 Series	80	1056
J160 Series	100	1320
J250 Series	150	1980

12. Maximum Flow Conditions

Premature pump failure may result if pumps are run for more than a short period at flow rates GREATER than the following:

Model	Flow Rates I/Min.	(GPH)
J25 Series	31	409
J40 Series	45	594
J60 Series	70	924
J80 Series	100	1320
J110 Series	140	1848
J160 Series	210	2772
J250 Series	310	4092

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 Davey 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.

Installation record:

To assist you and Servicing Personnel in the future, fill in all details below and retain with this booklet.
Bore Details (this information should be provided by your driller).
ID of casing: ..... in/mm Length cased: ..... metres
Depth of bore: ..... metres
Slotted casing at what depths? .....

Aquifers	1	2	3
Depth to main aquifers (m's/ft):	..... to	..... to	..... to .....
Estimated flow from main aquifers (gph/lpm):	.....	.....	.....
Rock types for main aquifers:	.....	.....	.....

Driller's Name: ..... Phone: .....
Driller's Estimate Yield: ..... gph/lph/m^3ph
Other Rock Types drilled through: .....
Was a Bore Yield Test undertaken? YES / NO
What type of Bore Test?
1. Bailed / Blown by Driller, or
2. Pumped with Test Pump to max. yield, or
3. 24 hr. constant discharge test, or
4. Other (please specify):
.....

What Yield and Draw Down was recommended from this test?..... gph/lph/m^3ph
PWL ..... metres
SWL ..... metres

Pump (this information should be supplied by your Davey dealer).

Model: ..... kW: .....
Voltage: 240 / 415
Design Flow Rate: ..... Design Pressure: .....
Depth Installed: ..... metres
Drop Pipe Size: ..... Type: ..... Class: .....
Cable Size: ..... Probes Fitted? YES / NO Phangle Fitted? YES / NO
Installed by: ..... Date: .....
Purchased from: ..... Date: .....

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Davey® Repair or Replacement Guarantee

In the unlikely event in Australia or New Zealand that this Davey product develops any malfunction within two years of the date of original purchase due to faulty materials or manufacture, Davey will at our option repair or replace it for you free of charge, subject to the conditions below.

Should you experience any difficulties with your Davey product, we suggest in the first instance that you contact the Davey Dealer from which you purchased the Davey product. Alternatively you can phone our Customer Service line on 1300 367 866 in Australia, or 0800 654 333 in New Zealand, or send a written letter to Davey at the address listed below. On receipt of your claim, Davey will seek to resolve your difficulties or, if the product is faulty or defective, advise you on how to have your Davey product repaired, obtain a replacement or a refund.

Your Davey Two Year Guarantee naturally does not cover normal wear or tear, replacement of product consumables (i.e. mechanical seals, bearings or capacitors), loss or damage resulting from misuse or negligent handling, improper use for which the product was not designed or advertised, failure to properly follow the provided installation and operating instructions, failure to carry out maintenance, corrosive or abrasive water or other liquid, lightning or high voltage spikes, or unauthorized persons attempting repairs. Where applicable, your Davey product must only be connected to the voltage shown on the nameplate.

Your Davey Two Year Guarantee does not cover freight or any other costs incurred in making a claim. Please retain your receipt as proof of purchase; you **MUST** provide evidence of the date of original purchase when claiming under the Davey Two Year Guarantee.

Davey shall not be liable for any loss of profits or any consequential, indirect or special loss, damage or injury of any kind whatsoever arising directly or indirectly from Davey products. This limitation does not apply to any liability of Davey for failure to comply with a consumer guarantee applicable to your Davey product under the Australian or New Zealand legislation and does not affect any rights or remedies that may be available to you under the Australian or New Zealand Consumer Legislation.

In Australia, you are entitled to a replacement or refund for a major failure and for compensation for any other reasonably foreseeable loss or damage. You are also entitled to have the goods repaired or replaced if the goods fail to be of acceptable quality and the failure does not amount to a major failure.

Should your Davey product require repair or service after the guarantee period; contact your nearest Davey Dealer or phone the Davey Support Centre on the number listed below.

For a complete list of Davey Dealers visit our website (davey.com.au) or call:

DAVEY

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*** Installation and operating instructions are included with the product when purchased new. They may also be found at davey.com.au**