SERVICE MANUAL

FEROL STREET

KSB Ajax Pumps Pty. Ltd.

Pumps
Valves
KSB

KSB AJAX PUMPS PTY LTD

FORRERS WORKS

FORRERS

AUSTRALIAN FOR SUBMERSIBLE

All members of the Forrers pumps Works staff are pleased to have been part of the team who produced your unit. Every effort is made by us to ensure the product you have purchased is finished to the highest standard.

Our Ref:\Model\150T300A

PROJECT DETAILS

Pump Model: E00-280 NCD
Motor: 12KW 4Pole
Project Drawings: N/A
Pump Serial Number: F50284

PERFORMANCE DETAIL

Duty: 7L/s @ 24 M
Pump Efficiency: N/A
Motor Efficiency: N/A
KWH/KL: N/A

SPECIAL CONSTRUCTION DETAILS

Cable Length: 10 MTRS
Thermistors Fitted: YES
Water Sensor Fitted: NO
Cable Connection: DELTA

CLIENT

Customer: BRISBANE CITY COUNCIL
Project: N/A
Pump Station: N/A
Contract Number: N/A

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Motor Manufacturer:	KSB AJAX PUMPS FORRERS PUMP WORKS

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REFER APPENDICES 12.7 (MOTOR TECHNICAL DATA)

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1.2 PUMP IDENTIFICATION

To ensure the correct procedure is followed when working on equipment and ordering spares it is essential you identify equipment correctly.

Pump units are fitted with an identification similar to:

KSB AJAX PUMPS PTY LTD

SUBMERSIBLE INDUCTION MOTOR (AS1359) AND PUMP

CONTRACT NO. [ ] SEAL NO. [ ]

PUMP TYPE [ ] MOTOR [ ]

VOLTS 3 PHASE HERTZ [ ] AMPS

RATING S1 INSUL F DESIGN [ ] CONN [ ]

KW [ ] RPM [ ] L/SEC [ ] HEAD [ ] M

MADE IN AUSTRALIA 199[ ] FORRERS PUMP WORKS

DETAILS ARE:

Contract Number - filled in with clients contract number if known.

Serial Number - special serial number for this unit. This number must be quoted to ensure correct spares are supplied.

Pump Type - details specific pump model.

Motor - this nominates the motor frame size. This allows the client to follow correct procedure in the following manual eg. FR203 refers to a motor with a stator diameter nominally 203mm.

Volts - indicates correct operating volts.

Hertz - indicates correct operating frequency.

Amps - indicates motor full load current.

Design - indicates motor design capability.
eg. N - normal starting.
NY - able to be star delta started.

CONN - indicates cable connection.
Y - star connected.
"DEL" OR Δ - delta connected.
Δ - open delta connected (2 sets power leads)

KW - rated kilowatts of motor.

RPM - speed of motor.

L/Sec - flow in litres per second where a specific duty is nominated.

Head - head in metres where a specific duty head in nominated.

Year of manufacture is also noted.

As well as the above the pump has a direction of rotation tag on the pump volute which has specific pump serial number stamped on it.

If the unit is a stock standard pump unit it will also be fitted with a single plate stamped with a part number for that unit. Quoting this number will also ensure correct spares are supplied.

2.0 PRINCIPLES OF OPERATION

2.1 PUMP DESCRIPTION

This pump unit is a submersible, wet well, sewage pump close coupled to a submersible motor. The non clog impeller is double shrouded non-clog design with open passages to minimise the possibility of blockages while pumping sewage. The impeller and pump case are fitted with replaceable wear rings on the suction side of the impeller to maximise the life of the major components. The impeller is mounted directly onto the motor shaft via a key and positively locked by means of a lock nut. The impeller is balanced at the factory before dispatch. Motor and pump are fitted with a one piece stainless steel shaft.

The alternative shredder style pump consists of an open impeller where product passes through a rotating cutter and stationary shredder before entering the volute. This action breaks down product to enable the use of smaller diameter discharge pipe work.

Also available is a cutter pump where an open vane impeller operates against serrated suction cover. This creates a shearing action which is particularly effective for breaking down plastics and rags.

The pump and motor are normally mounted vertically. In the most common configuration a discharge stand is permanently fixed to the wet well floor. The discharge of the pump is fitted with a locking plate which forms an automatic seal with the discharge stand when the pump is lowered onto the stand. Guide rails run from the stand to the top well opening to guide the pump onto the stand. Should maintenance on the pump or motor be required the whole unit may be lifted from the well even if the well is full.

The pump is also available in a free standing configuration, different guide arrangement or a dry well application in which the motor is fitted with a cooling jacket.

Once installed the pump will operate continuously provided there is fluid present to be pumped.

Automatic control of the pump can be achieved with a variety of electrical or mechanical controls. The pump may be stopped by isolating the motor from the power supply. **For the safety of maintenance staff it is recommended that a remote lockout type stop button or isolator is provided near the well in case of emergency.**

This is particularly important if the switchboard controlling the pump is remote from the pump station.

The pump end is normally constructed of a heavy duty high quality cast iron. All fixings are stainless steel (special materials of construction are used when specified).

2.2 MOTOR DESCRIPTION

This motor is a KSB Ajax Pumps, Forrers Works submersible motor. The motor is cooled by the pumping medium around the outside of the motor frame in the well. It is recommended that the motor operates submerged during its normal pumping cycle. With jacketed motors product fluid is circulated through jacket to provide cooling. It is recommended (although not essential) where possible to circulate clean water through this jacket. The motor frame is designed for heavy duty application and is constructed from cast iron. The stator assembly consists of laminations of low loss electrical grade steel clamped together with cleats in dovetail slots.

The windings are copper wire coated with polyester imide to a thickness complying with AS1194 Grade 2 insulations. The insulation material is Class F to BS2757. The winding overhangs are laced together securely then impregnated with a Class F varnish and baked at high temperature to cure the varnish to a solid homogeneous mass. Insulation is carried out using a vacuum impregnation process.

The winding tails consist of tinned, flexible copper wire of sufficient diameter to ensure that the current density at the rated load does not exceed 3.5 Amperes per square millimetre. The tails are insulated with Class F material. The winding tails are run to a terminal box. Motors below 3kw use a 3 wire star connection. 3kw and above have 6 wires to the terminal block.

The stator windings contain one positive temperature coefficient (P.T.C.) thermistor per phase in the overhang. The three thermistors are connected in series and the wires taken to a terminal block in the terminal box.

The rotor core is made of laminations of low loss electrical grade steel. These are stacked and fixed by pressure case aluminium or copper bars. The rotor is shrunk onto a stainless steel shaft and dynamically balanced.

The motor is sealed from the pump by a double mechanical seal. Seals consist of either a back to back arrangement or series seal configuration. In standard arrangement the upper seal is tungsten carbide against carbon with the lower seal being tungsten carbide against tungsten carbide. Upper and lower seal faces are separated by an oil filled chamber.

NOTE: Motors manufactured at KSB Ajax - Forrers Works us a white mineral oil (Whiterex 307) or equivalent which is low-toxic and environmentally friendly.

3.0 OPERATING PROCEDURE

3.1 CAUTION

NOTE: ANY INTERFERENCE WITH THE ENCLOSURE OF THE ELECTRIC MOTOR VOIDS ANY WARRANTY ON THE ELECTRIC WINDINGS AND TERMINALS. ENSURE CORRECT SUPPLY VOLTAGE AND PHASE ROTATION IS SUPPLIED TO MOTOR AS INCORRECT ROTATION CAN CAUSE PERMANENT DAMAGE TO EQUIPMENT.

3.2 STARTING

3.2.1 Check that the complete rotating element is free to turn prior to connecting electrical power.

3.2.2 Ensure pump and motor are fully submersed prior to operating. In the case of a dry well application ensure volute is full of fluid and a positive head exists on the inlet of the pump.

NOTE: WHERE STARTING CONDITIONS HAVE BEEN CHECKED THE PUMP MAY BE STARTED WITH AN OPEN DELIVERY VALVE. AS WITH ANY CENTRIFUGAL PUMP PROLONGED OPERATION AGAINST A CLOSED DISCHARGE VALVE IS NOT RECOMMENDED.

3.2.3 Where the discharge line has not been charged with fluid it is permissible to operate the pump against a partially closed discharge valve.

3.2.4 Ensure there is sufficient fluid in the well and then start the motor. Ensure equal and correct voltage is supplied to each phase.

3.2.5 Open the pump delivery valve slowly until the required pressure or flow is obtained.

CAUTION: 1. PROLONGED RUNNING WITH A CLOSED DELIVERY VALVE CAN DAMAGE PUMP INTERNAL COMPONENTS AND MUST BE AVOIDED.

3.3 **CONTINUOUS OPERATION**

Most pump installations run under automatic control so providing the pump unit has been commissioned correctly and maintenance schedules are maintained the pump unit requires little additional supervision unless there is a duty change required.

3.4 **STOPPING**

Isolate the motor from the mains and mechanically lock the isolator out. If work is to be carried out on the pump unit ensure that the isolator is mechanically locked open and power supply is isolated from motor. **Do not restart the motor before it has fully stopped.** Restarting the motor results in very high current fluctuations in the motor windings and pressure surges in the rising main and may cause serious damage to the unit or the system.

3.5 **EMERGENCY STOPPING**

Follow the procedure outlined in Section 3.4 above. It is recommended that lock out isolators be installed at all points where work is to be carried out on the pump or its associated equipment.

3.6 **ENSURING MAXIMUM LIFE FOR YOUR UNIT**

In the interest of ensuring maximum benefit and life from equipment the following basic recommendations should be followed:

a) Operate with correct power supply,
b) Provide adequate protection for equipment in the form of thermistor protection, and overload protection set to suit motor rating,
c) Do not run dry or without an adequate supply of fluid (run with motor submersed),
d) Run units in correct rotation (clockwise when viewed from drive end),

e) Operate pump in its correct range of design flow and discharge pressure.
f) Use pump in pumping medium for which unit was designed.
g) Ensure regular maintenance of station pumping units and ancillary equipment is carried out.

4.0 GOODS INSPECTION AND STORAGE

4.1 INSPECTION

4.1.1 Immediately on receipt of the equipment, inspect it thoroughly. Examine the crate and the wrapping before discarding them, since parts or accessories are sometimes wrapped individually or fastened to the crate.

4.1.2 Report any damage or shortage to KSB Ajax Pumps and the carrier immediately. All claims must be made (or confirmed) in writing within seven days.

4.1.3 If the equipment is not being installed immediately, it must be stored under suitable conditions.

4.2 STORAGE

4.2.1 SHORT TERM

4.2.1.1 When it is necessary to store a pump for a short time before it is installed, place it in a dry location. Ensure cable ends are kept dry and cable is protected against mechanical damage.

4.2.1.2 To prevent rusting-in or seizing, lubricate the unit before storing paying particular attention to components which run in close tolerance, eg. wear rings, etc. Turn the pumpset by hand at least once a week. Extreme care should be exercised with regard to the motor cables: ensure, that the pump dose not stand on the motor cables and that the cable seal on the end of the cable is not damaged as it prevents water entering the cable.

4.2.2 **LONG TERM**

4.2.2.1 More thorough precautions are required if the pump is to be stored for an extended period of time. Refer to FORRERS PUMPS WORKS for full information on long term storage.

Do not store any equipment in any area which is subject to either direct or indirect vibration as this can have a detrimental effect on bearings.

5.0 PIPEWORK INSTALLATION

5.1 DELIVERY PIPEWORK

5.1.1 It is essential to ensure that the delivery pipework is adequately supported and anchored to resist hydraulic thrust.

5.1.2 If the delivery pipe does not rise continuously air pockets can form in the pipe at high spots. If is good pumping practice to remove these air pockets in the pipe by venting the air through an air release.

6.0 PUMPSET INSTALLATION

6.1 PROCEDURES PRIOR TO INSTALLATION

6.1.1 CLEANING PRIOR TO INSTALLATIONS

6.1.1.1 All packing and crating should be removed and discarded prior to starting the installation procedure. Check all the packing before discarding it to ensure that no parts or accessories are attached to it in individual wrappings.

6.1.1.2 All parts of the assembly must be thoroughly cleaned before installation begins. All traces of rust preventative must be removed from the discharge and suction faces, exposed shafting, and all coupling surfaces.

6.1.2 LAY-OUT OF PUMP PARTS FOR INSTALLATION

6.1.2.1 Care must be taken to avoid damage to components whenever handling or installing them.

6.1.2.2 If suitable lifting tackle is not available, skids must be employed to transfer heavy weights at ground level. Loaded crates, individual components or subassemblies must never be dropped to the ground from a transport vehicle.

6.1.2.3 Individual components should be layed out on clean dry timbers or on a suitably cleaned surface in the order which they will be installed.

6.1.2.4 Any packing or other protective material must be removed before starting the installation procedure.

6.2 PUMPSET FOUNDATION

6.2.1 An adequate pump foundation is essential. It should consist of a solid block of concrete brickwork or masonry sufficiently massive and rigid to provide continuous support for the pump pedestal throughout the pumps life.

6.2.2 The top of the foundation plinth should be 25mm to 38mm below the required finished height of the stand's lower flange. This is to allow the discharge stand to be adjusted and levelled during installation. The remaining gap is filled with grout after levelling to provide support to the discharge stand.

6.2.3 Foundation bolt holes should be prepared in the foundation plinth to match the discharge stand holes. Each hole should be drilled the correct diameter to accept the masonry anchor.

6.3 DISCHARGE STAND LEVELLING

6.3.1 Position the masonry anchors or fixings using stand or dimension drawing as a guide.

6.3.2 Place solid packers approximately 30mm high on either side of each masonry anchor.

6.3.3 Sling the discharge stand and lift it onto the anchors so that it sits on the packers. Level the discharge stand by placing shims between the packers and the stand.

6.3.4 Once the discharge stand is level place a washer on each masonry anchor and screw on the nuts. tension the nuts until the masonry anchor has gripped firmly and the discharge stand is clamped tight.

6.4 GROUTING

6.4.1 The use of good grout is important when installing a pump as it prevents lateral movement of the discharge stand and damps vibration. The use of a non-shrink grout or other available propietry product is recommended. (Hilti provide a range of suitable fixings, adhesives & grouts).

6.4.2 After levelling and alignment is completed and all foundation bolts pulled down tightly, preparation for grouting the stand can commence. Boxing should be placed around the stand's lower flange to contain the grout when it is poured.

6.4.3 Manufacturers recommendations for application of grouting material should be followed.

NOTE: IT IS IMPORTANT THAT THE GROUT FILLS THE CAVITY BETWEEN THE LOWER FLANGES AND THE FOUNDATION SO THAT FULL SUPPORT IS GIVEN TO THE STAND. IT SHOULD BE CHECKED THAT THE GROUT DOES NOT SHRINK FROM THEN STAND'S FLANGE AFTER CURING.

6.4.4 The exposed surfaces should be covered with damp hessian to prevent the grout from drying too rapidly and cracking. The hessian should be kept damp for about forty-eight hours or until the grout is set.

6.4.5 When the grout is set, the boxing should be removed and a smooth finish given to the grout and foundation surfaces. Manufacturers recommendations should be followed.

6.4.6 After curing, guide rails and top bracket can be fitted.

6.5 CONNECTING THE PUMP

6.5.1 Before lowering the pumpset onto the discharge stand the motor and pump should be checked as per Section 3 of this manual.

6.5.2 After carrying out the above checks the pumpset is ready to be installed on the discharge stand. Attach a sling to the lifting points on the motor and position the pumpset across to the well opening and lower it onto the guide rail. Lower the unit down the guide rail until it locks onto the discharge stand. It may be necessary to manipulate the unit by hand while supported to ensure that it has seated home correctly and that the seal between the pump and discharge stand is complete. Keep the pump completely vertical when lowering into position.

6.5.3 In the case of free standing pump, discharge pipework is securely attached to the pump discharge prior to lowering into position. It is advantageous to fit pipework with a quick connect type coupling. Ensure the pump is mounted on level foundations and slung to prevent turning.

6.6 COMMISSIONING THE PUMPSET

6.6.1 Start the pump unit as per Section 3 of this manual.

6.6.2 Allow it to run for approximately ten minutes to fill the pipeline with fluid and stabilise in its operation. Test readings of head, flow, voltage, current and power should then be taken to check that the unit is operating correctly. If flow measurement equipment is not available then the flow may be calculated by measuring the rate at which the fluid level drops in the wet well. The flow may be adjusted by altering the setting of he discharge pipe valve.

6.6.3 Once the commissioning procedure outlined above has been finished the pump unit should be shut down as per Section 3 of this manual.

7.0 MAINTENANCE SCHEDULES

7.1 ROUTINE MAINTENANCE

ALWAYS COMPLY WITH CORRECT PROCEDURES WHEN MAINTAINING PUMPING EQUIPMENT. UNDER ALL CIRCUMSTANCES SAFETY FIRST.

When a pump station is initially commissioned it should be visited daily for the first two weeks to check that all the systems are working correctly. Particular care should be taken with a new installation that foreign matter such as concrete, tins, timber or tools do not foul the pump. The wet well should be hosed down and pumped to its minimum level each day to check for such foreign matter. All such material should be removed.

Each time the pump station is visited readings of the hours run, voltage and current should be taken and recorded in a station log book for each pump. Abnormalities in these readings are often the first sign that maintenance is required on the pump unit. Ideally the station should be visited on a daily basis to check the pumps operation, record the above data and clean any build ups of fats or foreign material in the wet well. The required frequency of visits to the well can often be established by the attention required during the daily visits for the two weeks following commissioning.

7.2 PERIODIC MAINTENANCE

7.2.1 The tables in Appendix 12.2 give the recommended times for periodic maintenance checks. The major check required is a six monthly or 1500 hour inspection of the motor. The procedure to be followed in this check is detailed in the following section.

7.2.2 The pump unit requires a complete overhaul once either the delivery head drops below an unacceptable level or the power consumption rises significantly. The establishing of acceptable variation to the installed performance is normally left to the maintenance engineer's discretion, however a variation of 15% in power, flow or head usually warrants investigation. The unit should then be returned to KSB Ajax Pumps or the instructions in Sections 8 to 11 followed to repair the unit.

7.2.3 Where a pump station involves sub-contractors associated equipment it is important that their instructions are read so that a fully comprehensive maintenance schedule can be drawn up for the station.

7.2.4 **SIX MONTHLY OR 1500 HOUR INSPECTION**

7.2.4.1 The pump and motor should be checked every six months or 1500 hours of operation, whichever comes first. The checks cover the condition of the electrical insulation in the motor windings, condition of the mechanical seal and the wear of the pump components.

7.2.4.2 Refer to Section 8 to electrically disconnect the motor and lift the motor-pump from the pump well. Where possible, the incoming power isolator should be padlocked in the **'OFF'** position. Any electrical work on the enclosure of the electrical motor should be carried out by suitably qualified personnel. Any work should be conducted following good safety procedures.

7.2.4.3 Inspect the pump end for wear or damage. Ensure all the fasteners are tight. Inspect the discharge sealing ring (120) for damage or excessive wear.

7.2.4.4 Refer to section 8 for instructions on disassembly of pump.

7.2.4.5 Check the diametrical clearance between the impeller wear rings and the case wear rings. If the diametrical clearance is greater than 1.5mm the wear rings will require replacement. Refer to section 8 for wear ring removal. With shredder style pumps wear of cutter and stationary will result in shredding action being diminished with resultant more frequent blocking.

7.2.4.6 After the inspection refer to Section 11 for instructions on the procedure for replacement of pump components.

7.2.4.7 The mechanical seal should be checked to ensure it is sealing correctly. Leaving pump/motor upright remove the upper plug sealing the oil reservoir in the lower end of the motor. Draw off a small sample of oil (approx. 100mls) and put into a clean glass container. Allow the oil to settle. Inspect the oil to see that it is not milky or that water has not settled at the bottom of the container. Caution should be taken when removing the taper plugs as the oil may spray out if the pressure remains in the oil chamber.

7.2.4.8 If the oil contains water and it has been ascertained that it has not leaked through the plugs the mechanical seal may require reconditioning. Refer to Section 9 for the procedure to remove the mechanical seal.

It is quite acceptable under normal operating conditions for a small amount of water to infiltrate into the seal chamber. Above 5 percent contamination normally indicates a problem with the seal.

7.2.4.9 Refer section 1 for motor frame identification.

If the oil tested is only milky (less than 5%) it is acceptable practice to drain the oil chamber, for motor frames 203, 260 with motor

vertical. Remove plug 15(c) to drain oil taking care not to spill any oil. Replace plug 15(c). Use a thread sealant on the thread then tension firmly into place. Remove level plug 15(a).

With 203 & 260 frame motor still standing vertically, refill oil chamber through oil filler line 15(b) until oil reaches oil level plug. Use recommended lubrication as per appendices 12.3. After applying thread sealant replace filler plug 15(b) and level plug 15(a) after allowing any excess oil to drain off. **Do not overfill.**

For motor frames 150, 165 & 300 lay motor on side. Remove plugs 15(c) & 15(b) then roll motor over to drain oil into a suitable container.

Roll unit over with motor still on its side and plug holes to top. Fill chamber completely with oil. After applying thread sealant replace plugs 15(c) and 15(b).

7.2.4.10 If the motor was previously stripped refer to Section 10 for motor assembly and mechanical seal assembly. Ensure that the impeller is free and revolving truly and reinstall pump-motor unit back into the pump station.

7.2.4.11 Refer to Section 3 for the procedure for reconnecting the motor to the switchboard and starting the pump.

8.0 TO DISASSEMBLE THE PUMP

8.1 PREPARATION PRIOR TO DISASSEMBLY

8.1.1 Isolate the electric motor from the mains by opening the main isolator supplying power to the switchboard or lock the power isolator and control circuit isolator for the unit (remember safety first) in the '**OFF**' position.

8.1.2 Disconnect power and control cables.

8.1.3 Close the discharge isolating valve.

8.1.4 Lift the pump from the wet well and thoroughly clean down the outside of the pumpset.

8.1.5 The highest possible standard of cleanliness must be maintained throughout any maintenance operation.

8.2 DISASSEMBLY PROCEDURE (REFER SECTION 12 FOR SECTIONAL ARRANGEMENT DRAWING)

For Non Clog Pumps

8.2.1 **To remove the impeller**

8.2.1.1 Stand the pump-motor unit upright on clean, dry timbers, ensuring that it is stable. Chock it securely.

8.2.1.2 Remove the nuts which secure the motor to the volute (101).

8.2.1.3 Attach a sling to the lifting points on the motor and using suitable safe lifting equipment lift the motor off the pump end. If the gasket will not release the motor from the pump end raise the pump-motor unit approximately 5mm off the timber and strike the volute with a soft hammer onto a piece of timber. The motor complete with impeller can be withdrawn from volute.

8.2.1.4 Remove gasket (113) if damaged in any way.

8.2.1.5 Position the motor unit on a bench at a suitable working height and chock it securely.

8.2.1.6 Secure the impeller (102) to prevent rotation.

8.2.1.7 Remove the locknut (103) and washer (104). Using a puller remove the impeller (102) from the shaft. The impeller is driven by the shaft using a tapered drive and key. The impeller may require a gentle impact to remove. In the case of an impeller being difficult to remove the application of heat to the impeller will assist in its removal. Rapid heating of impeller minimising heat transfer to the shaft provides best results.

8.2.2 Complete disassembly.

8.2.2.1 Check the diametral clearance between the volute wear rings (108) and the impeller wear rings (107). if the diametral clearance is greater than 1.5mm the wear rings will require replacement. Replacement if also recommended if significant scoring of wear rings has occurred. Excessive wear of wear rings result in less efficient operation of pumps, flow loss and head loss, therefore resulting in higher operating costs.

8.2.2.2 To remove the impeller wear rings (107) set the impeller in a lathe and machine if off. If a lathe is not available grind a flat through one side of the wear ring and knock the wear ring off. Ensure the original machine surface of impeller under wear ring is not damaged.

8.2.2.3 To remove the case wear ring (108) press the wear ring out of the volute.

8.2.2.4 Remove the key (33) from the shaft (4).

8.2.2.5 Discard any gasket if damaged.

8.2.2.6 Remove the discharge sealing ring (120) if it is worn, perished or damaged.

8.2.2.7 Clean all the components thoroughly and lay them out ready for reassembly.

8.3 DISASSEMBLY OF SHREDDER PUMPS

8.3.1 Lay pump horizontally.

8.3.2 Grip shredder cutter (7) to prevent it from rotating.

8.3.3 Remove locknut (3) and washer (4).

8.3.4 Slide shredder cutter (7) off shaft.

8.3.5 Remove fixings (17) securing volute (1) to motor. Remove volute.

8.3.6 Slide impeller (2) off shaft.

8.3.7 Turn volute (1) over and remove fixings (27). Drive stationary shredder ring (8) out of volute.

8.3.8 Check all parts for wear. Clean components thoroughly and lay them out ready for reassembly.

8.4 DISASSEMBLY OF CUTTER PUMPS.

8.4.1 Remove Suction Cover.

8.4.2 Remove impeller lock nut then remove impeller (a puller will be required). Procedure is similar to non-clog pumps for other disassembly work.

9.0 TO DISASSEMBLE THE MOTOR (REFER SECTION 12 FOR SECTIONAL ARRANGEMENT DRAWINGS)

9.1 TO REMOVE THE MECHANICAL SEAL

9.1.1 Introduction

9.1.1.1 Once the mechanical seal has been removed from the motor it should not be reinstalled. The seal should be reconditioned or replaced.

REMEMBER: THE MECHANICAL SEAL IS THE HEART OF THE SUBMERSIBLE MOTOR.

9.1.1.2 The area in which the motor is worked on MUST be very clean and extreme care should be taken not to damage or scratch the sealing area on the shaft or any of the seal components. The faces of the mechanical seal are hand lapped to a flatness of 50 microns and rapid deterioration of the seal faces may occur unless the instructions are followed implicitly.

9.1.2 Seal plate removal (for internal seals 1.1/8" & 1.5/8" shafts)

9.1.2.1 Stand motor on bench at a suitable working height and chock it securely.

9.1.2.2 Remove the key (33) from the shaft (4).

9.1.2.3 Remove the oil plugs (15) and drain the oil from the oil chamber. Dispose of any waste oil correctly. Remove motor adaptor (114) if fitted.

9.1.2.4 Remove the hex head set screws (13) and spring washers (9) holding the seal chamber (12) to the bottom bearing bracket (7).

9.1.2.5 Remove the seal chamber (12) complete with the seal seat assembly.

9.1.2.6 Place the seal chamber (12), with the seal seat facing downwards, on a clean, dry rag and place some padding beneath it.

9.1.2.7 Carefully prise the seal seat out of the seal chamber (12) and allow it to drop onto the padding.

9.1.2.8 Slide the seal head assembly off the shaft complete with the spring. If seals are fitted with rubber bellows they can adhere to the shaft. These require additional pressure to remove.

9.1.2.9 With multi spring seals loosen drive grub screws from centre spacer then slide complete rotating assembly off shaft.

9.1.2.10 Clean the seal components thoroughly and apply a light coat of oil to prevent corrosion. Pack the removed seal in the box which contained the reconditioned seal and return it to **KSB AJAX PUMPS.**

If seal seat is difficult to remove clean the face of the seal. Using an extended tube with similar internal and external diameter to the seal seat place some Loctite No. 601 on the seal face and tube. Press tube onto face until surfaces adhere. Gently remove seal seat with an oscillating motion. The seat can be removed from tool by tapping tool sharply on its side.

9.1.3 **Seal plate removal (for external tandem seals 2.1/4" shaft)**

Lay motor on bench and remove key (33) from shaft (4). Remove motor adaptor (114) if fitted.

9.1.3.1 Remove the oil plugs (15) and drain the oil from the oil chamber. Oil can be drained with motor standing vertically. Dispose of any waste oil correctly.

9.1.3.2 Loosen grub screws in drive ring of mechanical seal then remove drive ring completely with spring and rotating seal head.

9.1.3.3 Remove the fasteners (13) and spring washers (9) holding the seal chamber (12) to the bottom bearing bracket (7).

9.1.3.4 Remove the seal chamber (12) complete with the seal seat assembly.

9.1.3.5 Place the seal chamber (12), with the seal seat facing downwards, on a clean, dry rag and place some padding beneath it.

9.1.3.6 Carefully prise the seal seat out of the seal chamber (12) and allow it to drop onto the padding.

9.1.3.7 Loosen grub screws in drive ring of inner mechanical seal then remove drive ring completely with springs and rotating seal head. Follow same procedures as per clause 9.1.2.10 for handling of seal components and removal of seal seats.

9.2 TO REMOVE THE CABLE ASSEMBLY

9.2.1 Attach support to the cables and take the weight of the cables.

9.2.2 Remove the hex head set screws (26) and (22) and spring washers (27) holding the terminal box (16) to the motor housing (1).

9.2.3 Move the terminal box (16) away from the side of the motor a sufficient amount to be able to access the terminal blocks (232). Be careful not to strain the cable leads or the motor tails which connect to the terminal blocks.

9.2.4 Disconnect cable after recording their position.

9.2.5 Lift the entire cable assembly clear of the motor and place it in an area which is clean and dry.

9.2.6 Remove the O-ring (11E).

NOTE: 150fr motors are not fitted with a separate terminal box with cable entering motor via a cable gland).

9.2.7 **To check the cables**

9.2.7.1 Inspect the inside of the terminal box for any signs of water leaking into the motor. If water is present check the O-ring (11E) and the condition of the sealant (210). Also thoroughly inspect the cable for any nicks and cuts on the outer sheath.

9.2.7.2 Check the continuity of each lead in the cable with a multimeter. The resistance of the leads should be equal.

9.2.7.3 Check the insulation between each cable and all the rest of the cables with a 500 volt Megahom meter. The insulation between each lead and the terminal box should also be checked. All readings should be infinity.

If readings are irregular disconnect stator winding tails from terminal blocks (232) then carry out above continuity & insulation checks.

9.3 DISASSEMBLY PROCEDURE

9.3.1 Remove the set screws (35) and spring washers (36) from the top bearing cap (34). Remove the top bearing cap (34) from the motor housing (1).

9.3.2 Discard the O-ring (11C) from the top bearing cap (34) if O-ring (11C) is not in perfect condition.

Note: 150fr are not fitted with bearing cap 150fr have an upper sealed ball bearing).

9.3.3 See note below. Remove the set screws (9) and spring washers (13) holding the motor housing (1) to the bottom bearing bracket (7).

9.3.4 Using the jacking screw holes provided jack the motor housing (1) off the bottom bearing bracket (7).

9.3.3 Lift the entire motor frame vertically until it clears the top of end of the shaft (4). Lift with extreme care to ensure windings are not damaged. The slightest bump can result in permanent damage. The inner ring of the top bearing (5) remains on the shaft, sliding through the rollers of the bearing and through the oil seal (96). Place the motor frame on clean dry timbers.

NOTE: The motor housing should only be initially lifted 100mm. The lead to the water sensor probe (32) should be disconnected at the spade connector before lifting the motor completely off the bottom bearing bracket.

9.3.4 Discard the O-ring (11A) if not in perfect condition.

9.3.5 Remove the oil seal (96) by tapping it down, out of the bore, allowing it to drop through the motor housing.

9.3.6 Remove the outer race of the top bearing (5) from the motor housing (1). Do this by using a bearing puller or by inverting the housing and tapping the race out of the bore.

9.3.7 Clean the recess where the top bearing (5) seats of all grease.

9.3.8 If the stator (2) needs to be pressed out of the motor housing (1) the position of the stator in the housing should be measured and recorded so that it may be replaced in the same position when it is re-installed. Stator is an interference fit in the housing and requires a press to remove.

9.3.9 Remove the circlip (39) from the bottom bearing bracket (7). With 300fr motors remove fasteners (41 & 65) retaining bearing cap (40).

9.3.10 Lift the shaft (4) complete with top bearing inner ring (5), rotor (3) and bottom bearing (6) out of the bottom bearing bracket (7). If the outer race of the bottom bearing bracket (6) will not slide out of the bottom bearing bracket it may be necessary to apply heat quickly and uniformly around the boss of the bottom bearing bracket which houses the bottom bearing.

9.3.11 Lay the shaft on a clean bench at a suitable working height.

9.3.12 Remove the bottom bearing (6) with a bearing puller taking care not to damage the shaft particularly in the area where the mechanical seal sits.

9.3.13 Remove the inner ring of the top bearing (5) from the shaft with a bearing puller. It is permissible to grind a flat through one side of the ring and knock the ring off the shaft however **extreme care must be taken** not to damage the shaft.

9.3.14 Thoroughly clean all the components and lay them out on a clean, dry surface for re-assembly.

10.0 TO ASSEMBLE THE MOTOR (REFER SECTION 12 FOR SECTIONAL ARRANGEMENT DRAWINGS)

10.1 ASSEMBLY PROCEDURE

10.1.1 All parts including stator should be thoroughly cleaned before reassembly. If stator has been contaminated then clean and revarnish. Before the motor is re-assembled the motor housing (1) with the stator (2), shaft (4) with the rotor (3), desiccating bag (57), bottom bearing bracket (7) and seal plate (12) should all be placed in a drying oven at 80 - 90 degrees celsius overnight. The motor must be assembled on the same day that the components are removed from the drying oven, preferably while still warm. This ensures maximum displacement of any moisture from stator.

10.1.2 After the stator has been taken from the drying oven it should have the electrical checks detailed in section 3 carried out on it. It is important to carry these checks out at this stage so that it is confirmed that the stator is sound before assembly commences.

10.1.3 Before commencing to re-assemble the motor check that all the replacement parts are to hand. It is recommended that no O-rings, bearings or seals are reused when the motor is rebuilt.

10.1.4 Place the shaft (4) on a clean bench at a suitable working height.

10.1.5 Thoroughly clean the area on the shaft (4) where the bottom bearing (6) will sit with acetone to remove all traces of grease or oil. With 300fr motor slide bearing cap (40) over shaft.

10.1.6 Apply Loctite 241 to the shaft (4) on the cleaned area just prior to fitting bearing.

10.1.7 Clean out bottom bearing after removing bottom shield. Heat the bottom bearing (6) slightly so that it just slides onto the shaft. Do not over heat bearing. If it is necessary to apply pressure to seat the bearing against the shaft shoulder a dolly should be used to apply the force to the inner ring of the bearings. Pack bearing with grease BRBS72 (do not over grease). Spin bearing by hand and remove excess grease. Refit bearing shield.

10.1.8 Lift the shaft and position it above the bottom bearing bracket (7).

10.1.9 Lower the shaft (4) and allow the bearing to slide into the bottom bearing bracket (7). If the outer race of the bearing will not slide into the bottom bearing bracket apply heat quickly and uniformly around the boss which houses the bottom bearing. Care should be taken not to raise the temperature to a point where the grease begins to break down.

10.1.10 Replace the circlip (39). For 300fr fix retaining cap (40) with fixings (41 & 65).

10.1.11 Fit the inner race of the top bearing (5) to the shaft (4) using the same procedure outlined in section 10.1.5 to 10.1.7.

10.1.12 Fit the oil seal (96) to the motor housing (1) by tapping it down into its bore so that the top edge is level with the bearing bore. Ensure its correct orientation when fitting. (To retain grease).

10.1.13 Fit the outer race and rollers of the top bearing (5) to the motor housing (1). Apply heat quickly and uniformly around the boss which houses the bearing until the outer race just slides to the bottom of the bore.

Care should be taken not to raise the temperature to the point where the bearing or grease seal is affected. Use a press and suitably sized pipe jig to press outer race into place.

10.1.14 Lightly grease both the bearing race and oil seal (96) with SKF LGHT 3/1 high temperature grease.

10.1.15 Cover the top bearing (5) with a clean, dry, dust free cloth to keep dust and dirt out of the bearing.

10.1.16 If the stator (2) was pressed out of the motor housing (1) in section 9.3.5 it should be pressed back into the housing paying particular attention that it is in its original position and that the winding overhangs are not damaged in any way. Feed stator tails through side of housing and reconnect to terminal block.

The correct position of the stator (2) is centralised around the rotor.

10.1.17 Replace the O-ring (11a) on the bottom bearing bracket (7).

10.1.18 Lift the motor housing (1) across to the bottom bearing bracket. Position the housing above the shaft (4) and rotor (3) and slowly lower the housing over the rotor ensuring that the stator does not scrape down the side of the rotor.

The motor housing (1) should be held approximately 100mm above the bottom bearing bracket (7) while the control wire is connected to the water sensor (32) with its spade connector.

10.1.19 The motor housing may require rotation to line it up with the holes in the bottom bearing bracket (7).

Care should be taken that the O-ring (11a) is not pinched as the housing seats home.

The insulation between the water sensor probe (32) and the motor housing should be checked with a 500 volte Megahom Meter. Test from the water sensor lead to the motor housing. The reading should show infinity.

10.1.20 Replace the fixings (9 & 13) and tighten. Through out the assembly procedure turn shaft by hand ensuring it is free to rotate at all times.

10.1.21 Replace the O-ring (11C) to the top bearing cap (34). Fit the top bearing cap (34) to the motor housing (1). Replace the set screws (35) and spring washers (36) to the top bearing cap (34) and tighten.

10.1.22 Lift the motor at its lifting points and lay it on a bench at a suitable working height.

10.2 **CABLE ASSEMBLY**

10.2.1 Lift the terminal box (16) across to the motor.

10.2.2 Renew the O-ring (11E).

10.2.3 Position the terminal box so that the motor tails and leads reach the terminal blocks (232). Reconnect wires as per original connection.

10.2.4 Wire the earth leads to the motor housing (1) using the earth screw (29) and spring washer (28).

10.2.5 Feed the motor tails back into the motor as the terminal box (16) is placed into position against the motor housing (1).

10.2.6 Replace the set screws (26) and (22) with the spring washers (27) then tighten. Carry out insulation & continuity checks through cable to ensure no damage has occurred during assembly.

10.3 **TO ASSEMBLE THE MECHANICAL SEAL**

10.3.1 Thoroughly inspect the shaft (4), bottom bearing bracket (7) and seal chamber (12) in the areas which the mechanical seal (21) will seat. They should be free from scratches and burrs and be spotlessly clean. Pressure compensator is fitted (150fr, 165fr & 300fr motors only). Replace if it has collapsed.

10.3.2 Lubricate the shaft and elastomer components with detergent and water to assist in the assembly.

10.3.3 Check that the O-ring is properly seated in both of the seal seat assemblies.

10.3.4 Fit the seal seat assembly into the bottom bearing bracket (7). If the seal seat is difficult to push into the recess it is permissible to cover the seal seat with a clean piece of cardboard fashioned to slide over the shaft and exert pressure on the cupboard with a bronze tube. Both seal seats are tungsten carbide. The upper rotating seal head can be carbon or tungsten carbide (carbon is standard).

10.3.5 Wipe the faces of the seal with a clean, dry, dust free piece of cloth so that it is thoroughly clean.

10.3.6 Lightly oil the faces of the seal. Slide upper seal head along shaft until faces contact. The seal head can incorporate bellows which make it quite tight to press onto the shaft.

For internal type single spring seals (1.1/8")

10.3.7 Install spring making sure it is properly seated over the retainer. (It is sometimes advantageous to compress spring and tie in compressed state until lower seal head is fitted).

10.3.8 Fit the seal seat to the seal chamber (12) using similar procedure as upper seal.

10.3.9 Replace the O-ring (11b) on the seal chamber (12).

10.3.10 Slide product end seal head onto the shaft ensuring the spring is located correctly over the retainer. **Important:- Leave seal head positioned so that final compression of the spring will be by the seal chamber.** (Care should be taken not to damage the lapped face). Note the bottom product faces are tungsten carbide to tungsten carbide).

10.3.11 Before installing the seal chamber (12) clean and oil both lapped faces. The sliding the seal chamber over the shaft as far as it will go and fit securing bolts. Tighten screws or bolts evenly to keep seal and seat at right angles to the shaft. Tightening of the seal chamber (12) automatically sets the seal into it's correct position.

For multi spring back to back seals

10.3.12 Slide seal head retainer on shaft complete with springs until faces meet.

10.3.13 Compress springs to correct working length (refer appendices).

10.3.14 Tighten grub screws evenly and firmly to shaft.

NOTE: Seal must not be allowed to rest on the shaft too long before the end plate is placed in position, as the bellows has a tendency to adhere to the shaft.

As noted above final compression of spring must be executed when fitting seal chamber. Oil chamber must be filled (as per maintenance instruction) before the pump is run. Bellow seals are often tight on the shaft requiring extra pressure and lubrication to fit.

NEVER RUN THE SEAL DRY !!

10.3.15 Fit the seal plate (12) to the bottom bearing bracket (7) and tighten fixings (13) and spring washers. Rotate shaft by hand during the assembly process to ensure it does not bind. Where applicable fit external seal using same procedure as above for the internal multi spring seal.

10.3.16 For 203fr & 260fr. Stand unit vertically and fill the oil chamber with Whiterex 307 or an equivalent and replace the plugs (15B & 15A). A thread sealant should be used on these plugs to ensure a good seal. Unit is filled through (15B) with level plugs (15A). **DO NOT OVER FILL WITH OIL.** Fill chamber through 15B until oil just starts to flow out of 15A. For 150fr, 165fr & 300fr lay motor on its side and fill completely with oil.

10.3.17 Hold motor vertically and immerse shaft and lower section of seal plate (12) in a container of water. Run the motor for a maximum of two minutes for 2 pole motors and five minutes for four or six pole machines. Let it stand for a further thirty minutes. Check the shaft for any oil due to the seals leaking. If the amount of oil showing is only very slight clean the shaft carefully and repeat the two or five minute run.

If oil still leaks from the seal they have not been fitted correctly and their installation should be checked, especially the O-rings.

10.3.18 Replace the key (33).

10.3.19 Turn the motor shaft by hand to ensure that no binding has occurred. Shaft runout should be checked to ensure it is running true (within 0.05mm).

10.3.20 Remove the plug (15d) in the motor housing (1). Screw in a T-piece fitted with stop valves. Attach a vacuum pump to one branch and a bottle of dry nitrogen to the other. Evacuate the motor to a pressure of -50 to -60 Kpa (gauge pressure) and isolate the vacuum pump with the valve. Check that the motor will hold this vacuum for ten minutes. If the vacuum diminishes it is possible that an O-ring has been damaged during assembly and the O-ring will require replacement. If vacumn holds open the valve to the nitrogen tank and charge the motor with nitrogen to a pressure of 30 Kpa (gauge pressure). Repeat this procedure to ensure all air is purged from the motor.

11.0 TO ASSEMBLE THE PUMP

11.1 ASSEMBLY PROCEDURE (NON CLOG PUMP)

11.1.1 Using a new gasket is recommended during the assembly procedure below. Use anti seize on all threads.

11.1.2 Renew the discharge sealing ring (120) if required.

11.1.3 Lay the motor unit on bench at a suitable working height.

11.1.4 If the impeller wear ring (107) was removed refit a new wear ring by heating the new ring and pressing in onto the impeller (102). If required "scotch key" impeller wear ring to impeller.

11.1.5 Fit the key (33) into the shaft. Ensure key is a tight fit and all burrs in keyway and key have been removed.

11.1.6 Fit the impeller (102) onto the shaft and ensure the shaft and impeller are correctly engaged. Take care that there are no burrs, defects or dirt on the shaft or impeller bore as this will affect the fit. Prior to fitting impeller balance should be checked to ensure normal wear has not caused imbalance.

11.1.7 Fit the locknut washer (104) and screw the locknut (103) onto the thread. Locknut is the nyloc type and particular care should be taken not to damage thread on the pump shaft (4).

11.1.8 Tighten the locknut (3).

11.1.9 Check runout of impeller using a dial gauge. Runout should be within 0.2mm.

11.1.10 If the case wear ring (108) requires replacing in section 8 replace the new wear ring by pressing it into the volute (101).

11.1.11 Attach a sling to the motor complete with impeller and lift the motor over to where the pump volute is supported on clean, dry timbers.

11.1.12 Renew the gasket (113) which will be between the motor and the volute (101).

11.1.13 Lower the motor onto the double ended studs (117) making sure that the lifting points on the motor are on the same centre line as the discharge of the pump.

11.1.14 Screw the nuts (112) onto the double ended studs (117). Tighten the nuts (112) to tension.

11.1.15 Turn impeller by hand to ensure it is free. Before running the pumpset the installation procedure in section 6 should be followed through thoroughly.

11.2 **ASSEMBLY PROCEDURE (SHREDDER PUMP)**

11.2.1 FIT KEYS TO SHAFT. ENSURE the keys are fitted correctly. Slide impeller (2) on to shaft.

11.2.2 PLACE VOLUTE (1) ON BENCH. Replace shredder ring (8) and fix into place with fixing (27) and back up washers (63).

11.2.3 Lift volute into place and slide over impeller. Bolt volute (1) to motor with fixing (17). Tension fixings. Lay motor on its side.

11.2.4 Slide shredder cutter (7) onto shaft then lock into place with locknut (3) and washer (4).

11.2.5 Turn cutter by hand to ensure rotating element is free. Before running the pump set theinstallation procedure in Section 6 should be followed through thoroughly.

11.3 **ASSEMBLY PROCEDURE (CUTTER PUMP)**

11.3.1 Assembly of cutter pump is generally similar to non clog pumps with the exception of impeller and suction cover.

11.3.2 Inspect the cutting face of impeller blade. If face is worn or chipped it can be re-surfaced with wear resistant metal spray. Fit impeller following similar procedure as Non Clog Pump.

11.3.3 Once volute, impeller and motor are in place the suction cover can be fitted.

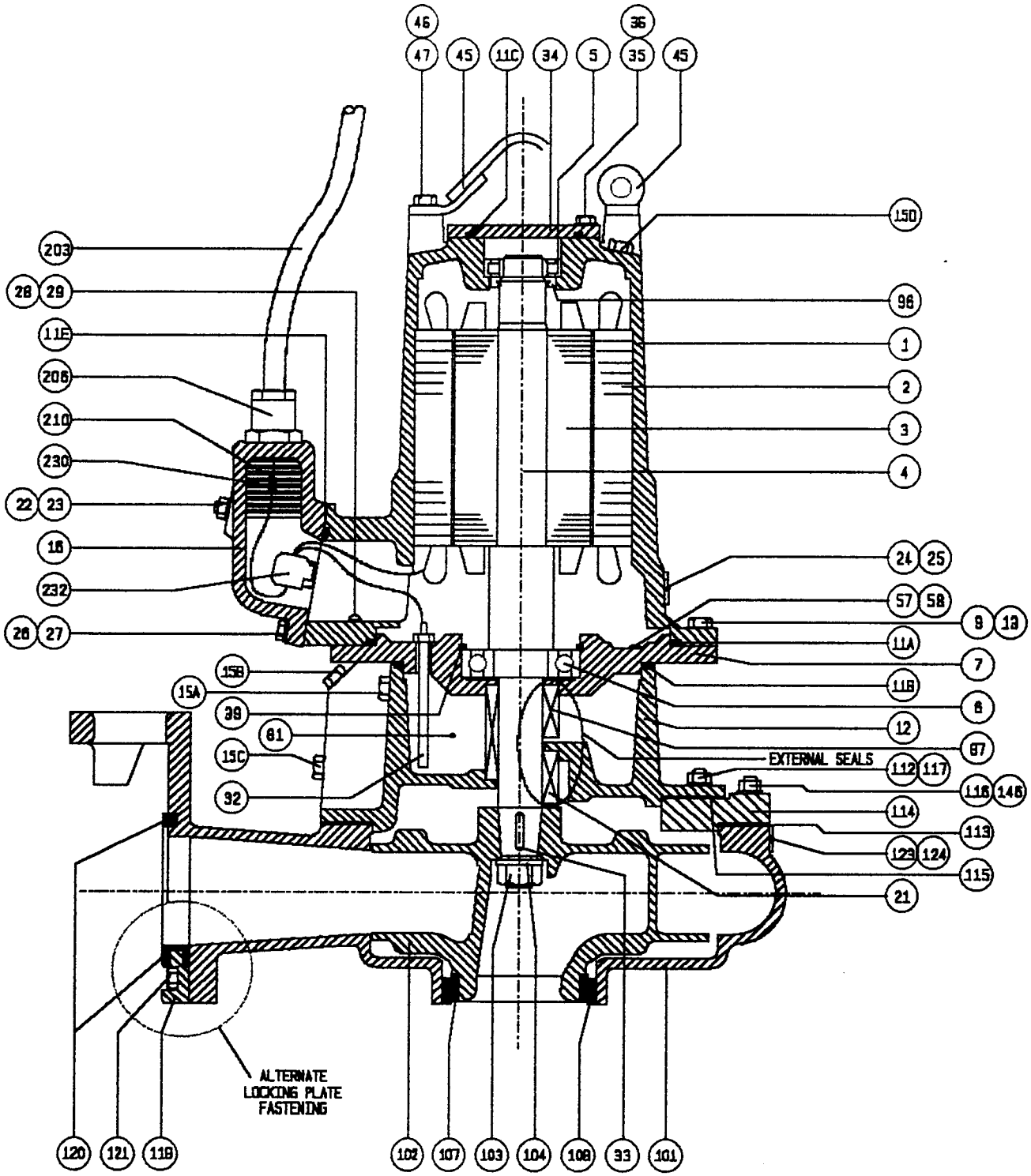
11.3.4 If suction cover has worn excessively then replace.

11.3.5 Slide suction cover onto volute. The cover needs to be packed out with approx. 0.8mm gaskets until the cutting blade just clears the suction cover. Tension suction cover in place then turn impeller by hand to ensure impeller does not foul with cover.

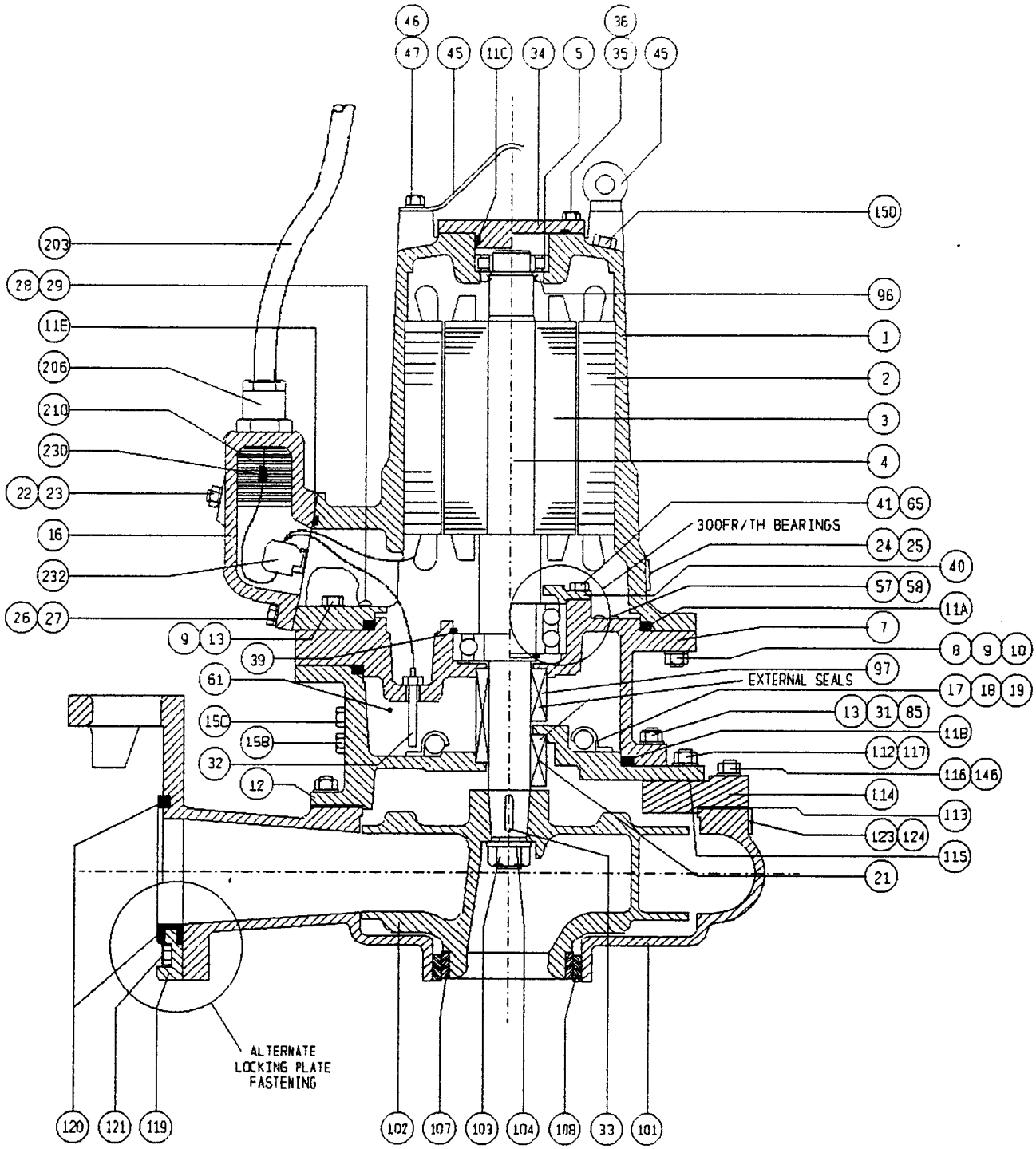
11.3.6 Install as per Non Clog Pump.

12.0 APPENDICES

12.1 SECTIONAL AND DIMENSIONAL DRAWINGS



A203FR AND A260FR MOTORS



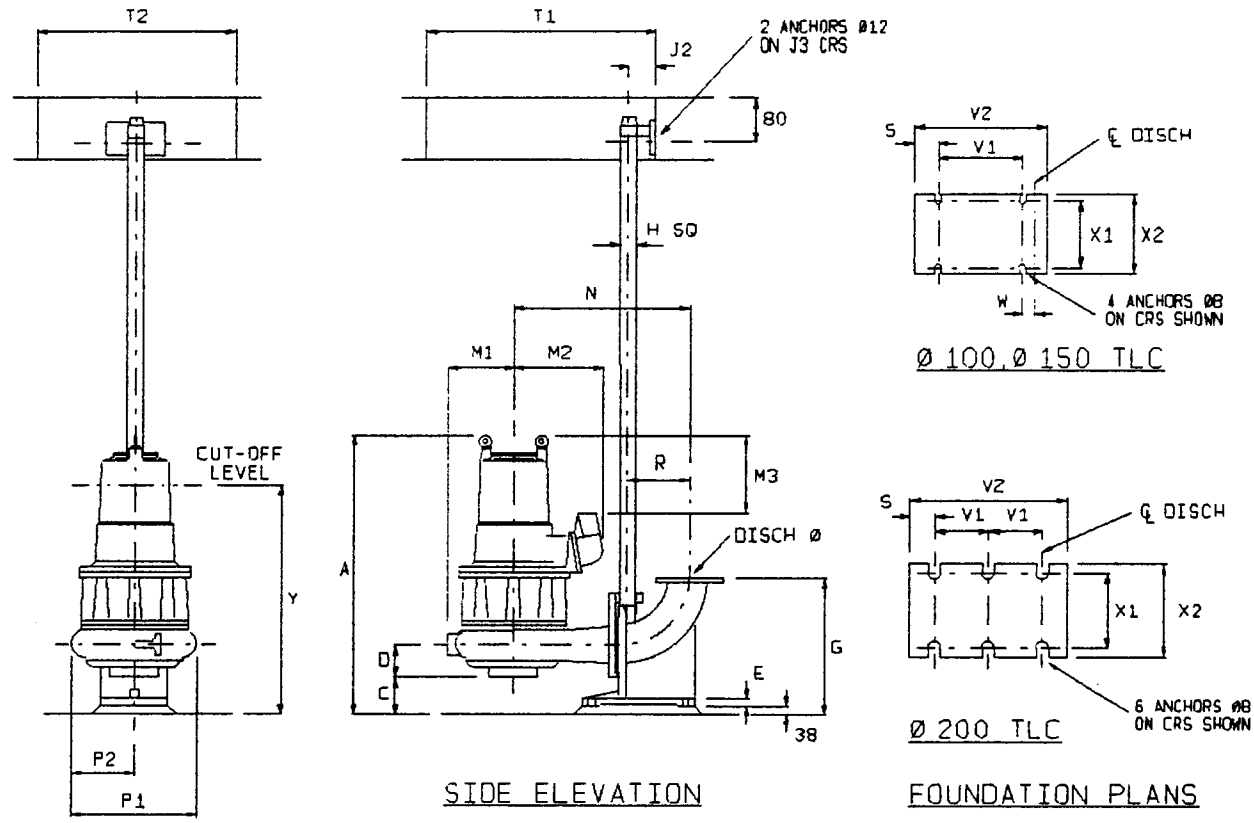
A165FR, A300FR AND A300FR MOTORS

MOTOR AND PUMP ASSEMBLY

ITEM	DESCRIPTION	MATERIAL	MATERIAL STANDARD
1	Housing	CI GR 220	AS 1830-1985
2	Stator	-	AS 1359
3	Rotor	-	AS 1359
4	Shaft	Stainless Steel 431	AS 2857-1986
5	Bearing	-	-
6	Bearing	-	-
7	Bottom Bearing Bracket	CI GR 220	AS 1830-1985
8	Fastener	Stainless Steel 304	AS 1111-1980
9	Spring Washer	Stainless Steel 316	AS 1968-1968
10	Nut	Stainless Steel 304	AS 1112-1980
11a	'O' Ring - Mtr Housing	Lurene	AS 2842-1986
11b	'O' Ring - Btm Brg Brkt	Lurene	AS 2842-1986
11c	'O' Ring - Top Brg Brkt	Lurene	AS 2842-1986
11d	'O' Ring - Terminal Box	Lurene	AS 2842-1986
11e	'O' Ring - Btm Brg Cap	Lurene	AS 2842-1986
12	Seal Chamber	CI GR 220	AS 1830-1985
13	Fastener	Stainless Steel 304	AS 1111-1980
15a	Plug - Oil Level	Stainless Steel 304	DZ9-1973
15b	Plug - Filler	Stainless Steel 304	DZ9-1973
15c	Plug - Oil Drain	Stainless Steel 304	DZ9-1973
15d	Plug - Gas	Stainless Steel 304	DZ9-1973
16	Terminal Box	CI GR 220	AS 1830-1986
17			
18			
19			
21	Mechanical Seal	TC/TC - TC/C	-
22	Fastener	Stainless Steel 304	AS 1111-1980
23	Nut	Stainless Steel 304	AS 1112-1980
24	Name Plate	Stainless Steel 316	AS 1449-1980
25	Rivet	Stainless Steel 304	B118-1953
26	Fastener	Stainless Steel 304	AS 1111-1980
27	Spring Washer	Stainless Steel 316	AS 1968-1976
28	Spring Washer	Stainless Steel 316	AS 1968-1976
29	Earth Screw	Stainless Steel 304	B194-1970
31	Nut		
32	Water Sensor (optional)	-	-
33	Key	Stainless Steel	ISO 3912-1977
34	Top Bearing Cap	CI GR 220	AS 1830-1986
35	Fastener	Stainless Steel 304	AS 1111-1980
36	Spring Washer	Stainless Steel 316	AS 1968-1976
39	Circlip	Carbon Steel	AS 1447-1981
40	Btm Brg Cap		
41	Fastener		
45	Eye Bolt	Forged Steel	AS 2317-1984
45	Lifting Bridle		
46	Fastener	Stainless Steel 304	
47	Spring Washer	Stainless Steel 316	
57	Dessicator Bag	Silica Gel	-
58	Rivet	Stainless Steel 304	B118-1953
61	Oil	Shell Tellus 68	AS 1767-1975
65	Spring Washer		
85	Spring Washer		
96	Oil Seal	-	-
97	Mechanical Seal	TC/TC	-

MOTOR AND PUMP ASSEMBLY

ITEM	DESCRIPTION	MATERIAL	MATERIAL STANDARD
101	Volute	CI GR 220	AS 1830-1985
102	Impeller	CI GR 220	AS 1830-1985
103	Nuloc Nut	Stainless Steel 304	AS 1285-1973
104	Washer	Stainless Steel 304	AS 1237-1973
107	Wear Ring - Impeller	Mild Steel	AS 2574-1982
108	Wear Ring - Volute	Ni Cr Iron	AS 2027-1985
112	Nut	Stainless Steel 304	AS 112-1980
113	Gasket	B.A. Unit	AS 2544-1982
114	Motor Adaptor	CI GR 220	-
115	Gasket	B.A. Unit	-
116	Fastener	Stainless Steel 304	
117	Fastener	Stainless Steel 304	AS 1111-1980
119	Locking Plate	CI GR 220	AS 1830-1985
120	Sealing Ring	Neoprene	AS 2544-1982
121	Fastener	Stainless Steel 304	-
123	Name Plate	Stainless Steel 316	AS 1449-1980
124	Rivet	Stainless Steel 304	B118-1953
146	Nut	Stainless Steel 304	
203	Cable	-	AS 2893-1986
206	Cable Gland	Brass - S/S Plated	AS 1567-385C
210	Epoxy	-	AS 1147.1-1989
230	Cable Link	Copper	AS 1299-1989
232	Terminal Box	Melamine	AS 1299.1989


T2
CUT-OFF LEVEL
Y
P2
P1
END ELEVATION
T1
J2
2 ANCHORS Ø12 ON J3 CRS
80
H SQ
N
M1
M2
R
M3
DISCH Ø
A
D
C
E
G
38
SIDE ELEVATION
V2
S
V1
℄ DISCH
X1
X2
W
4 ANCHORS Ø8 ON CRS SHOWN
Ø 100, Ø 150 TLC
V2
S
V1 V1
℄ DISCH
X1
X2
6 ANCHORS Ø8 ON CRS SHOWN
Ø 200 TLC
FOUNDATION PLANS
FLANGE DRILLING TO AS2129, TABLE 'D'
DIMENSIONS SHOWN IN MILLIMETRES

MODEL	MOTOR FRAME	DISCH	A	B	C	D	E	G	H	J2	J3	M1	M2	M3	N	P1	P2	R	S	T1	T2	V1	V2	W	X1	X2	Y
E100-280	150	100	806	12	135	106	28	459	50	86	121	205	N/A	N/A	568	408	204	199	31	900	700	300	362	12	179	220	668
	165	100	828	12	135	106	28	459	50	86	121	205	185	277	568	408	204	199	31	900	700	300	362	12	179	220	760
	203	100	925	12	135	106	28	459	50	86	121	205	294	265	568	408	204	199	31	900	700	300	362	12	179	220	810
	260	100	1005	12	135	106	28	459	50	86	121	205	294	387	568	408	204	199	31	900	700	300	362	12	179	220	759
E100-340	203	100	924	12	138	103	28	459	50	86	121	244	294	265	566	489	256	199	31	900	700	300	362	12	179	220	759
	260	100	1071	12	138	103	28	459	50	86	121	244	294	387	566	489	256	199	31	900	700	300	362	12	179	220	859
E100-350	260	100	1071	16	127	114	28	459	50	86	121	319	294	387	598	548	274	199	31	900	800	300	362	12	179	220	859
E100-380	260	100	1108	16	146	95	28	459	50	86	121	280	294	387	613	560	280	199	31	900	800	300	362	12	179	220	913
	300	100	1162	16	146	95	28	459	50	86	121	280	274	435	613	560	280	199	31	900	800	300	362	12	179	220	922
E100-405	260	100	1076	16	127	114	28	459	50	86	121	319	294	387	598	548	274	199	31	900	800	300	362	12	179	220	881
	300	100	1137	16	127	114	28	459	50	86	121	319	274	435	598	548	274	199	31	900	800	300	362	12	179	220	897
	350	100	1267	16	127	114	28	459	50	86	121	319	442	416	598	548	274	199	31	900	800	300	362	12	179	220	987
K150-330	203	150	1000	16	186	122	28	463	75	121	171	242	294	265	654	484	242	234	32	900	800	375	438	N/A	225	275	835
	260	150	1147	16	186	122	28	463	75	121	171	242	294	387	654	484	242	234	32	900	800	375	438	N/A	225	275	952
	300	150	1165	16	186	122	28	463	75	121	171	242	274	435	654	484	242	234	32	900	800	375	438	N/A	225	275	925
	350	150	1334	16	186	122	28	463	75	121	171	242	442	416	654	484	242	234	32	900	800	375	438	N/A	225	275	1054
K150-350	260	150	1136	16	151	157	28	463	75	121	171	289	294	387	683	572	315	234	32	1000	800	375	438	N/A	225	275	941
	300	150	1210	16	151	157	28	463	75	121	171	289	274	435	683	572	315	234	32	1000	800	375	438	N/A	225	275	970
	350	150	1334	16	151	157	28	463	75	121	171	289	442	416	683	580	315	234	32	1000	800	375	438	N/A	225	275	1054
	370	150	1334	16	151	157	28	463	75	121	171	289	442	416	683	580	315	234	32	1000	800	375	438	N/A	225	275	1054
K150-405	260	150	1142	16	218	90	28	463	75	121	171	283	294	387	781	569	305	234	32	900	800	375	438	N/A	225	275	947
	300	150	1204	16	218	90	28	463	75	121	171	283	274	435	781	569	305	234	32	900	800	375	438	N/A	225	275	964
	350	150	1334	16	218	90	28	463	75	121	171	283	442	416	781	569	305	234	32	900	800	375	438	N/A	225	275	1054
	370	150	1334	16	218	90	28	463	75	121	171	283	442	416	781	569	305	234	32	900	800	375	438	N/A	225	275	1054
K200-360	260	200	1369	20	370	132	35	695	75	146	241	330	294	387	936	635	350	302	51	1000	800	254	610	N/A	305	406	1174
	300	200	1401	20	370	132	35	695	75	146	241	330	274	435	936	635	350	302	51	1000	800	254	610	N/A	305	406	1161
	350	200	1527	20	370	132	35	695	75	146	241	330	442	416	936	635	350	302	51	1000	800	254	610	N/A	305	406	1247
	370	200	1527	20	370	132	35	695	75	146	241	330	442	416	936	635	350	302	51	1000	800	254	610	N/A	305	406	1247

12.2 TABLES FOR ROUTINE MAINTENANCE

MAINTENANCE CHART

	DAILY	WEEKLY	MONTHLY	3 MONTHLY	6 MONTHLY	YEARLY	REMARKS
Check for leaks.	■		■				Extend to monthly if proved satisfactory during running-in.
Check electrical continuity & insulation resistance.			■		■		Extend to 6 monthly if proved satisfactory during running-in.
Check oil in seal chamber, drain & refill.					■	■	Extend to 12 monthly if proved satisfactory during running in and 1500 hrs. Running not exceeded.
Check for vibration.	■	■					Extend to weekly if proved satisfactory during running-in.
Check cable for damage.					■		Depending on environmental condition.
Inspect wear rings.				■			Frequency can be changed depending on findings and pumping conditions.
Check for undue wear or corrosion of volute or impeller.				■		■	Check at end of first 3 months. Extend to yearly dependant on environmental and pumping conditions.
Check holding down bolts for tightness				■		■	Check at end of running in period, then at 12 monthly intervals.
Remove Waterjacket and clean out all feeder lines. (if applicable)					■		Depending on environmental condition.

PUMP OVERHAUL

The pump should be completely overhauled if the discharge pressure drops below an acceptable level the overhaul procedure is detailed in the maintenance instructions.

MOTOR OVERHAUL

The motor requires overhauling if an excessive amount of water is present in the seal chamber. The motor bearings should be replaced at each major overhaul.

PROBLEM SOLVING

PROBLEM SOLVING AND REMEDIAL ACTION REQUIRED

(A)	Power failure.	- Restore power.
(B)	Damaged cable.	- Repair or replace cable.
(C)	Blown fuses.	- Check to ensure the correct rating is being used. Check that the pump is not jammed. Check voltage supply. Carry out insulation and continuity checks. Replace fuse.
(D)	Thermistor failure.	- Check thermistors. Check for open circuit in thermistor wiring. Check backup relay. Check if more than 2.5 volts has been applied across thermistors.
(E)	Overload tripped.	- Reset. Follow procedure as for Item C.
(F)	Circuit breaker tripped.	- Reset. Follow procedure as for Item C.
(G)	Jammed/choked impeller.	- Remove cause of blockage.
(H)	Restriction/discharge line.	- Remove restriction, check gate valve.
(I)	Worn wear ring.	- Replace wear rings.
(J)	Excess air in liquid.	- Check inlet lines into station and relocate if necessary. Check level in well.
(K)	Head higher than design head.	- Check systems. Check for blockages in system.
(L)	Loose or damaged wiring.	- Repair or replace as required.
(M)	Open circuit/burnt-out stator.	- Replace, repair or rewind stator as required.
(N)	Loose plug/seal compartment.	- Tighten.
(O)	Damaged/worn mechanical seal.	- Replace or repair. NOTE - In some cases mechanical seals are suitable for re-installation after relapping of tungsten carbide faces.
(P)	"O" ring/gasket failure.	- Replace.
(Q)	Casting fracture/failure.	- Repair or replace as required.

TROUBLE SHOOTING

PUMP WILL NOT START

(A) Power failure.
(B) Damaged cable.
(C) Blown fuse.
(D) Thermistor failure.
(E) Jammed impeller.
(F) Overload tripped.
(G) Circuit breaker tripped.
(H) Electrical switch board fault.
(I) Motor incorrectly connected.
(J) Faulty motor winding.

PUMP STARTS BUT MOTOR HAS EXCESS CURRENT and/or LOW SPEED

(A) Wrong direction of rotation.
(B) Over or under voltage.
(C) Clogged impeller.
(D) Failed bearing.
(E) Fault in the motor.
(F) Incorrect motor connection.

PUMP RUNS BUT CAPACITY LOW

(A) Wrong direction of rotation.
(B) Impeller choked or inlet restricted.
(C) Restriction of discharge line.
(D) Wear rings worn excessively.
(E) Excessive air in liquid.
(F) Head higher than design head.
(G) Leakage from discharge.
(H) Supply voltage incorrect.

LOW RESISTANCE READING or SHORT

(A) Water in cone housing.
(B) Cable damaged.
(C) Water in stator housing.
(D) Stator burnt out.
(E) Loose wire.
(F) Wire clamped.

HIGH CONTINUITY READING

(A) Open circuit in stator.
(B) Broken wire or loose connection.
(C) Damaged cable.

12.3 RECOMMENDED SPARES & LUBRICANTS

RECOMMENDED SPARE PARTS LIST

DESCRIPTION	ITEM NO:
Bearing Upper	5
Bearing Lower	6
Mechanical Seal	21
Locknut	103
Wear Ring Impeller	107
Wear Ring Volute	108
Sealing Ring	120
'O' Ring & Gasket Set	

When ordering spare parts quote the serial number of the pump.

RECOMMENDED LUBRICANTS

Oil for Seal Chamber - Mobil Whiterex 307

Bottom Bearing Grease - BRBS72

Upper Bearing Grease - SKF LGHT 3/1 High Temperature Grease

12.4 **RECOMMENDED TOOL LIST**

This equipment can be serviced using standard equipment normally available to Electrical and Mechanical Tradespersons.

Meggar
Multimeter
Screwdrivers
Open ended spanners
Socket spanners & extension bars

Major overhauls should be carried out in a workshop containing the following:-

Presses
Heating Apparatus - Induction Heater
- Gas Flame Heater
- Oven
Bearing Pullers
Impeller Puller

12.5 PUMP PERFORMANCE CURVES AND SHEETS

KSB Ajax Pumps Pty. Ltd.

FORRERS PUMPS WORKS

A.C.N. 006 414 642

WORKS ORDER F.50284 ..... PUMP No. F.50284/1 ..... CONTRACT No. ..... DATE 6/12/95

CUSTOMER: MESSRS BRISBANE C.C. ..... TEST SHEET No. 1

TYPE OF PUMP N.C.D. ..... PUMP SIZE E.100-200 ..... SUC. DIA 150 mm ..... DELIVERY DIA. 100 mm

SPECIFIED DUTY R.P.M. 1440 ..... L/S 7 ..... TOTAL HEAD 24 m ..... TEMP. — ..... BAROMETER —

SYSTEM OF WATER MEASUREMENT V. NOTCH IN AIR ..... PUMP EFF. — ..... KwH/KL — ..... DRIVE DIRECT

MOTOR PARTICULARS: MAKER KSB AJAX ..... No F.50284/1 VOLTS 415 CYCLES 50 AMPS 23 PHASES 3 R.P.M. 1440 K.W 12

Time	R.P.M.	Quantity I.N.T.	Quantity Litres per Second	HEAD Suction	HEAD Delivery	HEAD Correction	HEAD Velocity	HEAD Total Head	Water Power K.W.	MOTOR DRIVE Volts	Amps	KWH Meters W1	KWH Meters W2	KWH Meters W3	K.W.H.	K.W.H. / 1000	P.F.	Motor Input Power K.W.	Motor eff.	Pump Input Power K.W.	Efficiencies % Pump W.P. / P.I.P.	Efficiencies % Overall W.P. / M.I.P.
		274	53.92	-.8	7.5	-.10	1.7	9.9	5.23	418 418 416	19	12.07	12.35	12.75		.0561		10.9	87	9.5	55.2	48
		240	38.62	-.39	14	-.08	1.0	14.41	5.48	419 420 420	18.5	13.37	13.73	14.3		.0699		9.8	"	8.5	64.4	56.1
		185	20.39	-.1	20	-.05	.2	20.25	4.04	420 421,421	14.3	16.99	17.54	18.03		.1108		8.1	"	7.1	57.2	49.8
		142	10.56	0	23	-.04	0	22.96	2.37	419 419 419	11.5	20.54	20.95	21.64		.1687		6.41	"	5.68	42.6	37.0
		109	5.48	+.1	24.6	-.02	0	24.48	1.31	419 420 420	11.1	22.85	22.95	24.25		.293		5.78	"	5.03	26.1	22.7
		58	3.22	+.2	25.5	-.02	0	25.28	.79	419 420 420	10.1	23.47	24.38	24.75		.4812		5.58	"	4.85	16.4	14.3
0		—	0	+.2	28	-.01	0	27.79	—	420 421 421	10	—	—	—		—		—		—	—	—
15		121	7.1	+.11	24	-.02	0	23.81	1.65	421 421	10.3	21.16	21.99	23.27		.2385		6.10	"	5.30	31.2	27.2
30																						
45																						
60																						
75						AH	∞															
90						AQ	∞															
105																						
120																						

WORKS TEST AS 2417 PART 2 - 1989			
QUOTED	WITH TOL'R.	AS TESTED	
—		.2385	KWH/L
—		31.2	EFF
7	$\left(\frac{\text{TOL}}{\Delta H}\right)^2 + \left(\frac{\text{TOL}}{\Delta Q}\right)^2$	7	L/S
24	∞	24	H.D.M

REMARKS:

Impeller Diameter = 274 Eye Dia. .....

C (Meter Constant in Revs/KWH) = 400

KW = R (No. of Revs) x 3600 / t (secs) x C = 5

S.B. No. 6-1

TESTED BY ..... TESTED IN THE PRESENCE OF .....

ISSUE DATE: 14/08/92

Thermister: 174 OHMS

Water Detector: — MEG OHMS

Thermostats: — OHMS

Insulation: ∞ MEG OHMS

Oil Check: O/K.

KSB Ajax Pumps Pty. Ltd.

FORRERS PUMPS WORKS

A.C.N. 006 414 642

WORKS ORDER F50284 PUMP No. F50284-2 CONTRACT No. DATE 5-12-95

CUSTOMER: MESSRS BRISBANE CITY COUNCIL TEST SHEET No. 1

TYPE OF PUMP NCD PUMP SIZE E100-280 SUC. DIA 150 mm DELIVERY DIA. 100 mm

SPECIFIED DUTY R.P.M. 1440 L/S 7 TOTAL HEAD 24 m TEMP. – BAROMETER –

SYSTEM OF WATER MEASUREMENT V NOTCH WEIR PUMP EFF. – KwH/KL – DRIVE DIRECT

MOTOR PARTICULARS: MAKER KSB AJAX No F50284-2 VOLTS 415 CYCLES 50 AMPS 23 PHASES 3 R.P.M. 1440 K.W. 12

Time	R.P.M.	Quantity I.N.T.	Quantity Litres per Second	HEAD FTA&B Suction	HEAD FTB3 Delivery	HEAD Correction	HEAD Velocity	HEAD Total Head	Water Power K.W.	MOTOR DRIVE Volts	Amps	KWH Meters W1	KWH Meters W2	KWH Meters W3	K.W.H.	K.W.H. / 1000	P.F.	Motor Input Power K.W.	Motor eff.	Pump Input Power K.W.	Efficiencies % Pump W.P. / P.I.P.	Efficiencies % Overall W.P. / M.I.P.
		272	52.95	-.7	7.7	-.10	1.7	10.0	5.19	$A_{21}^{A_{20}}$	18	12.53	12.59	13.19		.0554		10.57	87	9.20	56.4	49.1
		242	39.63	-.2	14.0	-.08	1.0	15.12	5.87	$A_{21}^{A_{20}}$	17	13.34	13.44	13.94		.0697		9.94	"	8.65	67.9	59.1
		185	20.35	0	20.0	-.05	.2	20.15	4.02	$A_{20}^{A_{20}}$	14.5	17.06	17.07	17.91		.1062		7.78	"	6.77	59.4	51.6
		138	9.84	+.2	23.0	-.04	0	22.76	2.19	$A_{21}^{A_{21}}$	13.0	20.63	20.31	21.38		.1834		6.50	"	5.65	38.8	33.8
		114	6.12	+.3	24.3	-.02	0	23.98	1.43	$A_{22}^{A_{22}}$	12.5	21.84	22.44	23.03		.2730		6.02	"	5.23	27.5	23.9
		102	4.65	+.3	24.8	-.02	0	24.48	1.11	$A_{22}^{A_{22}}$	12.0	22.69	22.57	23.84		.3501		5.86	"	5.10	21.9	19.0
0		–	0	+.3	27.7	-.01	0	27.39	—	$A_{22}^{A_{22}}$	12.0	—										
15		120	6.95	+.05	24.0	-.02	0	23.93	1.63	$A_{23}^{A_{23}}$	13.0	21.16	21.50	22.47		.2486		6.22	"	5.41	30.1	26.2
30																						
45																						
60																						
75					.25	AH																
90					.3	AQ																
105																						
120																						

WORKS TEST AS 2417 PART 2 — 980

QUOTED	WITH TOLR.	AS TESTED	
–		.2486	KWH/KL
–		30-1	EFF
7	$\left(\frac{H_2-H_1}{\Delta H}\right)^2+\left(\frac{Q_2-Q_1}{\Delta Q}\right)^2$	6.95	L/S
24	= 17.41	23.93	HD-M

REMARKS:

Impeller Diameter = 274 Eye Dia. Thermister: 168 OHMS

C (Meter Constant in Revs/KWH) 400 Water Detector: – MEG OHMS

KW = R (No. of Revs) x 3600 5 Thermostats: – OHMS

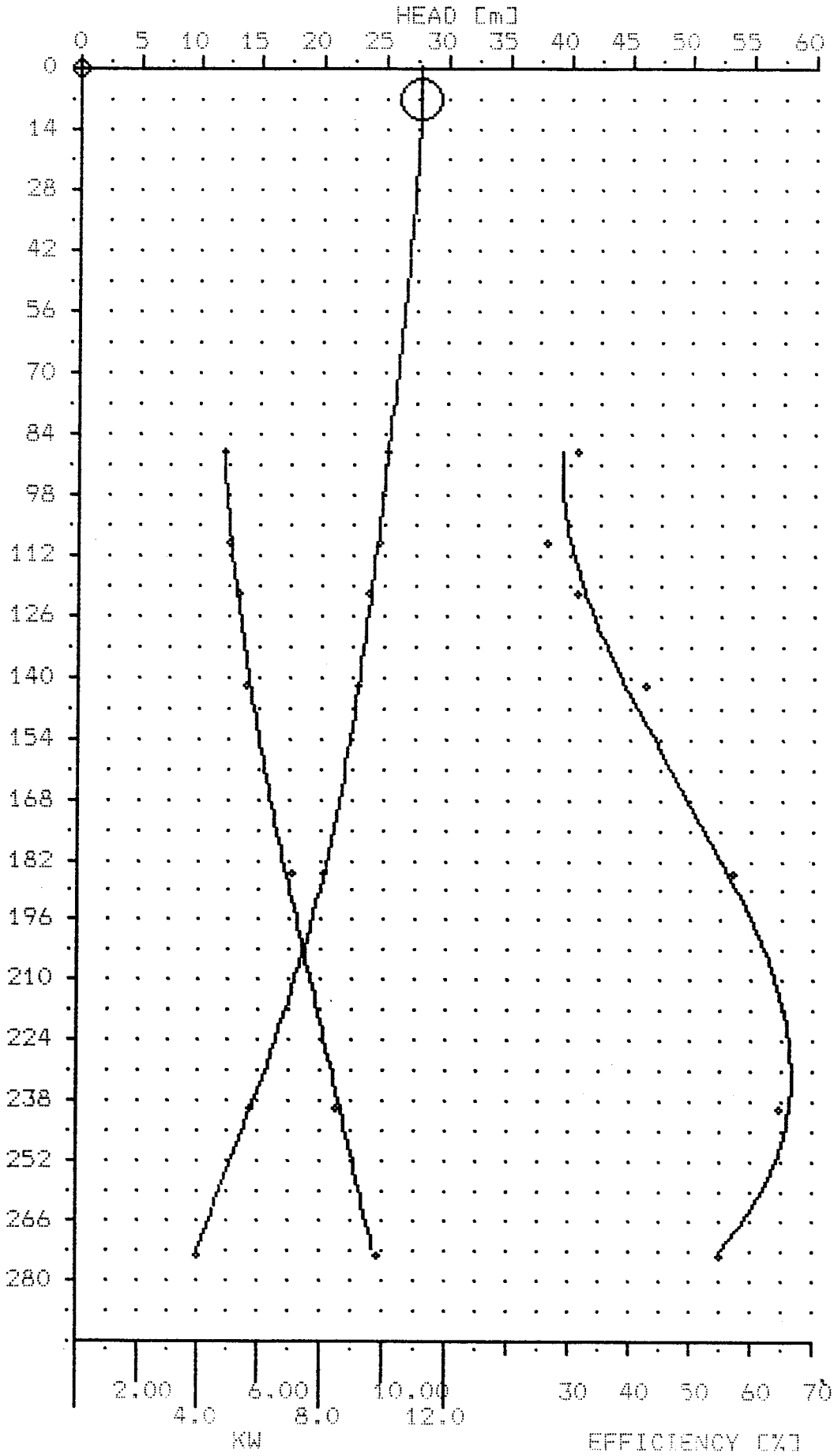
t (secs) x C S.B. No. 6-1 Insulation: ∞ MEG OHMS

TESTED BY TESTED IN THE PRESENCE OF Oil Check: ok

PUMP SERIAL NUMBER- F50284/1
MODEL- E100-200 TYPE- NCD
IMPELLER DIAMETER- 274 MM
CURVE No-

CUSTOMER- BRISBANE C/COUNCIL
SIZE- 100 MM DISCHARGE
MAX. SPHERE- 75 MM
DATE 06-12-95

TEST RESULTS ARE FOR CLEAN COLD WATER
DUTY POINT ONLY GUARANTEED WITHIN LIMITS OF AS2417-PART 2



PUMP DUTY PERFORMANCE
PUMP DUTY HEAD-24 M
PUMP EFFICENCY- %
MOTOR RATING-12 KW

PUMP DUTY FLOW-7 L/SEC
OVERALL EFFICENCY- %
MOTOR NOMINAL SPEED-1440 RPM

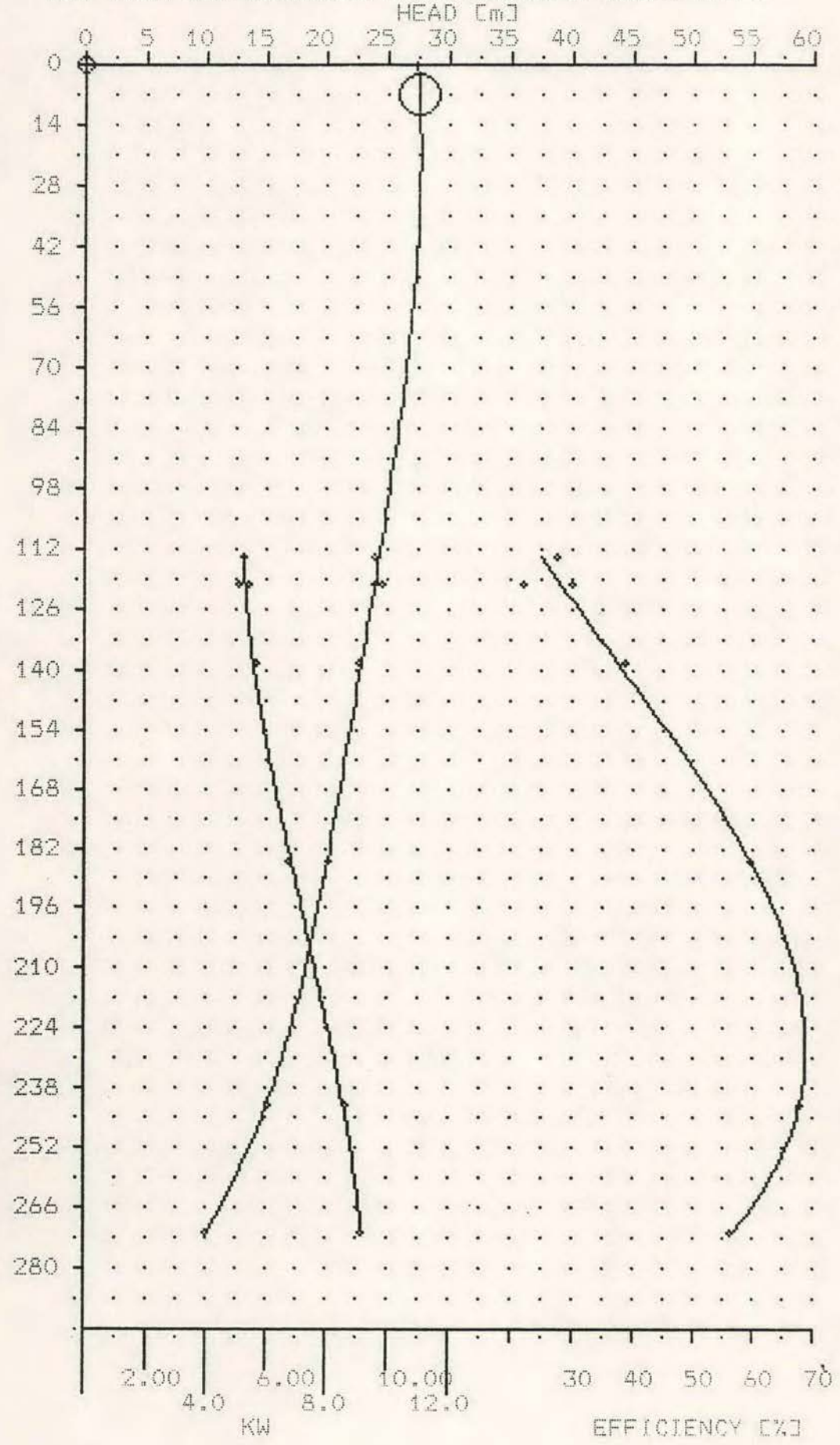
FORRERS PUMP WORKS
PUMP PERFORMANCE CURVE

6/10 ARGON STREET,
SUMNER PARK QLD 4074, AUSTRALIA
PHONE (07) 279 2433
FAX (07) 279 2434

PUMP SERIAL NUMBER- F50284-2
MODEL- E100-200 TYPE- NCD
IMPELLER DIAMETER- 274 MM
CURVE No-

CUSTOMER- BRISBANE C/COUNCIL
SIZE- 100 MM DISCHARGE
MAX. SPHERE- 75 MM
DATE 06-12-95

TEST RESULTS ARE FOR CLEAN COLD WATER
DUTY POINT ONLY GUARANTEED WITHIN LIMITS OF AS2417-PART 2



PUMP DUTY PERFORMANCE
PUMP DUTY HEAD-24 M
PUMP EFFICENCY- %
MOTOR RATING-12 KW

PUMP DUTY FLOW-7 L/SEC
OVERALL EFFICENCY- %
MOTOR NOMINAL SPEED-1440 RPM

FORRERS PUMP WORKS
PUMP PERFORMANCE CURVE

6/10 ARGON STREET,
SUMNER PARK QLD 4074, AUSTRALIA
PHONE (07) 279 2433
FAX (07) 279 2434

12.6 PUMP TECHNICAL DATA & DIMENSION SHEETS

FORRERS PUMP DETAILS

Model (Old Model No)	SP280	SGV100-150	SGV280	4S250/3	4S330/3
Model (New Model No)				E100-280	E100-340
Discharge Diameter	75	75	75	100	100
Inlet Diameter	75	75	75	125	170
Impeller Type	Shredder	Shredder	Shredder	Non Clog	Non Clog
Impeller Fixing	Locknut	Locknut	Locknut	Taper/Locknut	Taper/Locknut
Rang to fit pump	180 - 100	150 - 100	180 - 100	277 - 185	340 - 275
W/ring Diametrical Clearance	N/A	N/A	N/A	0.82-0.61	340 - 275
W/ring Fixing	N/A	N/A	N/A	Pressed	Pressed
Min Submergence - TLC	440	440	440	440	440
Weight - Pump Only	40	38	40	96	114

FORRERS PUMP DETAILS

Model (Old Model No.)	4S350/3	4S380/4	4S405/3	6D330/3.5	6D350/4
Model (New Model No.)	E100-350	E100-380	E100-405	K150-330	K150-350
Discharge Diameter	100	100	100	150	150
Inlet Diameter	168	100	185	125	150
Impeller Type	Non Clog	Non Clog	Non Clog	Non Clog	Non Clog
Impeller Fixing	Taper/Lockn ut	Taper/Lockn ut	Taper/Lockn ut	Taper/Lockn ut	Taper/Locknut
Range to fit pump	355 - 340	370 - 270	406 - 346	330 - 250	344 - 265
W/ring Diametrical Clearance	0.81-0.71	0.81-0.71	0.81 -0.71	0.81-0.71	0.81-0.71
W/ring Fixing	Pressed	Pressed	Pressed	Pressed	Pressed
Min Submergence - TLC	440	450	440	550	550
Weight - Pump Only	135	131	155	170	198

FORRERS PUMP DETAILS

Model (Old Model No)	6D405/3	6D430/4	6D480/3	8D360/4	8D405/4
Model (new Model No)	K150-405	K150-430	K150-480	K200-360	K200-405
Discharge Diameter	150	150	150	200	200
Inlet Diameter	170	168	157	185	212
Impeller Type	Non Clog	Non Clog	Non Clog	Non Clog	Non Clog
Impeller Fixing	Taper/Lockn ut	Taper/Lock nut	Taper/Lock nut	Taper/Lock nut	Taper/Lockn ut
Range to fit pump	406 - 345	440 - 342	485 - 435	364 - 272	406 - 350
W/ring Diametrical Clearance	0.81-0.71	0.81-0.71	0.71-0.71	0.89-0.64	0.79-0.64
W/ring Fixing	Pressed	Pressed	Pressed	Pressed	Pressed
Weight - Pump Only	190	218	340	310	320

12.7 MOTOR TECHNICAL DATA SHEETS

MOTOR TECHNICAL DATA
(COMMON CONSTRUCTION DETAIL)

Frame Size	150	164	203
Enclosure	IP68	IP68	IP68
Insulation Class	F	F	F
Mechanical Seal Size	1.1/8	1.1/8	1.5/8
Seal Face Material	TC/C TC/TC	TC/C TC/TC	TC/C TC/TC
Seal Style	BACK TO BACK FIGURE 1		BACK TO BACK FIGURE 2
NDE Bearing	6302 VV-C3	NU204 EC-C3	NU207 EC-C3
Size	Dia. 15	Dia. 20	Dia. 35
D.E. Bearing	6306 VV-C3	6306 VV-C3	6310 VV-C3
Size	Dia. 30	Dia. 30	Dia. 50
Bearing Lubrication	Sealed	Sealed/ Grease	Sealed/ Grease
Weight	40	86	155

Note: Bearing Types - Examples 6302 VV-C3 indicates ball bearing
NU204EC-C3 indicates roller bearing
7315BECB-C3 indicates to matched angular contact ball bearings

MOTOR TECHNICAL DATA
(COMMON CONSTRUCTION DETAIL)

Frame Size	260	300	350
Enclosure	IP68	IP68	IP68
Insulation Class	F	F	F
Mechanical Seal Size	2.1/4	2.1/4	2.7/8
Seal Face Material	TC/C TC/TC	TC/C TC/TC	TC/C TC/TC
Seal Style	TANDEM INTERNAL - EXTERNAL FIGURE 3		
NDE Bearing	NU209 EC-C3	NU209 EC-C3	NU212 EC-C3
Size	Dia. 45	Dia. 45	Dia. 60
D.E. Bearing	6312 VV-C3	3313 C3	7315 BECB-C3
Size	Dia. 60	Dia. 65	Dia. 75
Bearing Lubrication	Sealed/ Grease	Sealed/ Grease	Grease
Weight	215	315	555

Note: Bearing Types - Examples 6302 VV-C3 indicates ball bearing
NU204EC-C3 indicates roller bearing
7315BECB-C3 indicates to matched angular contact ball bearings

MOTOR TECHNICAL DATA
(COMMON CONSTRUCTION DETAIL)

Frame Size	370	420	470
Enclosure	IP68	IP68	IP68
Insulation Class	F	F	F
Mechanical Seal Size	2.7/8	3.5/8	3.5/8
Seal Face Material	TC/C TC/TC	TC/C TC/TC	TC/C TC/TC
Seal Style	TANDEM INTERNAL - EXTERNAL FIGURE 3		
NDE Bearing	NU212 EC-C3	NU212 EC-C3	NU212 EC-C3
Size	Dia. 60	Dia. 60	Dia. 60
D.E. Bearing	7315 BECB-C3	7319 BECB-C3	7319 BECB-C3
Size	Dia. 75	Dia. 95	Dia. 95
Bearing Lubrication	Grease	Grease	Grease
Weight	555	880	900

Note: Bearing Types - Examples 6302 VV-C3 indicates ball bearing
NU204EC-C3 indicates roller bearing
7315BECB-C3 indicates to matched angular contact ball bearings

MOTOR TECHNICAL DATA
(COMMON CONSTRUCTION DETAIL)

Frame Size	533		
Enclosure	IP68		
Insulation Class	F		
Mechanical Seal Size	4.7/8		
Seal Face Material	TC/C TC/CT		
Seal Style	TANDEM INTERNAL - EXTERNAL FIGURE 3		
NDE Bearing	NU315 EC-C3		
Size	Dia. 75		
D.E. Bearing	7226 BECB-C3		
Size	Dia. 130		
Bearing Lubrication	Grease		
Weight	1800		

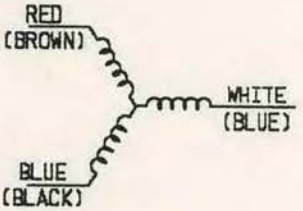
Note: Bearing Types - Examples 6302 VV-C3 indicates ball bearing
NU204EC-C3 indicates roller bearing
7315BECB-C3 indicates to matched angular contact ball bearings

12.8 WIRING DIAGRAM

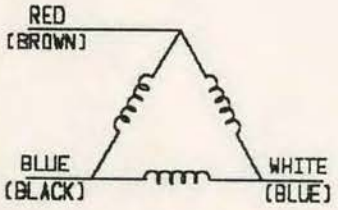
MOTOR CONNECTION FOR FORRERS AUSTRALIS SUBMERSIBLE MOTORS

POWER CABLE

1



2



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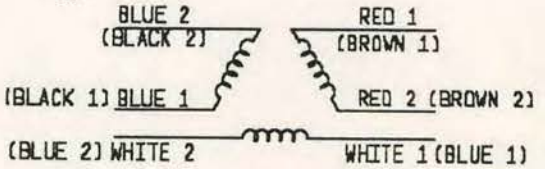

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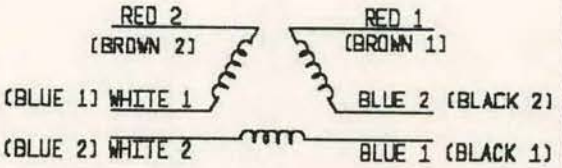


CONTROL CABLES

5 TWO BLACKS IN MAIN CABLE
WINDING THERMISTORS

6 TWO BLACKS IN MAIN CABLE
WATER SENSOR

7 TWO BLACKS IN MAIN CABLE 1
WINDING THERMISTORS

8 TWO BLACKS IN MAIN CABLE 2
WATER SENSOR

9 SEPARATE CABLE
RED & BLUE - WINDING THERMISTORS
GREEN & WHITE - WATER SENSOR

10 SEPARATE CABLE
RED & BLACK - WINDING THERMISTORS

11 SEPARATE CABLE
RED & BLACK - WATER SENSOR

FOR CORRECT ROTATION DE CONNECT
R.W.B. TO R.W.B. OF A SUPPLY WITH A
TIME SEQUENCE R.W.B.

	STANDARD MOTOR CONECTION			STAR/DELTA MOTOR CONNECTION		
RATING	STANDARD THERMS	STANDAR THERMS & SENSOR	STANDARD SENSOR	STAR/DELTA THERMS	STAR/DELTA THERMS & SENSOR	STAR/DELTA SENSOR
BELOW 3kW	1,5	1,5,11	1,6	N/A	N/A	N/A
3kW TO 45kW	2,5	2,5,11	2,6	3,7	3,7,8	3,8
55kW TO 120kW	4,7	4,7,8	4,8	3,7	3,7,8	3,8
ABOVE 120kW	4,10	4,9	4,11	67 3,10	3,9	3,11

12.9 MECHANICAL SEAL DATA

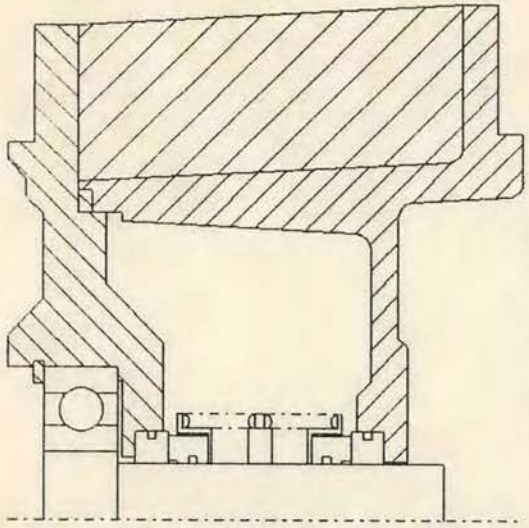


FIG No. 1 - SELF CENTERING ARRANGEMENT

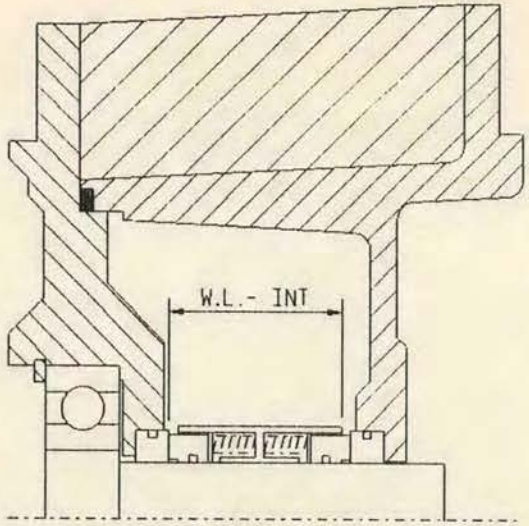


FIG No. 2 - HIGH/LOW PRESSURE ARRANGEMENT

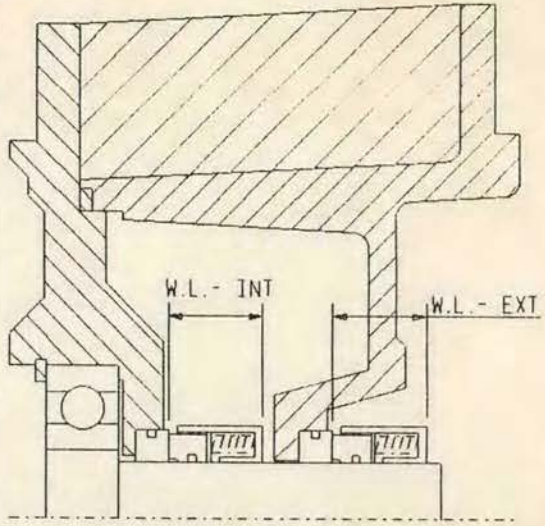


FIG No. 3 - INTERNAL/EXTERNAL ARRANGEMENT

SEAL SIZE	1.1/8"	1.5/8'	2.1/4"	2.1/4"	2.7/8"	2.7/8"	3.5/8"	3.5/8"	4.7/8"	4.7/8"
W.L.- INT	---	64.3	---	42.9	---	42.5	---	40.5	---	1.687"
W.L.- EXT	---	---	---	42.9	---	42.5	---	40.5	---	1.687"
COMP.	---						---		---	
P/No.- INT	562100	HIGH - 562120/2 LOW - 562120/3	---	562131/2	---	562151/2	---	562171/2	---	562191
P/No.- EXT	---	---	---	562132/2	---	562152/2	---	562172/2	---	562192
FIG No.	1	2	2	3	2	3	2	3	2	3

NOTE: CARBON END OF SEAL TO POINT TO BEARING

ISSUE	REF.	REVISIONS	DATE	BY	CKD
A		ORIGINAL	18/08/95		

DRN. AS | BIN CODE
CKD. | WEIGHT
PASS. | SECTION : 21GA00/B
SHEET ONE OF ONE
MAT'L CODE
MAT'L

SCALE N.T.S.

TOLERANCES UNLESS OTHERWISE SPECIFIED
FABRICATION & CASTING ± 2.00
MACHINE - WHOLE NUMBERS ± 0.40
MACHINE - DECIMAL ± 0.15

KSB AJAX PUMPS
FORRERS PUMP WORKS

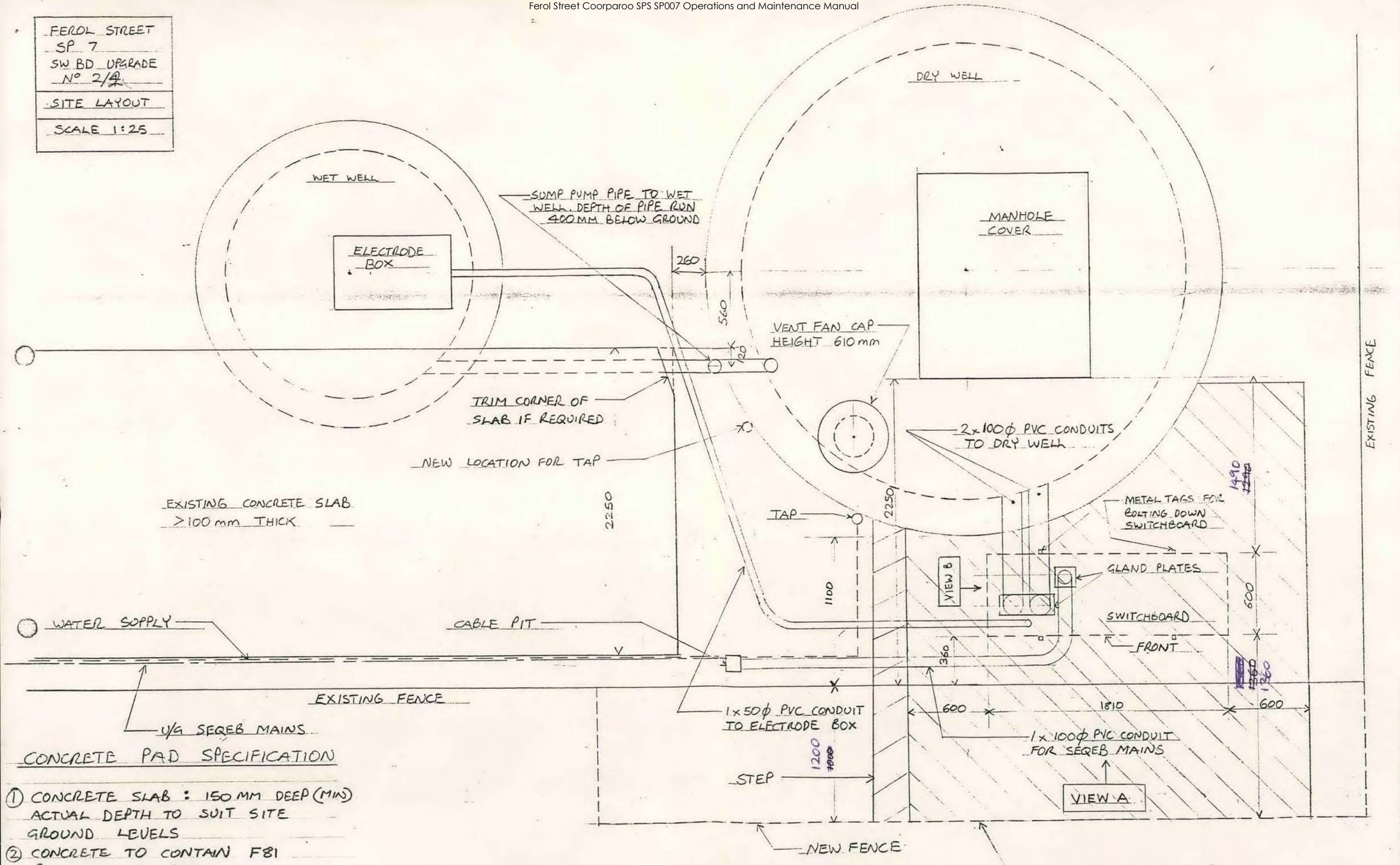
MECHANICAL SEAL DATA
STANDARD SEAL - CRANE

ISSUE B | A3
DRG No 5621GA00 | CAD

FEROL STREET
SP 7
SW BD UPGRADE
Nº 2/2

SITE LAYOUT

SCALE 1:25



CONCRETE PAD SPECIFICATION

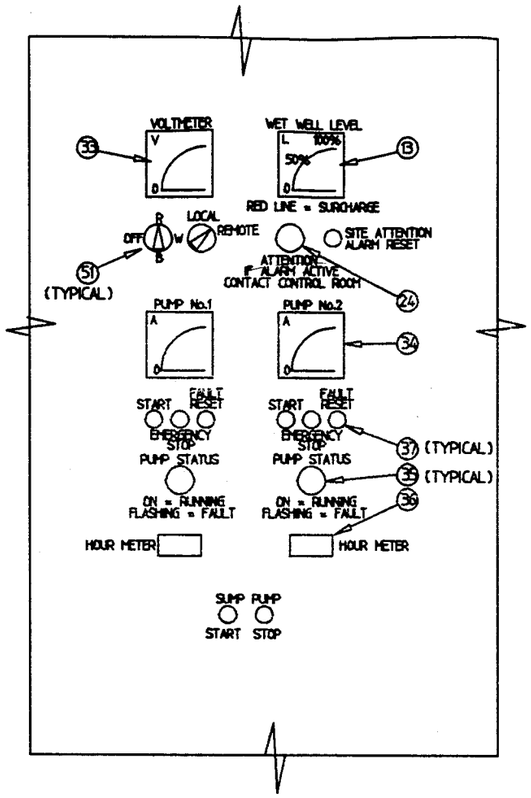
1. CONCRETE SLAB : 150 MM DEEP (MIN) ACTUAL DEPTH TO SUIT SITE GROUND LEVELS
2. CONCRETE TO CONTAIN F81 REINFORCING MESH
3. NEW SLAB TO BE EPOXY-BONDED TO EXISTING WALL OF DRY WELL USING EPIREZ 133 OR EQUIVALENT

NB : ① AREA FOR SLAB IS CROSS-HATCHED
② TOP OF SLAB TO BE LEVEL WITH TOP OF EXISTING DRY WELL

②
1:25

EQUIPMENT LIST

No.	ITEM
1	INCOMING CIRCUIT BREAKER
2	MOTOR CIRCUIT BREAKERS FOR PUMPS 1 & 2
3	SUMP PUMP CIRCUIT BREAKER
4	COMBINED FUSE SWITCH FOR SUBDISTRIBUTION BOARD
5	SUBDISTRIBUTION BOARD 18 WAY CHASSIS
6	AUTO-TRANSFORMER 11 kW, 12 STARTS / HOUR
7	AUTO-TRANSFORMER CONTACTORS:
7.1	LINE
7.2	TRANSFORMER
7.3	STAR
8	SUMP PUMP STARTER
9	PUMPS 1 & 2 THERMAL OVERLOAD RELAYS:
10	POWER FAILURE RELAY
11	CURRENT TRANSDUCER
12	KILOWATT TRANSDUCER
13	ANALOG LEVEL METER (4-20mA) 96 X 96
14	LEVEL TRANSMITTER
15	PRESSURE TRANSMITTER EVALUATION UNIT
16	8W FLUORESCENT LIGHT
17	REMOTE TELEMETRY UNIT
18	MULTITRODE RELAY
19	THERMISTOR RELAY
20	240V AC INTERFACE RELAY
21	24V DC INTERFACE RELAYS
22	CT'S (MOTORS) CLASS 1 TOROIDS 5A SECONDARY
23	PROTECTION FUSES FOR VOLTMETER & TRANSDUCERS
24	ATTENTION INDICATOR
25	24V DC INTERFACE TERMINALS
26	240V AC CIRCUIT BREAKERS FOR PUMP CONTROL
27	240V AC CONTROL TERMINALS
28	24V DC MINIATURE CIRCUIT BREAKERS
29	SURGE DIVERTER FOR INCOMING POWER SUPPLY
30	CATHODIC PROTECTION UNIT
31	GLAND PLATES
32	FIELD DEVICE INTERFACE TERMINALS (POWER, CONTROL, EARTHING)
33	VOLTMETER (96 X 96)
34	AMMETER (96 X 96)
35	LED CLUSTER INDICATING LIGHT
36	HOURS RUN METER
37	PUSH BUTTON
38	SURGE DIVERTER FOR RTU POWER SUPPLY
39	SURGE DIVERTERS FOR ANALOG SIGNALS
40	3A, 24V DC LINEAR POWER SUPPLY
41	FLOW METER EVALUATION UNIT
42	10A G.P.O.
43	DOOR SWITCH
44	C.T. TEST LINKS
45	MAIN EARTH LINK
46	MAIN NEUTRAL LINK
47	SUB DISTRIBUTION NEUTRAL LINK
48	SUB DISTRIBUTION EARTH LINK
49	SUMP PUMP THERMAL OVERLOAD UNIT
50	CONTROL NEUTRAL LINK
51	SELECTOR SWITCH (64 X 64)
52	3 PHASE (4 PIN) W/P SWITCHED OUTLET
53	1 PHASE (3 PIN) W/P SWITCHED OUTLET



EQUIPMENT MOUNTED ON ESCUTCHEON PLATE
IN FRONT OF MOTOR STARTING EQUIPMENT

(NOTE 1)

(DRAWING NOT TO SCALE.
SWITCHBOARD SUPPLIER SHALL SUBMIT ESCUTCHEON LAYOUT, SHOWING ACTUAL DEVICE SIZES & POSITIONS, TO BCC FOR APPROVAL PRIOR TO CONSTRUCTION.)

NOTES

1. IF NECESSARY EQUIPMENT MOUNTED ON THE ESCUTCHEON SHALL BE POSITIONED SLIGHTLY OFF CENTRE TO ENSURE THAT THEY DO NOT CONTACT DOOR RETURNS WHEN THE ESCUTCHEON IS OPENED.

No	DATE	AMENDMENT / ISSUE TO / ISSUE FOR	INITIALS
B	12.93	ISSUED FOR CONSTRUCTION	O.L.P.
A	11.93	ISSUED FOR QUOTATION	O.L.P.

AMENDENT & ISSUE REGISTER

MANAGER	DIRECTOR OF PLANNING & DESIGN
DATE:	DATE:

DIRECTOR OF CONSTRUCTION	DIRECTOR OF M & E SERVICES	DIRECTOR OF SEW. OPERATIONS / W.S. DISTRIBUTION
DATE:	DATE:	DATE:

DESIGN	K.H.	11.11.93	ENGINEER IN CHARGE
DRAWN	O.L.P	12.11.93	SUPERVISING ENGINEER
TRACED			
CHECKED			

CADD FILE No.	REFERENCES
77T035B	

BRISBANE CITY COUNCIL
DEPARTMENT OF WATER SUPPLY & SEWERAGE
MECHANICAL & ELECTRICAL SERVICES
INFORMATION TECHNOLOGY
Brisbane City

PROJECT:
SP7 FEROL STREET
SEWAGE CONVENTIONAL
PUMP STATION

TITLE:
SWITCHBOARD
CUBICLE CONSTRUCTION
& GENERAL ARRANGEMENT

SCALE: N.T.S. | No. 3 OF 3 SHEETS

DRAWING No. 486/7/7-RJ1T035E | AMEND. B

ORIGINAL