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SHAKTI
PUMPING LIFE

INSTALLATION & OPERATING INSTRUCTIONS

SOLAR SUBMERSIBLE PUMP

DC SSP (HELICAL) SERIES

Renewable-energy-based water supply systems

SHAKTI
PUMPING LIFE

CONTENTS PAGE NO.

SYMBOLS USED IN THIS DOCUMENT

⚠ *WARNING*
If these safety instructions are not observed, it may result in personal injury!

⚠ *CAUTION*
If these safety instructions are not observed, it may result in malfunction or damage to the equipment!

⚠ *WARNING*
Before to installation, should be read this installation and operating manual carefully. This manual explains right method of installation. This is applicable to Shakti Helical submersible pump-sets only. These instructions apply to Shakti Helical submersible motors, types 3", 4".

SHAKTI DC SSP

The SHAKTI DC SSP system is a reliable water supply system based on renewable energy sources, such as solar, wind energy. The DC SSP system incorporates in submersible pump. Very flexible as to its energy supply and performance, the DC SSP system can be combined and adapted to any need according to the conditions on the installation site.
The SHAKTI motor has been developed specifically for the DC SSP system and is designed according to the permanent-magnet principle with separate electronic unit.

1. GENERAL DATA

1.1 APPLICATION

- Shakti submersible DC SSP pump sets are used for Drinking Water, Irrigation and other Industrial application. Wherever there is a need to install pump set under water.
- Pump sets are used at Boring, Ponds, River, and Canal Etc.
- Pump set could be used in vertical position.

1.2 PUMP LIQUID:-

- DC SSP pumps are applicable in thin, clean, nonaggressive, non-explosive liquids, not containing solid or long-fibred particles larger than sand grains.

- pH value: 5 to 9.
- Liquid temperature: 0 °C to +40 °C.
- Maximum sand content: 50 g/m3.
- A higher sand content will reduce the pump life considerably due to wear.

1.3 LOSS OF GUARANTY AND EXCLUSIVE LIABILITY

Shakti Pumps shall not be liable for the damage resulting from any further, non intended use. The risk of such use rests solely with the user.

1.4 TARGET GROUP

The electrical system must only be installed by professional staff (qualified electrical engineers or electrical machine technicians).

1.5 DISPOSAL

Disposal of this product or parts of it must be carried out according to the following guidelines:

1. Dispose of the product and the packaging material in a proper, environmentally sound manner.
2. Use the local public or private waste collection service.
3. In case such waste collection service does not exist or cannot handle the materials used in the product, please deliver the product or any hazardous materials from it to your nearest Shakti Service Workshop.

2. DELIVERY AND STORAGE

Shakti submersible DC SSP pump sets are supplied from the factory in proper packing in which they should remain until they are to be installed. During unpacking and prior to installation, care to be taken when handling the pump to ensure that misalignment does not occur due to bending. The pump should not be exposed to unnecessary impact and shocks. When the pump part and motor are supplied as separate units (long pumps), fit the motor to the pump as described in section 4 fitting the motor to the pump.

STORAGE AND HANDLING : Storage temperature
For Pump – 20 °C to +60 °C For Motor – 15 °C to +60 °C

The pump and motor must be stored in a dry and closed placed. Make sure that the pump cannot roll or fall over. During storage, the pump should be supported.
If the pump has been unpacked, it should be stored horizontally, sufficiently supported, or vertically to prevent misalignment of the pump.
(as shown in Fig. 1)

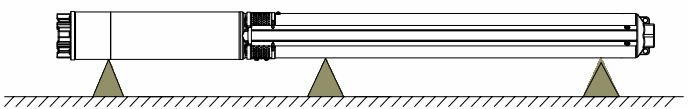


Fig. 1

It can be lifted by hand or other means by hold the pump from end as well as pump ends. Take care of the balance as per the length of the pump (as shown in Fig. 2).

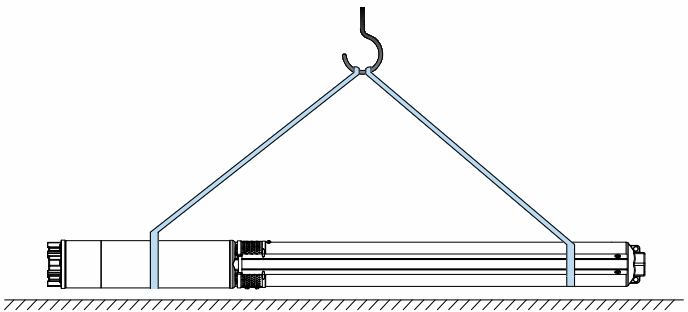


Fig. 2

SHAKTI PUMPING LIFE

WARNINGS about Handling Helical Rotor Pumps

WARNING (helical rotor models)
DO NOT APPLY MACHINE GREASE TO THE PUMP. Ordinary machine grease will damage the stator (EPT rubber) and void the warranty.
Helical rotor pumps are lubricated at the factory with a clear, non-toxic grease. Its only purpose is temporary, to allow the pump to be run dry for a short time to test the direction of rotation. There is no normal reason to reapply lubricant but if you do, use VASELINE (petroleum jelly, white petrolatum) or non-toxic silicone grease approved for water valves and seals.

CAUTION (helical rotor models)
BEFORE INSTALLATION, KEEP THE PUMP OUT OF THE SUN.
If the pump gets hot, the rubber stator will expand and may lock the rotor. No damage will result from this, but you may be unable to test the direction of rotation. If the pump gets hot, allow it to cool in water for 20 minutes before testing.

CAUTION The pump must be fully submerged.
A helical rotor pump may overheat and stop (temporarily) if the pump end is not fully submerged.

CAUTION High water temperature can cause failure to start. Low temperature can reduce lift and flow capacity.
This can occur in surface water during weather extremes, due to temporary expansion or contraction of the rubber stator. The product specifications say: Optimum water temp. is 46°F to 72°F (8°C to 22°C). Other ranges are available by special order. These performance problems are temporary and will NOT damage the pump. If you are uncertain about using the pump you received, contact your supplier before you install it.

NOTE - The water must be poured before installing through the NRV top end for proper lubrication for starting. A helical rotor pump may stop (temporarily) if the pump end is not fully submerged.

3. PRE-OPERATION CHECKS

3.1 CHECK THE SOLAR MOTOR PRIOR TO INSTALLATION:-

If a leak is visible or if the Solar motor is more than one year old (e.g. in the event of re-use or after long storage):

- Check the fluid level in the Solar motor prior to installing it (See 3.3 to 3.4).
- Check insulation resistance and continuity prior to installation

3.2 TOOLS

You need the following tools for assembly and inspection work:
Insulation measuring unit: As Per testing Filling Kit

⚠ *CAUTION*

Solar Motor damage due to being insufficiently filled

- Fill the Solar motor with sufficient Solar motor fluid
- Wear safety goggles and gloves when filling and draining the Solar motor.
- Top up using original Solar motor fluid from Shakti Pumps container or clean drinking water.
- Never use distilled water
- Filling volumes
  3 Inch: approx. – 100 ml
  For 4 inch motor refer below table.

kW	VOLUMES
0.75 - 1.5	180 ml
2.2 - 3.7	200 ml
4.0 - 7.5	220 ml

3.3 VENTING THE SOLAR MOTOR

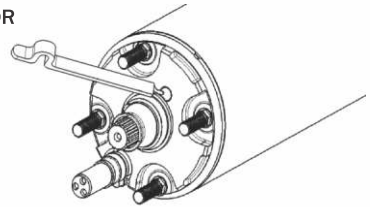


Fig. 3.3

- Place the Solar motor horizontally so that the filling valve is located at the highest position.
- Remove the PRV Cap from the filling valve
- Carefully push the test pin into the filling valve until air and some fluid escape from it.

3.4 CHECKING THE SOLAR MOTOR

- Feed the test pin (A) through the opening in the diaphragm housing (B)
- Measure the actual diaphragm distance to the side of the opening in the

diaphragm cover If the measured result is not identical to the target value:
12 mm±2 mm (3 Inch Solar motor)
12 mm±2 mm (4 Inch Solar motor)

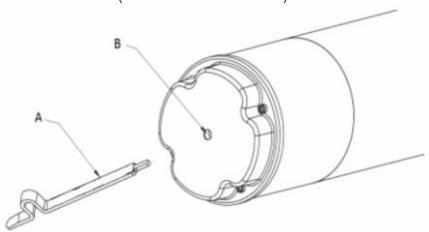


Fig. 3.4 Checking the solar motor fluid

3.5 TOPPING UP THE SOLAR MOTOR:-

- Apply the filling syringe (C) to the filling valve (D). See Figure (3.5)
- Top up the Solar motor filling fluid until the value of the diaphragm position is lower than the target value.

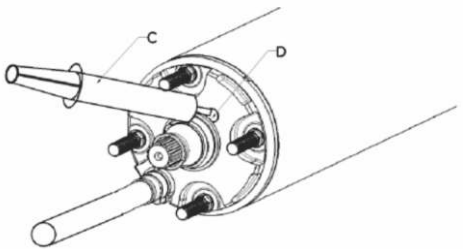


Fig. 3.5Topping up the solar motor fluid

3.6 ADJUSTING THE SOLAR MOTOR:-

- Adjust the diaphragm position by draining (see Venting) or topping up Solar motor fluid until the target value is reached.
- Fit the PRV Cap again.

4 ADJUSTING THE SOLAR MOTOR –

ASSEMBLING THE SOLAR MOTOR & PUMP

NOTE - These assembly & operating instructions only describe action steps related to the Solar motor. You should also observe the pump unit manufacturer's instructions in all events.

SHAKTI PUMPING LIFE

How to Couple Motor with Pump

Step A

Remove The Shaft Protector, Nut & Washer (ref Fig. –a) Surface Of Parts To Be Connected Are Free From Dust & Dirt.

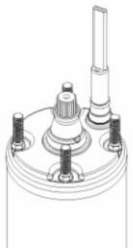


Fig. A

Step B

Assemble the Helical rotor with pump shaft as shown in fig. B

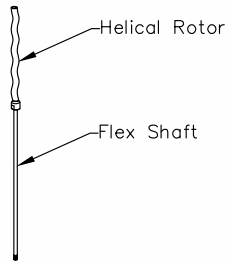


Fig. B

Step C

Assemble the helical rotor. flex shaft with coupling as shown in fig. c

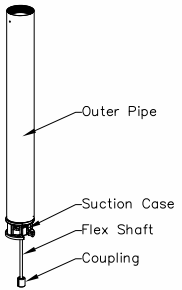


Fig. C

Step D

Pump Fitted on motor by taped hole (Ref. FIG D) apply water resistance non-toxic grease to the inner part of helical rotor

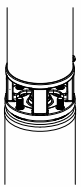


Fig. D

Step E

Put spring washer & nut tight crosswise as per table torque stated in table - 1 (Ref Fig. - E)

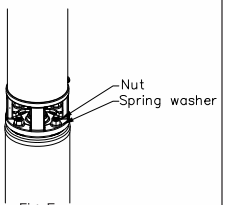


Fig. E

NOTE

Only use fixing screws of the relevant grade & dimensions approved by the pump unit manufacturer When Assembling the motor and pump, the nuts must be tightened diagonally to the torques stated in the following

PUMP/MOTOR STAY BOLT SIZE	TORQUE [NM]
M8	18
M12	100
M16	150
M20	300

⚠ *CAUTION*
Make sure that the pump chambers are aligned when assembly has been completed.

4.1 CONNECTING THE DROP CABLE CAUTION

⚠ *CAUTION*

- Motor damage due to damaged motor cable
- Make sure that the motor cable is not in contact with any sharp edges
- The unit manufacturer's instructions regarding the cable connection have been observed
- Only extension cable and insulating material used with are suitable for the specific use (specifically drinking water) and with are approved for the temperatures occurring in the relevant medium
- Cable cross-sections: The table in the appendix only save as recommended suggestions. The fitter is responsible for the correct selection & dimensioning of the cable
- Lay the cable along the pump
- Connect the ground conductor correctly (motors or integrated ground conductors are prepared for external grounding)
- Protect the cable connection location against water penetration (shrink hoses, compounds or ready cable sets)
- Make sure that the short motor cable is always fully surrounded by transport medium for proper cooling during operation

4.2 MEASURING THE INSULATION RESISTANCE
This measurement is to be carried out using an insulation measuring unit (500 VDC) before and while submersing the fully assembled unit at the place of use.

- Before submersing the unit, connect a measuring cable to the ground conductor
- Make sure that the contact points are clean Connect the other measuring cable to every core of the connected motor cable in succession The insulation resistance is shown on the insulation measuring unit

Minimum insulation resistance - (Ambient temp. 20° C) with extension cable :
For a new motor > 4MΩ
For a used motor > 1MΩ
For your Information
Minimum insulation resistance without extension cable:
For a new motor > 400 MΩ
For a used motor > 20 MΩ

4.3 ELECTRICAL CONNECTION
Testing the pump for direction Helical rotor pumps will produce water flow only if they are rotating in the right direction. If you place it in a water tank or a bucket, you will observe flow if the rotation is correct. (Submerge at least 75% to observe full flow).

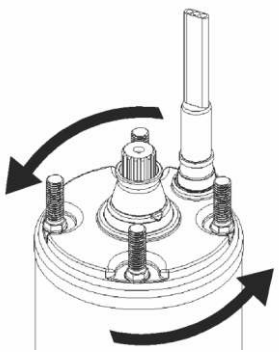
⚠ *WARNING* - Before starting the pump, make sure that the electricity supply has been switched off that it cannot be accidentally switched on.
General- The electrical connection should be carried out by an authorized electrician in accordance with local regulation.

The power wires on the pump with lettering to indicate L1, L2 and L3. WRITE DOWN the colors that you splice to L1/ L2 / L3 so you can match them with the L1/ L2 / L3 terminals in the pump controller. If your pump cable has the standard RED, YELLOW, BLACK and GREEN colors, use this sequence:

RED	YELLOW	BLACK	GREEN
L1	L2	L3	GROUND

Fig 4.3

when you are finished connecting the pump to the controller, test it to assure the proper direction.
HELICAL ROTOR pump Turn the pump on. Observe if air is rising from the pipe. If it isn't, check the wiring connection and observe again. If you cannot observe air rise, there is risk of dryrun damage if it runs too long in reverse. If the pump is new from the factory, it is lubricated so it can run dry for about 60 seconds without risk. In many cases, a pump that is reversed will turn off due to overload.



⚠ ***WARNING*** If the pump wires are in the wrong order, the motor will run in reverse and the pump will not function. Damage may result. Check the direction BEFORE installing the pump. The proper direction is COUNTERCLOCKWISE when viewed from above.
WARNING When testing for direction, do not run the pump dry for more than 15 seconds.

4.4 MOTOR OPERATION WITH SOLAR CONVERTER:-
NOTE- When operating a Solar motor with a frequency converter, the relevant operating manual must be observed

- Make sure that the Solar motor current in all operating levels of the regulating range does not exceed the nominal Solar motor current indicated on the type plate
- Adjust the frequency converter so that the limit values for the nominal Solar motor frequency of min. and max. the value of the nominal Solar motor RPM (500 - 3600) are observed
- Limit any voltage peaks on the Solar motor when using a frequency converter to the following values: max. Voltage rise 500 V/is, max. voltage peak 1000 V
- Make sure that the required coolant flow speed along the Solar motor is also observed with frequency converter operation

NOTE
If using Shakti Motor with Shakti make Controller, refer Shakti Pump Controller Installation Manual for parameters setting. If using Shakti Solar Motor with other make Controller, refer Shakti Solar Motor name plate data for KW, voltage and current rating details.

4.5 MAXIMUM INSTALLATION DEPTH BELOW WATER LEVEL
Shakti Motor 3" : 350 m.
Shakti Motor 4" : 350 m.

4.6 CABLE FITTING:-
Cable clips must be fitted every 3 meters to fix the submersible drop cable and the straining wire, if fitted, to the riser pipe of the pump.

Shakti supplies cable clip sets on request. The set consists of a 1.5 mm thick rubber band and 16 buttons.

- Cable fitting: Cut off the rubber band so that the piece with no slit becomes as long as possible.
- Insert a button in the first slit.
- Position the wire alongside the submersible drop cable, Fig.4.7
- Wind the band once around the wire and the cable.
- Then wind it tightly at least twice around the pipe, wire and the cable.
- Push the slit over the button and then cut off the band.
- Where large cable cross-sections are used, it will be necessary to wind the band several times.
- Where plastic pipes are used, some slackness must be left between each cable clip as plastic pipes expand when loaded.
- When flanged pipes are used, the cable clips should be fitted above and below each joint.

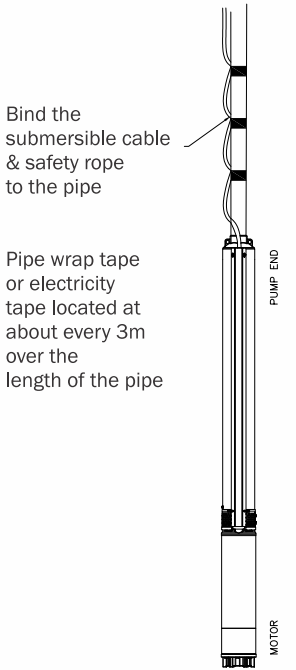


Fig.4.6

4.7 Deep Well Setting—How Deep?

SHAKTI Pumps may be submersed as deep as necessary to ensure reliable water supply. The lift load on the pump is determined by the vertical head of water starting at the SURFACE of the water in the source. Increasing the submergence of the pump (placing it lower in the well) will NOT cause it to work harder or to pump less water, nor will it increase the stress or wear on the pump. There are reasons NOT to set the pump near the bottom of the well, if it isn't necessary:

1. A deep setting will increase the size requirements, costs and weight of pipe and cable.
2. A deep setting may increase the chance of sand or sediment being drawn into the pump.
   To make an informed decision, it is helpful to have accurate data for your water source. In most places, drillers are required to report the details and the performance of wells that they drill. If you do not have the driller's well record, you may be able to obtain a copy from your regional government office that oversees ground water resources and issues drilling permits.

Dirty Water Conditions

SHAKTI Pumps have good resistance to quantities of sand and fine sediment that can normally occur in a well. However, any amount of abrasive material will reduce the life of this pump, like any other pump. Extreme sediment can cause the pump to stick. Sediment can also settle inside the drop pipe each time the pump stops, and block the flow. For water sources that contain high amounts of sand, clay, or other solids, consider the following suggestions.

To avoid pumping dirty water :

1. Have your well purged, developed, or otherwise improved by a water well contractor before installing the pump.
2. Temporarily install a more powerful pump to draw at a high flow rate until the water looks clean.
3. Set the pump as high as possible in the well. If the pump can be placed higher than the perforations in the well casing, it will probably avoid all but the finest suspended silt.

4. After lowering the pump in a well, wait at least 15 minutes for sediment or debris to settle down.
5. If the water source is at the surface, dig a shallow well next to the water source to obtain clean water.

If dirty water cannot be avoided

1. Monitor the situation regularly by observing the volume of water pumped and/or the current draw of the pump (AC amps). As a pump wears, its flow rate (and current draw) will decrease gradually. Replace the pump end when reduced performance is observed, or before your season of greatest water demand. Increased current draw may indicate debris stuck in the pump and/or pipe.

Filtration at the pump intake

SHAKTI Pumps will tolerate small amounts of sand, strainer is provided in suction case to block large size particles, but you may need to filter out larger debris that is normally found in a pond or stream.

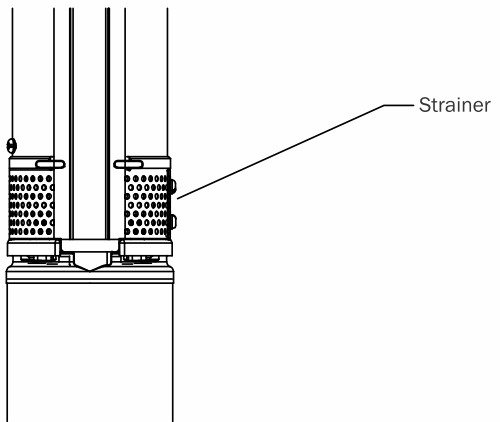


Fig. 4.7

4.8 LOWERING THE PUMP:-

It is recommended to check the borehole by means of an inside calliper before lowering the pump to ensure unobstructed passage.
Lower the pump carefully into the borehole, taking care not to damage the motor cable and the submersible drop cable.

NOTE - Do not lower or lift the pump by means of the motor cable.

4.9 INSTALLATION DEPTH:-

The dynamic water level should always be above the suction interconnector of the pump, Minimum inlet pressure is indicated in the NPSH curve for the pump.
The minimum safety margin should be 1-metre head.
It is recommended to install the pump so that the motor part is above the well screen in order to ensure optimum cooling, see section 1.2 liquid temperatures/cooling. When the pump has been installed to the required depth, the installation should be finished by means of a borehole seal.
Slacken the straining wire so that it becomes unloaded and lock it to the borehole seal by means of wire locks.

NOTE - For pumps fitted with plastic pipes, the expansion of the pipes when loaded should be taken into consideration, when deciding on the installation depth of the pump.

NOTE - The SHAKTI DC SSP system must be installed vertically.

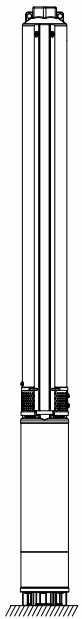


Fig. 4.9

4.10 START-UP AND OPERATION:-
START-UP

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

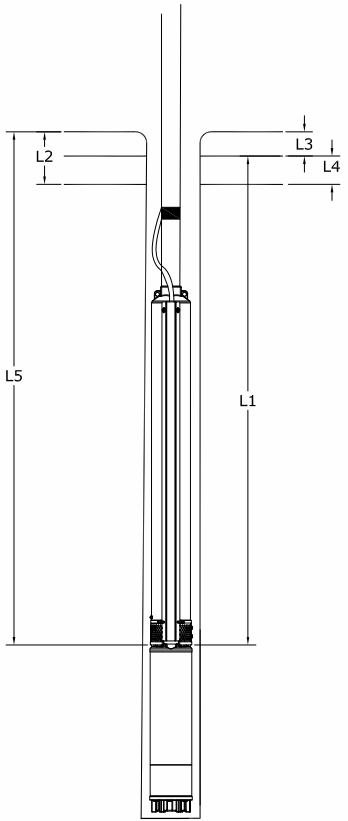


Fig. 4.10

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

If the pump can pump more than yielded By the well, it is recommended to fit the Shakti MP 204 motor protector, or some other type of dry-running protection. If no water level electrodes or level switches are installed, the water level may be drawn down to the suction interconnector of the pump and the pump will then draw in air.

⚠ ***CAUTION***

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

WARRANTY CERTIFICATE

Dear Customer,
Congratulation, for purchasing our product.

Pump and Motor are warranted against defects in workmanship and material under normal use, service & specified duty conditions. We provide one time warranty service for twelve months from the date of purchase by the first user.
Shakti Pumps (India) Limited warrants this product to be free from damage/ defects in material and workmanship under normal use and service for Twelve Months from the date of purchase by the first user. The user shall produce valid and original copy of invoice for availing warranty. The user shall carry defective pump set to nearest authorized service center
This warranty does not cover any loss or damage/ defect of any nature resulting from wrong product selection/ improper installation or installation by unauthorized/ untrained person/ sandy condition/ dry running and improper use of the pump sets.
The warranty also does not cover consequential losses/ damages arising due to failure of pump/ motor.
Our obligation is limited to recycling or repairing or replacing product/ parts ex-factory. Equipment for repairs should be returned free of cost to us.
The forgoing is subject to the provision that the user does not open the unit and make any change or repair without prior approval of authorized service center during the warranty period.
This warranty excludes every condition whether statutory or otherwise, whatsoever not herein expressly set out.

Customer name: .....Customer's phone:.....

Customer Address: .....

Invoice number: .....Invoice date:.....

Model Name: .....Model Serial Number:.....

Dealer's Name: .....Dealer's phone:.....

Dealer's Address:.....

APPROVED BY: DATE OF ISSUE

SHAKTI PUMPING LIFE

INSTALLATION REPORT

Customer's Name: - _____

Customer's Address: - _____

Customer's Ph. No.: _____

Dealer's Name: - _____

Dealer's Address: _____

Dealer's Ph. No. _____

Pump Model:- _____ S.L.No: _____

Project/Application: _____

Pressure In Kg:- _____ Flow in m^3/hr: _____

Liquid:- _____ Temp.: _____

Voltage:- _____ Current: _____

Packing Condition:- _____

Remarks: _____

_____

_____

Date:- _____ _____

Customer's Signature

BOOK-POST

SHAKTI PUMPS (INDIA) LIMITED

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Stamp