

14.0 Warranty

- 14.1 The warranty period commences on the date of original purchase of the equipment. Evidence of this date of original purchase must be provided when claiming repairs under warranty. It is recommended you retain all receipts in a safe place.
- 14.2 Shah Pneumatics products are warranted to the original user only to be free of defects in material and workmanship for a period of 12 months from date of manufacture. Shah Pneumatics' liability under this warranty shall be limited to repairing or replacing at Shah Pneumatics' option, without material charge however we may levy service charges, FOB Shah Pneumatics' Mumbai distribution center or authorized service agent. Shah Pneumatics will not be liable for any costs of removal, installation, transport or any other charges that may arise in connection with the warranty claim.
- 14.3 This warranty is subject to due compliance by the original purchaser with all directions and conditions set out in the Installation and Operating Instructions. Failure to comply with these Instructions, damage or breakdown caused by fair wear and tear, negligence, misuse, incorrect installation, inappropriate chemicals or additives in the water, inadequate protection against freezing, rain or other adverse weather conditions, corrosive or abrasive water, lightning or high voltage spikes or through unauthorized persons attempting repairs are not covered under warranty.
- 14.4 Shah Pneumatics shall not be liable for any loss of profits or any consequential, indirect or special loss, damage or injury of any kind whatsoever arising directly or indirectly from the product or any defect, and the purchaser shall indemnify Shah Pneumatics against any claim by any other person whatsoever in respect of any such loss, damage or injury.
- 14.5 This warranty applies to all states and territories of India only.
- 14.6 For effecting warranty user must produce copy of invoice/warranty page/card.
- 14.7 No warranty will be given if the above condition are not met with the decision of Flowmatics/Shah Pneumatics in relation of any claims or dispute over the warranty is final.

Shah Pneumatics has a continuous policy of product development and although the Company reserves the right to change specifications, it attempts to keep customers informed of any alterations. This publication is for general information only and customers are requested to contact our Sales Department for detailed specifications and advice on a product's suitability for specific applications. All products are sold subject to the Company's standard conditions of sale.

Flowmatics is a trademark of Shah Pneumatics



Shah Pneumatics

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FOR DISTRIBUTOR STAMP

10M VERTICAL MULTISTAGE CENTRIFUGAL PUMPS - PL



PL SERIES

**VERTICAL MULTISTAGE
STAINLESS STEEL CENTRIFUGAL PUMPS**

**INSTALLATION OPERATION
& MAINTENANCE MANUAL**

DEALER: This manual must be given to the user of the pump
 USER: Before using this pump, read this entire manual and save for future reference



For more information regarding Flowmatics products, parts & services, please visit www.shah-pneumatics.com

- WARNING:**
1. Periodic inspection and maintenance of pumps is essential
 2. Transfer of toxic, dangerous, flammable or explosive substances using Flowmatics products is at user's risk
 3. Inspection, maintenance & installation of pumps must be made only by experienced, trained & qualified personnel
 4. Use of strainer in the suction of the pump is a must for ensuring longer life of pump

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Congratulations for your purchase of Flowmatics pump/products.

We appreciate your trust while opening/unpacking the product make sure that there is no transit damage, if any, it must be reported to the dealer.

We take no responsibilities in the case of accidents or damages on the basis of carelessness or disregard to the instructions and reject every responsibilities for the damages which originate from the improper use of the pumps.

The purchaser must correctly fill in and mail the last page within 10 days from the date of purchase. No warrantee will be given for incomplete warrantee. (provide invoice no. / date / dealers name & add with stamp & signature on last page.)

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13.0 Maintenance Record

Purchase Details

Date of Purchase :

From: Name :

Address :

.....

Tel. No. :

Fax No. :

Pump Details

Pump Model No.:

Pump Connection :

Installation Details

Date of Installation :

Location :

Strainer Details

Estimated Date of Strainer Cleaning :

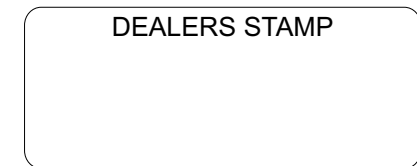
Estimated Date of Strainer Change :

Bill No.:

Bill Date :

Serial No. :

Manuf. Dt :



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12.0 Appendix

When the pump is operated under the following conditions, it is necessary to measure the suction pressure “H”

- ◆ High liquid temperature.
- ◆ Actual capacity is obviously bigger than rated capacity.
- ◆ Suction head is too high.
- ◆ Suction pipe is too long.
- ◆ Bad suction conditions.

If the pump suction pressure is lower than the steam pressure of the transported liquid, vapour may happen. To avoid this please make sure there is a minimum pressure at the pump suction. The Maximum Suction Head can be calculated using the following formula:

$$H = P_b \times 10.2 - NPSH - H_f - H_v - H_s$$

Where:

P_b = Atmosphere pressure, unit: kg/cm²g or bar

In the closed system, P_b represents system pressure, unit: kg/cm²g or bar

NPSH = Net Positive Suction Head, unit: m (refer to NPSH curves)

H_f = Lose of Suction Pipe, unit: m

H_v = Vapour Pressure, unit: m

H_s = Safety Allowance=minimum 0.5 m head

If “H” is a positive value, the pump can be operated under the Maximum Suction Head. If “H” is a negative value, a Minimum Suction Pressure, positive “H” m head is required.

For example (transported liquid is fresh water)

$P_b = 1$ bar

Pump model: PL2, 50Hz

Flow: $Q = 2$ m³/h

NPSH (refer to the curve) = 1.5 m

$H_f = 3$ m

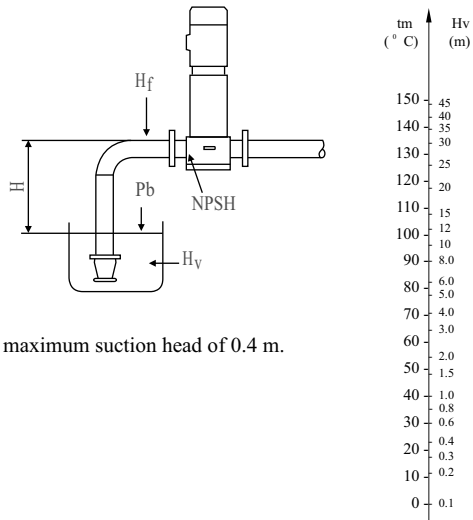
Liquid temperature: +80°C

$H_v = 4.8$ m (see Figure 7)

$$H = P_b \times 10.2 - NPSH - H_f - H_v - H_s$$

$$H = P_b \times 10.2 - 1.5 - 3 - 4.8 - 0.5 = 0.4$$

This represents the pump can be operated at a maximum suction head of 0.4 m.



10M VERTICAL MULTISTAGE CENTRIFUGAL PUMPS - PL

1.0 Features

The PL Vertical Multistage Centrifugal Pump is made from stainless steel SS304 and formed using metal sheet stamping and welding technologies. With its double-chamber design and easy-mounting mechanical seal design, the pump is compact, lightweight, low noise, long life and easy to assemble and maintain.

2.0 Applications

The PL Vertical Multistage Centrifugal Pump can be used for transporting thin, non-explosive, weak corrosive and clean liquids, such as water supply systems, boiler feeding, pure water treatment, food industries, fire fighting, pharmaceuticals and etc.

3.0 Model Ordering Code Instructions

PL - 16 - 20 - 1 - D
 ↑ ↑ ↑ ↑ ↑

| Series | Flow | Stages X 10 | Small Impellers | Phase |
|---|--|--|---|-----------------------------|
| PL - Vertical Multistage Centrifugal Pump | 2 - 2 m ³ /hr 4 - 4 m ³ /hr 8 - 8 m ³ /hr 16 - 16 m ³ /hr 32 - 32 m ³ /hr 45 - 45 m ³ /hr 64 - 64 m ³ /hr 90 - 90 m ³ /hr | 20 - 2 stage 80 - 8 stage 120 - 12 stage 220 - 22 stage | 1 - 1 impeller 2 - 2 impeller Blank - Nil | D - Single Blank - Three |

4.0 Working Conditions

- 4.1 Ambient temperature +40°C max.
- 4.2 Liquid temperature: -15~+110°C
- 4.3 Maximum working pressure: Upto 25 kg/cm²g
- 4.4 Maximum suction pressure: see Appendix
- 4.5 Suction pressure plus pressure at shutting discharge valve must not exceed the Maximum Working Pressure
- 4.6 Minimum capacity

| Model | Minimum Capacity When Liquid Temperature at -15~+110°C |
|-------|--|
| PL2 | 0.2m ³ /h |
| PL4 | 0.4m ³ /h |
| PL8 | 0.8m ³ /h |

Consult factory for higher PL Series

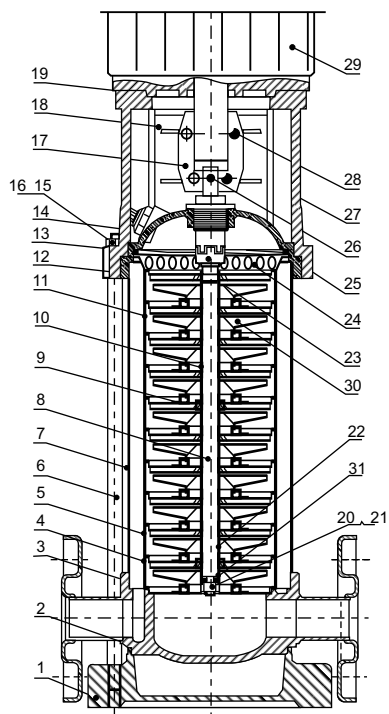
- 4.7 Electrical data: see motor nameplate.

5.0 Structure

- 5.1 The suction and discharge of the pump locate on a same axis. Three types of connections are available: flange, Victaulic and male threads.
- 5.2 Easy-mounting mechanical seal is used for the pump, which can provide fast and easy maintenance.
- 5.3 IBM14 standard motor is used on the pump, which is connected to the pump shaft using a coupling.

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5.4 Cross-Section



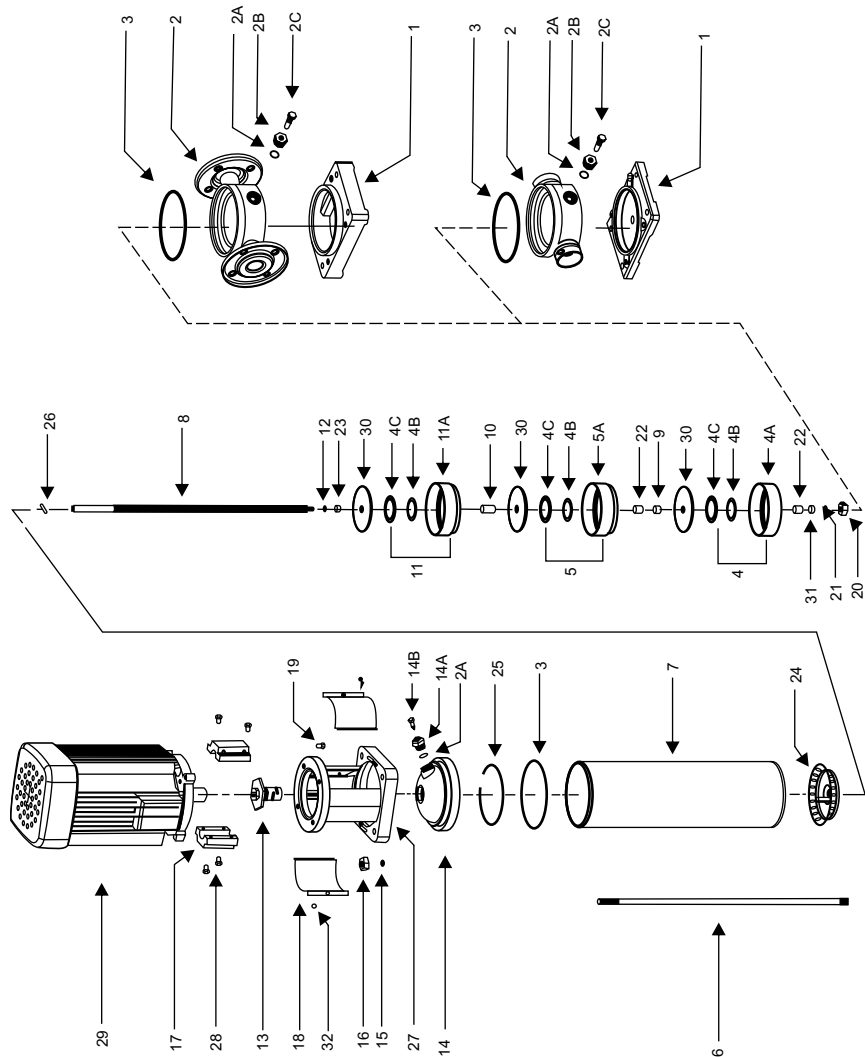
- | | |
|---------------------|----------------------|
| 1. Base Plate | 17. Coupling |
| 2. Bottom Cover | 18. Coupling Guard |
| 3. O' Ring | 19. Screw |
| 4. Diffuser I | 20. Shaft Nut |
| 5. Diffuser II | 21. Spring Washer |
| 6. Tension Bars | 22. Shaft Sleeve I |
| 7. Outer Barrel | 23. Shaft Sleeve III |
| 8. Splined Shaft | 24. Diffuser IV |
| 9. Plain Bearing | 25. Wire Washer |
| 10. Shaft Sleeve II | 26. Shaft Pin |
| 11. Diffuser III | 27. Bracket |
| 12. Position Ring | 28. Hex Screw |
| 13. Mech. Seal | 29. Motor |
| 14. Top Cover | 30. Impeller |
| 15. Washer | 31. Shave Sleeve IV |
| 16. Nut | |

6.0 Assembling and Dismantling

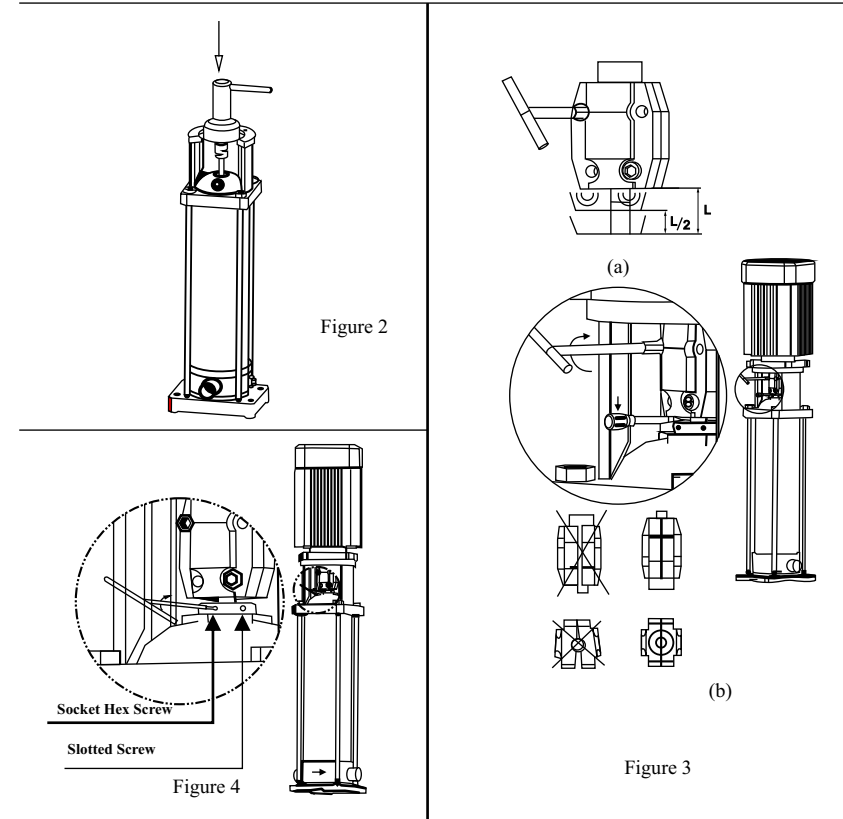
- 6.1 Before assembling, check all pump parts are all in readiness.
- 6.2 Put the O rings in the grooves of the bottom cover and top cover, then put the bottom cover on the base plate. Apply some silicone oil on the outside surface of one end of the outer barrel, push the end of the barrel into the bottom cover.
- 6.3 Push the position ring in the groove of the splind shaft, assemble all of the shaft sleeves, impellers and diffusers on the splind shaft in order then, put the spring washer on the end of the shaft and tighten up the assembly with the shaft nut.
- 6.4 Put the assembled internal assembly in the outer barrel and then, put on the Diffuser IV.
- 6.5 Put the wire washer in the top cover and put the top cover on the top end of the outer barrel, mount the bracket on the top cover, use the tension bars to fix top cover, bracket, outer barrel and bottom cover together.
- 6.6 Check the shaft extension is in the middle of top cover's hole. Apply some silicone oil on the inner side of mechanical seal's O ring and on the shaft extension.
- 6.7 Put the mechanical seal in the hole of the top cover along the shaft extension, screw the nut of mechanical seal into the hole until it is firmly tightened. (See Figure 2)
- 6.8 Mount the motor onto the bracket with the hex nuts, insert the pin from the hole of the splined shaft, combine the two half couplings on the shaft and make the couplings hold the pin properly.
- 6.9 Use a screw driver to set the coupling to the middle position between it moves to the top and bottom.

| No. | Part Name | Material | No. | Part Name | Material |
|-----|------------------------|-----------|-----|----------------------|-----------|
| 1 | Base Plate | Cast-iron | 14 | Top Cover | SS 304 |
| 2 | Bottom Cover | SS 304 | 14A | Top Drain Plug | SS 304 |
| 2A | "O" Ring-Drain Plug | NBR | 14B | Top Air Escape Plug | SS 304 |
| 2B | Bottom Drain Plug | SS 304 | 15 | Washers-Bracket | Steel |
| 2C | Bottom Air Escape Plug | SS 304 | 16 | Nuts-Bracket | Steel |
| 3 | "O" Ring-covers | NBR | 17 | Coupling | Steel |
| 4 | Diffuser I Assembly | Assembly | 18 | Coupling Guards | SS 304 |
| 4A | Diffuser I | SS 304 | 19 | Hex Bolts-Bracket | Steel |
| 4B | Ware Ring | Teflon | 20 | Nuts-Shaft | SS 304 |
| 4C | Ware Ring Plate | SS 304 | 21 | Spring Washer-Shaft | SS 304 |
| 5 | Diffuser II Assembly | Assembly | 22 | Shaft Sleeve I | SS 304 |
| 5A | Diffuser II | SS 304 | 23 | Shaft Sleeve III | SS 304 |
| 6 | Tension Bars | Steel | 24 | Diffuser IV Assembly | SS 304 |
| 7 | Outer Barrel | SS 304 | 25 | Wire Washer | SS 304 |
| 8 | Splined Shaft | SS 304 | 26 | Pin | Steel |
| 9 | Plain Bearing | WC | 27 | Bracket | Cast-iron |
| 10 | Shaft Sleeve II | SS 304 | 28 | Hex Bolts-Coupling | Steel |
| 11 | Diffuser III Assembly | Assembly | 29 | Motor | Assembly |
| 11A | Diffuser III | SS 304 | 30 | Impeller | SS 304 |
| 12 | Position Ring | SS 304 | 31 | Shaft Sleeve IV | SS 304 |
| 13 | Mechanical Seal | Assembly | | | |

11.0 Part Explosion Diagram



- 6.10 Use the socket hex bolts to fasten the two half couplings. The seams at each side of the coupling should equate to each other. (See Figure 3b)
- 6.11 Fix the mechanical seal to the shaft by screwing the socket hex screws on the mechanical seal, make sure the mechanical seal turns along with the shaft. Do not unscrew other longer slotted screws on the mechanical seal.
- 6.12 Check if the coupling and the shaft turns freely.
- 6.13 Screw on the priming and drain plugs, fix the coupling guards on the bracket using screws. Take the actions in reverse order to dismantle the pump.



7.0 Installing the Pump

- To avoid damage of pump, take the following actions before installing the pump.
- 7.1 Check the pump and the motor are in good conditions before installation.
 - 7.2 The arrow sign on the bottom cover indicates the pump's discharge direction.
 - 7.3 The pump can be installed vertically or horizontally. To provide the pump with good cooling condition, the pump must be installed in a place where is well ventilated.
 - 7.4 To reduce noise and vibration as far as possible, use flexible or soft hoses on the suction and discharge, and install the pump on a vibration proofed base.
 - 7.5 Set a valve on the suction and discharge tubes separately to provide convenience to pump maintenance. Set non-return valves can protect the pump from damage by water hammer.

- 7.6 Prevent air cave to create when installing the pipelines, particularly in the suctions pipeline.
- 7.7 When the discharge pipeline stretches downward for along distance, or when there is a risk of siphonage, or to prevent dirty liquid from flowing back to the pump it is recommend to set a drain valve on the pipe that closes to the discharge port.
- 7.8 Electrical wirings must be done by specialized electricians according to the local electrical regulations. The pump must be earthed effectively.

8.0 Starting, Operating and Stopping the Pump

- 8.1 Before using a new pump, turn coupling of pump by hand to check the pump is running freely, evenly and quietly.
- 8.2 Prime the pump and vent air before operating the pump.
 - a. When the water level is above the pump, unscrew the top air escape plug that locates in the middle of the top priming plug and let the water flow in and fill up the pump body to vent the air form the pump body completely, and then screw back the air escape plug until it is firmly tightened. (See Figure 5)
 - b. When the water level is beneath the pump, unscrew the top priming plug and the bottom air escape plug in the middle of the bottom drain plug, prime the pump body and the suction pipe from the priming hole until they are filled up with water, and then screw back the priming plug and the air escape plug until they are firmly tightened.

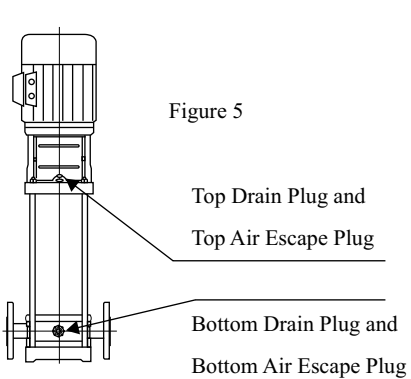


Figure 5

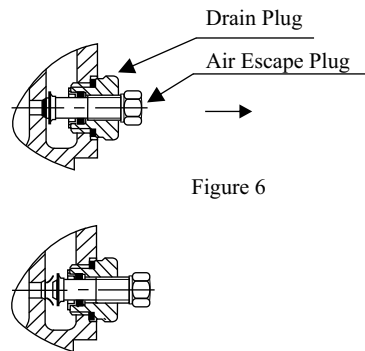


Figure 6

- 8.3 Start up the pump for a second and check the rotation is in the same direction that the arrow pointed on the bracket. (The rotation direction is anticlockwise when viewing from the top of the pump.)
- 8.4 Start up the pump and unscrew the air escape plug until a stream of water flows out evenly from the hole, and then screw back the plug.
- 8.5 After the pump is running normally, open the discharge valve and set the capacity and the pressure to the required values. There would be a risk that the pump gets heat when the capacity is set too low. Therefore, the operating capacity should not be lower than the minimum capacity that required. (See 4.6 Minimum capacity)
- 8.6 Before stopping the pump, shut off the discharge valve, and then turn off he power.
- 8.7 When faults occur during starting, operating and stopping, check the Troubleshooting for solutions.

9.0 Maintenance

- 9.1 Make sure the power is shut off before maintenance.
- 9.2 Maintenances of the splined shaft and shaft seal are not necessary.
- 9.3 When the pump remains inactive for a long period, before draining pump, remove one of the coupling guards and apply a few drops of silicone oil on the shaft seal to prevent it from being stuck when the pump is put in use again.
- 9.4 When the temperature of the transported liquid is lower than its freezing temperature, make sure the liquid is not frozen inside the pump before starting the pump. During frost season, always drain the pump completely after using the pump.

10.0 Troubleshooting

| Faults | Possible Causes | Remedies |
|---|--|---|
| 1. Motor doesn't run when switch is on. | <ul style="list-style-type: none"> ◆ No electricity ◆ Fuse burnt ◆ Thermistor of starter breaks ◆ Connections of starter do not close or windings are broken ◆ Controlling circuit failed ◆ Motor failed | Supply electricity Replace fuse Reset thermistor Repair starter or winding Check the cause Repair motor |
| 2. Thermistor of starter breaks immediately when power is on. | <ul style="list-style-type: none"> ◆ One of the fuses burnt ◆ Bad connections of thermistor ◆ Bad or loose plug ◆ Bad motor windings ◆ Pump is blocked ◆ Too low overload current is set | Replace fuse Replace thermistor Repair plug or replace it Repair windings Check and eliminate. Reset current |
| 3. Starter occasionally trips | <ul style="list-style-type: none"> ◆ Too low overload current is set ◆ Too low voltage at peak load | Reset current Check power supply system |
| 4. Starter is on but pump doesn't run. | <ul style="list-style-type: none"> ◆ Coupling is not fixed to shaft | Fix the coupling on |
| 5. Capacity is not even. | <ul style="list-style-type: none"> ◆ Too low suction pressure ◆ Suction pipe is blocked ◆ Air is drawn into pump | Increase suction pressure Clean suction pipe Seal suction |
| 6. Pump runs but no water outs | <ul style="list-style-type: none"> ◆ Suction pipe is blocked ◆ Foot valve or non-return valve is jammed ◆ Leakage on suction pipe ◆ Motor back runs | Clean suction pipe Clean the valve Seal suction pipe Correct wiring |
| 7. Pump back runs when power is off. | <ul style="list-style-type: none"> ◆ Leakage on suction pipe ◆ Foot valve or non-return valve is broken | Seal suction pipe Repair or replace valve |
| 8. Shaft seal leaks | <ul style="list-style-type: none"> ◆ Shaft seal is broken | Replace shaft seal |
| 9. Noise | <ul style="list-style-type: none"> ◆ Vapour ◆ Shaft is not fitted properly | Check and seal suction Adjust shaft position |

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