



INSTRUCTION & OPERATION MANUAL

100 mm (4") BOREWELL SUBMERSIBLE PUMPSET



TABLE OF CONTENTS

S.No	Contents	Page No.
1.	Welcome Message	1
2.	Complying Norms	1
3.	Contents in the Packing Box	1
4.	Introduction about Product and Briefing	1
5.	Schematic Drawings & Indication of Parts	2
6.	Key Product Specifications and Features	5
7.	Pre-Installation Requirements	7
8.	Installation Procedure	9
9.	Important Safety Instructions	19
10.	Storage and Handling	19

1. WELCOME MESSAGE

Dear Customer:

Welcome to the SAMUDRA family! Thank you for choosing products from SAMUDRA.

We congratulate you and value your decision made on choosing our products. You are entitled to enjoy the best in class product and service.

2. COMPLYING NORMS

IS 694 : Polyvinyl Chloride insulated unsheathed and sheathed cables/cords with rigid and flexible conductor for rated voltages up to and including 450 V/750V

IS 3043 : Code of Practice for Earthing-Specification

IS 8034 : Submersible Pumpsets-Specification

IS 9283 : Motors for Submersible Pumpsets-Specification

3. CONTENTS OF THE PACKING BOX

Submersibles are packed in tubular packing. The motor and pump are packed separately. The packing contains instruction manual.

Open the packing only before commissioning of the pump set. Note the details provided on the name plate of both motor and pump for future reference.

4. INTRODUCTION ABOUT PRODUCT AND BRIEFING

SAMUDRA Bore Well Submersible pump sets are manufactured using high quality raw materials and components using state-of-the-art manufacturing facilities. SAMUDRA Bore Well Submersible pump sets will give trouble free performance if they are properly installed and maintained. Prior to installation, read this manual carefully and follow the instructions for installation and maintenance of our submersible pump set to ensure reliable operation.

Applications include farm irrigation (Drip/Sprinkler), domestic and community water supply, water supply to high rise buildings, municipal water supply, industrial water supply, cooling water circulation systems, water treatment, firefighting and fountains.

The submersible pump set should be installed by technically qualified personnel in compliance with national and local electrical codes and as per our instructions in order to avoid electrical shocks, unsatisfactory performance and equipment failure.

5. SCHEMATIC DRAWING AND INDICATION OF PARTS

Cross-sectional view of 4" Submersible Motor up to 4HP is shown below in Fig.1:

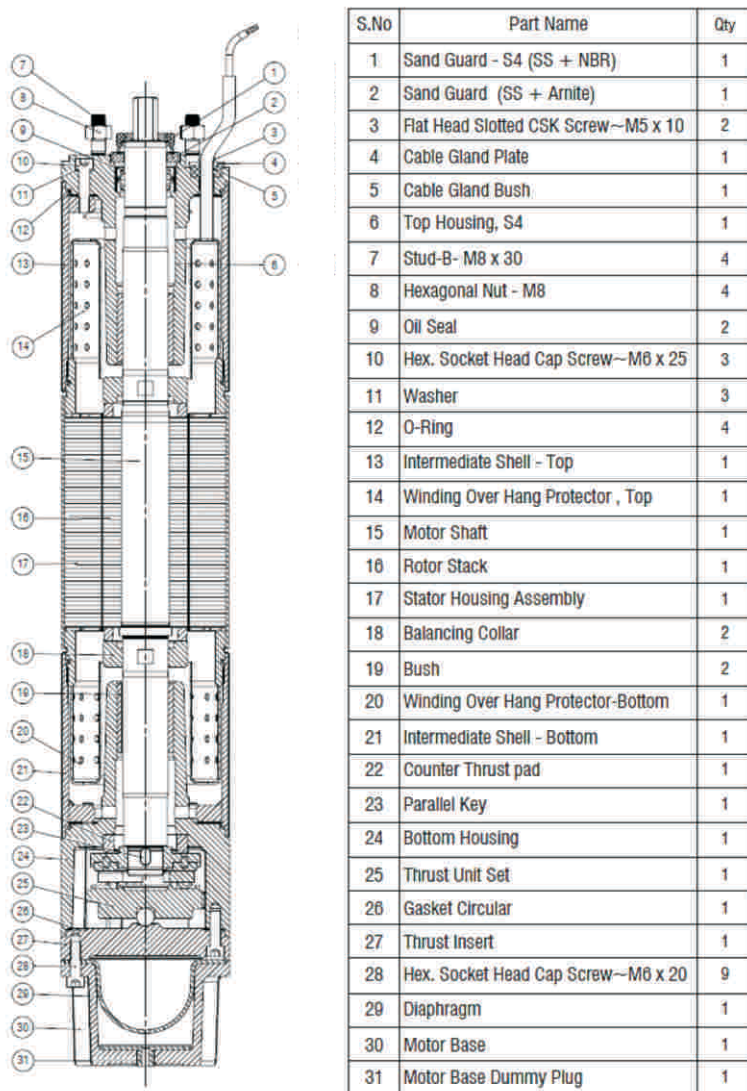
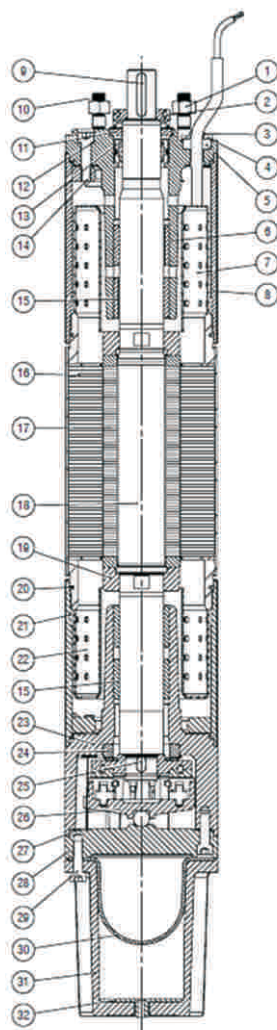


Fig.1 CROSS-SECTION VIEW OF 4" SUBMERSIBLE MOTOR: 1 - 4 HP

Cross-sectional view of 4" Submersible Motor above 4HP is shown below in Fig. 2:



S.No	PART NAME	Qty
1	Hexagonal Nut - M8	4
2	Sand Guard - S4 (SS + NBR)	1
3	Flat Head Slotted CSK Screw~M5 x 10	2
4	Cable Gland Plate	1
5	Cable Gland Bush	1
6	Top Housing, S4	1
7	Winding Over Hang Protector , Top	1
8	Intermediate Shell - Top	1
9	Parallel Key	1
10	Stud-B- M8 x 30	4
11	Sand Guard (SS + Amite)	1
12	Washer	3
13	Oil Seal	2
14	Hex. Socket Head Cap Screw~M6 x 25	3
15	Bush	4
16	Stator Housing Assembly	1
17	Rotor Stack	1
18	Motor Shaft	1
19	Balancing Collar	2
20	O-Ring	4
21	Intermediate Shell - Bottom	1
22	Winding Over Hang Protector-Bottom	1
23	Bottom Housing	1
24	Counter Thrust pad	1
25	Parallel Key	1
26	Carbon Thrust Unit Assy	1
27	Gasket Circular	1
28	Thrust Insert	1
29	Hex. Socket Head Cap Screw~M6 x 20	9
30	Diaphragm	1
31	Motor Base	1
32	Motor Base Dummy Plug	1

Fig. 2 CROSS-SECTION VIEW OF 4" SUBMERSIBLE MOTOR: 5, 6 and 7.5 HP

Cross-sectional view of a Submersible Radial Flow Pump is shown below in Fig. 3:

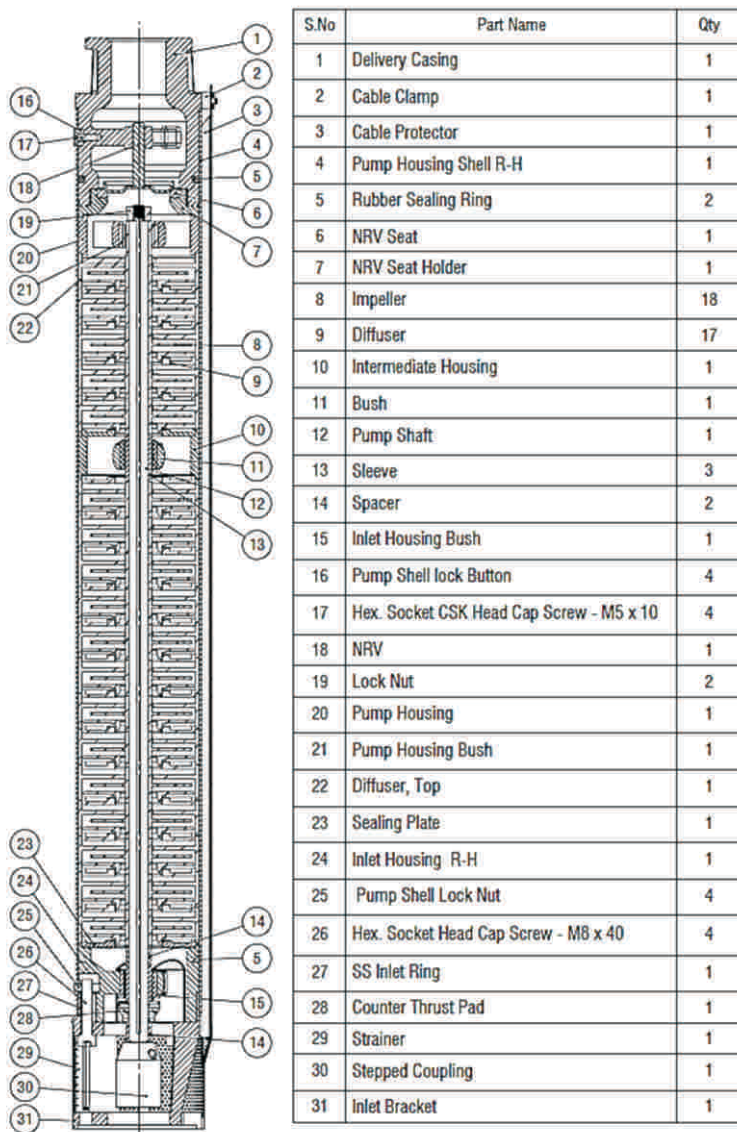


Fig. 3 CROSS-SECTION VIEW OF 4" SUBMERSIBLE RADIAL FLOW PUMP

6. KEY PRODUCT SPECIFICATIONS AND FEATURES

Standard Specification of 100 mm Bore Well Submersible Pumps is shown below in TABLE 1:

Phase and Power	Single Phase: 1.0- 2.0 HP	
	Three Phase: 3 -7.5HP	
Motor Type	Wet	
Starting method	DOL	
Operating Voltage	Excellence Series Three Phase:350 - 440V	Advanced Series Single Phase :180 - 240V
	Excellence Series Single Phase:180 - 240V	Value Series Single Phase :180 - 240V
Frequency	50 Hz	
Speed	2850 rpm	
Duty	S1 Continuous	
Max.Fluid Temperature	33°C	
Impeller Type	Radial	
Cable	3 Core PVC Insulated flat cable	

PRODUCT PERFORMANCE SPECIFICATION

SAMUDRA has a wide variety of 100 mm Bore Well Submersibles to meet your requirements. Please consult our Sales Team/your nearest dealer to meet your specific requirements.

KEY FEATURES

MOTOR

- The motor, a wet type submersible motor, is a squirrel cage induction motor filled with a mixture of pure clean water mixed with anti-corrosive liquid for improved life
- The motor houses water lubricated journal and thrust bearings
- The stator winding is water cooled and is made from poly-wrapped copper wire.
- As sand and other foreign particles can damage the motor, the motor is protected by the use of high-quality oil seals and sand guards
- As the motor is sealed, during operation, excessive pressure can build up

inside the motor due to thermal expansion of water. Rubber diaphragm is provided to compensate for pressure increase due to heating up of water in the motor

- Winding over hang protector is provided to ensure the coil life
- Provided with carbon thrust bearing for low voltage operation
- Carbon journal bearing bushes for longer life of motors
- Motors fitted with copper rotor for Single and Three Phase Excellence Series and Aluminum Die Cast Rotors for Advanced and Value Series motors
- Easily re-windable squirrel cage motor designed for wide operating voltage band
- Top and Bottom Intermediate Housings are Stainless Steel Clad for improved corrosion resistance.

PUMP

- The pump is designed for pumping clear cold water with a maximum sand content of 50 grams in 1000 ml. For higher sand content, the pump hydraulics will wear out at a faster rate
- As water needs to be pumped from large depths, the pumps are of multi-stage design
- For higher heads, radial impellers with diffusers are used
- For higher discharges, mixed flow impellers with bowls are preferred
- Radial and Mixed flow impeller designs including high head versions in shell type assembly
- Special nitrile rubber bearing bushes for high wear resistance
- Built-in NRV with low head loss design
- Pumps fitted with high quality engineering polymer NORYL GF 30% impellers and diffuser housings/bowls
- SBRF Series Pumps are provided with Stainless Steel cups for housing the diffuser and impeller assembly, Stainless Steel pump outer shell is provided for pre-loading the pump assembly to prevent inter-stage leakage
- Stainless Steel pump shell for enhanced corrosion resistance
- Stainless steel shaft for enhanced corrosion protection
- Counter thrust collar to limit up-thrust

STRAINER

- A Stainless-Steel strainer, wrapped around the Inlet Bracket, prevents the ingress of pebbles into the intake during pumping

WIRING HARNESS

- All submersible motors are provided with 3-core PVC insulated flat cable of length 3 meters.


7. PRE-INSTALLATION REQUIREMENTS


ARRANGEMENT FOR INSTALLATION

- Use the services of a professional and trained mechanic with experience in erecting bore well submersibles
- Ensure proper safety during installation
- Ensure the availability of electrical power as indicated in TABLE 1


GENERAL INSTALLATION PRECAUTIONS:

- Open the packaging and note down the Serial number and Model for future reference
- Inspect the purchased pump for damage/leakage
- Ensure all fasteners are tightened properly
- Check the inside diameter of the well casing to ensure that it is not smaller than the size of the submersible
- Check depth of bore well to determine the length of piping and power cable required

	<ul style="list-style-type: none">• If you detect damage or discrepancy in the product, contact the dealer from whom the pump was purchased.• Do not use this pump for oil or toxic, acetic, corrosive and/or inflammable liquids. Pumping inflammable liquids could cause explosion.• Do not use the pump cable for lifting/lowering pump.• Use trained professionals to install the submersible pump, Improper fitment can cause pump to fall into the bottom of the bore.
---	---


 <p>CAUTION</p>	<ul style="list-style-type: none"> • Use a power supply cable that has enough rating and has been exclusively provided for the pump. Factor in low-voltage operation. • Provide proper Earthing as improper Earthing can cause electrical shock. • Use a Megger to verify the insulation of motor. Insulation resistance should be 20 MΩ minimum. • It is recommended to use a Control Panel with Single-Phase Protector, Dry Run Protector, and Overload Protector. • Do not place submersible pump with its base resting at the bottom of the borewell. There is a possibility for the motor and pump to be buried in the silt which collects at the bottom of the bore well. • Mount the pump vertically. Never inclined or horizontal. • For three-phase models, it is recommended to use a control panel with single-phase preventer and overload, relay.
--	---

OPERATION PRECAUTIONS

 <p>CAUTION</p>	<ul style="list-style-type: none"> • Do not run the pump dry. It could lead to product Damage. • Switch OFF power supply and ensure that impeller completely stops before changing rotation or making any adjustments • Do not use this pump for pumping liquid exceeding 33° C as this may lead to product failure. • Do not switch ON the pump if there is any human contact with the pumped medium. If any electrical leakage occurs, this could be fatal. • For three-phase models, it is recommended to use a control panel with Single-Phase preventer, overload relay, and dry run protection.
--	--

8. INSTALLATION PROCEDURE

Please follow the below procedure to install the pump and motor.

 <p>CAUTION</p>	<p>The supply voltage should be within -15% to +6% of rated voltage.</p> <p>Water temperature for operation of the pump should not exceed 33° C</p> <p>Failure to observe the precautions given above could cause the pump to malfunction, which may lead to current leakage or electrical shock.</p>
--	---

INSTALLATION

TOPPING UP THE MOTOR

The submersible motor is supplied pre-filled with a mixture of clear cold drinking water and anti-corrosive liquid. The following steps are executed prior to installation:

- Position the motor vertically on its base.
- Check if all fasteners are tight. Tighten if required.
- The two threaded plugs provided at the top are removed as shown in Fig.4 below.

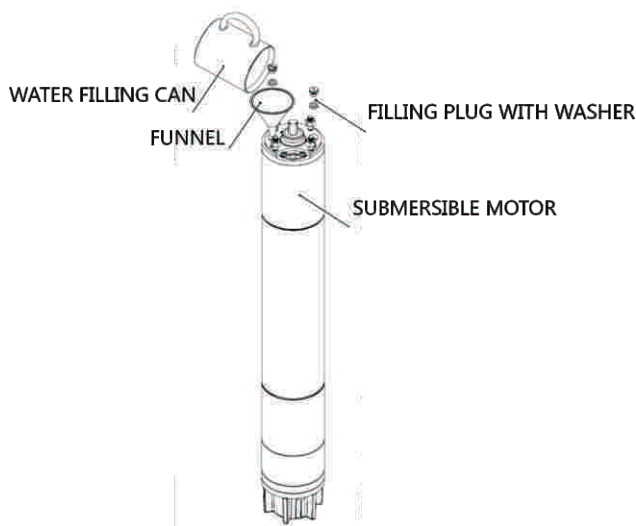



Fig. 4 Topping up the 100 mm Submersible Motor with Pure Drinking Water

- Check the motor and if required, top up the motor with pure drinking water.
- Air bubbles, if any, are removed by gently rocking the motor to and fro.
- Check water level in the motor and if required, top up with cold clear water.
- The two threaded plugs are then re-assembled, ensuring the motor is encapsulated.
- Dry the exterior of the motor and check thoroughly for water leakage.
- If there is no leakage, the motor is now ready for coupling with the pump and then installation.

CHECKING INSULATION RESISTANCE

- Before submerging the unit, measure the Insulation Resistance using a megger of 500 VDC
- Ensure contact points are clean
- Connect the measuring cable to the ground conductor
- Connect the other measuring cable to every core of the motor cable in succession
- Ensure that the insulation resistance, as shown on the megger, is a minimum of 20MΩ.

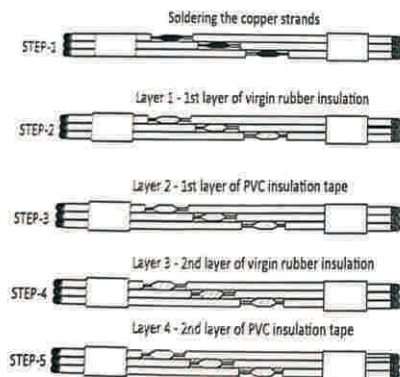
WATER PROOFING THE SUBMERSIBLE MOTOR CABLE-SUPPLY CABLE JOINT

 <p>DANGER</p>	<p>Hazardous voltage-Will cause death, serious injury, electrocution.</p> <p>Disconnect all power before working on this equipment so that it cannot be accidentally switched ON.</p>
---	---

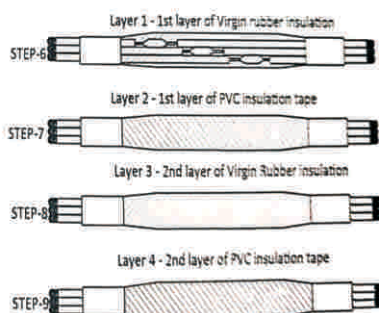
- Submersible Motors are supplied with a 3 core PVC insulated flat cable of length 3 meters
- The free end of the 3-core cable of the motor needs to be connected to the supply cable from the control panel
- As this joint is always nearly submerged in water, the joint needs to be water proof

Refer the sequence shown in Fig.5 below for insulating the cable joint for under water application:

PROCEDURE FOR JOINING AND INSULATING THE 3 CORE CONDUCTORS



PROCEDURE FOR INSULATING THE CABLE JOINT FOR UNDER-WATER CABLE



CHECKING DIRECTION OF ROTATION OF MOTOR




Hazardous voltage-Will cause death, serious injury electrocution.

All electrical work must be performed by an authorized electrician in compliance with local electrical equipment standards and internal wiring codes.

- After water-proofing the joint connecting the submersible motor cable and supply cable, check if the direction of rotation of the motor shaft matches the direction marked on the visible cable box top face
- The direction of rotation is counter-clockwise looking from the motor shaft end, as marked on the cable box
- Connect the free ends of the cable to the control panel and energize the motor for a second or two.
- For added protection, continuously pour clean water over the sand guard to remove heat generated.
- Check the direction of rotation of the motor shaft.
- If the direction of rotation is in the same direction as that marked on the Top Housing exposed face, the connections are right.

- In case the direction of rotation of the motor shaft does not match the marking on the top housing, inter change, for three phase connections, any two lead wires at the control panel and confirm as before.
- For single phase models, in case the direction of rotation does not match the marking on the Top Housing, return the set back to the dealer from where it was purchased.

COUPLING SUBMERSIBLE MOTOR TO PUMP

	<p>Hazardous voltage-Will cause death, serious injury electrocution.</p> <p>Disconnect all power before working on this equipment so that it cannot be accidentally switched ON.</p>
---	--

To couple the submersible motor and pump, follow the following procedure:

- The tripod with chain block is erected.
- Unpack the submersible pump and remove cable guard and strainer.
- Keep the submersible motor vertical.
- Couplings are supplied mounted on the pump shaft
- Couplings with grub screw are supplied assembled on the pump shaft
- Apply threading compound to the internal thread on the delivery casing and the external threaded portion of the short length delivery pipe to be fitted to the delivery casing
- Screw the short length of delivery pipe to the delivery casing

Refer Fig. 6 below for coupling the submersible motor to the pump:

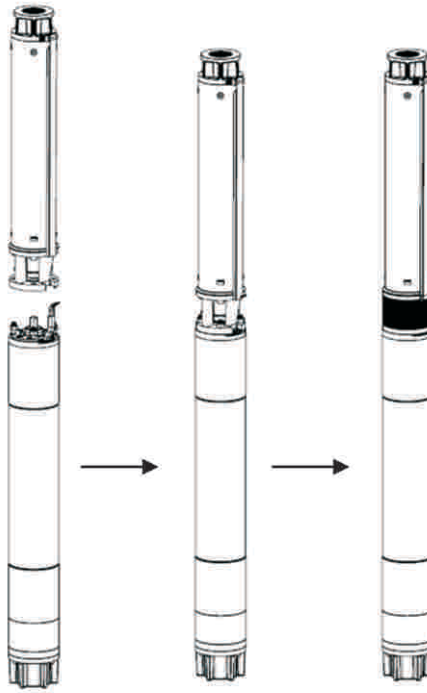


Fig.6 ASSEMBLING PUMP WITH COUPLING AND SUBMERSIBLE MOTOR

- For pumps with the coupling mounted on its shaft, carefully lower the pump while ensuring the motor shaft is aligned with the coupling till the inlet bracket bottom face sits on the top housing
- Ensure that studs on the motor top housing should pass through the holes in the bottom portion of the inlet bracket and that the face of inlet bracket rests on motor top housing.
- Using hexagonal nuts, tighten the inlet bracket to top housing of the motor.
- Check the play by lifting the coupling with pump shaft.
- Check for free rotation of the assembled motor-pump
- Lastly fit the cable guard and strainer back in position, ensuring that the Cable Guard cover the cable.

- Fit the supporting clamp to the delivery pipe and suspend the submersible pump from the chain block (Refer Fig. 7)

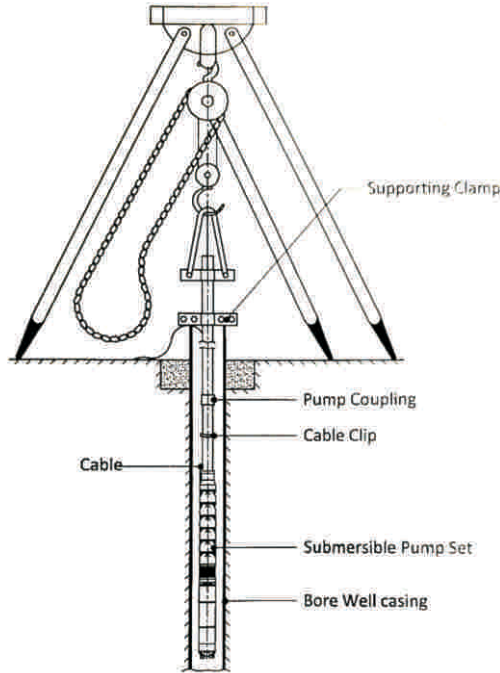


Fig. 7 TYPICAL TRIPOD STAND FOR LOWERING / LIFTING SUBMERSIBLE PUMP SETS

ARRANGEMENT FOR INSTALLATION

- Use the services of a professional and trained mechanic with experience in erecting bore well submersible
- While lowering the pump set, ensure the cable does not get damaged
- Use cable clips to keep the cable as close as possible to the pipe
- Ensure the suspended submersible pump has a secondary support to prevent the set from falling to the bottom of the bore well.


ELECTRICAL INSTALLATION

Check the power supply voltage and frequency and compare with the product requirements specified on the name plate.

- Observe relevant EB regulations while giving power supply to the motor.

- Use a single cable from the Control Panel right up to the Submersible Motor
- Ground the Submersible Motor
- Ensure the joint is water proof as the cable joint is submerged in water
- The cable must not be coiled if it is of extra length. Any excess should be cut off before the connections are made.
- Connect the cable properly to the starter terminals

CONTROL PANEL

 <p>DANGER</p>	<p>Failure to use correct starting equipment and overloads may damage your Submersible Motor. This damage may not be covered by warranty.</p>
---	---

It is recommended that the Control Panel shall incorporate the following:

- Contactors of sufficient current ratings with over-current relay
- Over voltage and under voltage protection
- Phase failure protection
- Dry run preventer
- Ammeter and Voltmeter to display the current and voltage

CABLE LEAD WIRE CONNECTION TO STARTER

DIRECT ONLINE STARTER

CABLE	TERMINAL
RED	U
YELLOW	V
BLUE	W

STAR DELTA STARTER

CABLE 1	TERMINAL	CABLE 2	TERMINAL
RED	U1	RED	U2
YELLOW	V1	YELLOW	V2
BLUE	W1	BLUE	W2

CABLE SELECTION

Refer TABLE 2 for the selection of cables from Control Panel to Submersible Motor:

TABLE 2
SUBMERSIBLE CABLE SELECTION CHART
(For 415 V, 50 Hz Ac power supply)


FL Current (Amps)	Motor Rating		Cable size in Sq.mm									
			1.5	2.5	4.0	6.0	10.0	16.0	25.0	35.0	50.0	
	kW	HP	Maximum Length of Cable in Meters									
2.75	0.75	1	262	437	705							
3.25	1.1	1.5	222	370	596							895
4.5	1.5	2	160	267	430	646						
6.5	2.2	3	111	185	298	447						
8.5	3	4	84	141	228	342	590	933				
10	3.7	5	72	120	193	290	502	793				
12	4.5	6	60	100	161	242	462	661				
14.5	5.5	7.5 DOL		82	133	200	346	547				
14.5	5.5	7.5 SD	86	143	231	347	600	947				
18	6.7	9	69	115	186	279	483	763				
19.5	7.5	10	64	106	172	258	446	704				
25	9.3	12.5		83	134	201	348	549				852
29	11	15		71	115	173	300	473	735			
34	13	17.5			98	148	256	404	626	882		
39	15	20			86	129	223	352	546	769		
43	18.5	25			78	117	202	319	495	697		
52	22.5	30				96	167	264	409	577	828	
60	26	35					145	229	355	500	717	
65	30	40					133	211	327	461	662	

Note:


- Table shows maximum allowable length of submersible cable for the given full load current where site voltage is normal i.e. 415V.
- For other voltages, the cable size is to be selected for the length which is calculated as follows.
- Calculated length = $(415 / \text{Actual voltage}) \times \text{Actual length}$
- 7.5 HP and above are Star Delta motors. For these motors, the actual current is 1/ 3 times the Full Load current.
- The cable size and maximum allowable length are arrived at accordingly.

ELECTRICAL WIRING WORK


Operate well within the capacity of the power supply and wiring.

 <p>WARNING</p>	<ul style="list-style-type: none"> • All electrical work must be performed by an authorized electrician in compliance with local electrical equipment standards and internal wiring codes. • Improper wiring can lead to current leakage, electrical shock, or fire. • Provide a dedicated (ELCB) earth leakage circuit breaker, single-phase preventer, dry run preventer, and overload preventer for the submersible pump. Failure to follow this warning can cause electrical shock.
--	--


EARTHING

 <p>WARNING</p>	<ul style="list-style-type: none"> • Be sure to install the ground wire securely. Failure to observe this precaution could damage the pump and cause current leakage, which may lead to electrical shock. • Do not connect the ground wire to a gas pipe, water pipe, lightning rod, or telephone ground wire. Improper grounding could cause electrical shock.
--	---

CONNECTING THE POWER SUPPLY


 <p>WARNING</p>	<ul style="list-style-type: none"> • Observe relevant Electricity Board regulations while powering up the Pumpset. • Before inserting the power plug or connecting the wires to terminal board, make sure that power supply is properly disconnected. Failure to do so may lead to electrical shock, short, or injury caused by the unintended starting of pump. • Do not use damaged cables, power plugs, or loose power outlets. Failure to observe this precaution could lead to electrical shock, short circuit, or fire.
--	--

PRECAUTIONS DURING INSTALLATION

 <p>WARNING</p>	<ul style="list-style-type: none">• When installing the pump, be mindful of the pump's center of gravity and weight. If the pump is not suspended properly, the pump may fall and break, which may lead to injury.• When installing or moving the pump, never suspend the pump by the cable. Doing so will damage the cable, which may cause current leakage, electrical shock, or fire.
--	---


START-UP

- When the pump has been connected correctly, direction of rotation confirmed and is submerged in water, it should be started with the gate valve closed off to approximately 1/3 of its maximum volume of water.
- 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 clean, as otherwise the pump parts and the non-return valve may choke up.
- As the valve is being opened, the draw down of the water level should be checked to ensure that the pump always remains submerged.
- The dynamic water level should always be above the inlet bracket.
- If the pump can pump more than yielded by the bore well, it is recommended to fit a dry running protection device.
- If the water level approaches the inlet bracket, there is likelihood of air being drawn in and being pumped with water.
- Long time operation with water containing air may damage the pump and cause insufficient cooling of the motor.

 <p>WARNING</p>	<p>If you find any abnormalities like vibration, noise, smell, etc., from the pump during trial operation, switch OFF the pump and contact the dealer from whom this pump was purchased.</p>
--	--


9. IMPORTANT SAFETY INSTRUCTIONS

Only qualified personnel should be involved for inspection, maintenance and repairs. The successful and safe operation of such a product depends on proper handling, installation and maintenance. It is suggested that in case of non-functioning of the product, the customer is requested to contact the dealer through whom the purchase was made.

	<p>Hazardous voltage-Will cause death, serious injury, electrocution.</p> <p>Disconnect all power supply before working on this equipment.</p> <p>Maintenance should be performed only by qualified personnel.</p>
---	--

10. STORAGE AND HANDLING

- The submersible pumps are supplied from the factory in proper packing in which they should remain until they are to be installed.
- The product should be stored in a closed, dry and well-ventilated room.
- Do not store the products in direct sunlight.
- Handle the pumps with care and do not expose the product to unnecessary impact and shocks.
- During unpacking and prior to installation, care must be taken when handling the pump to ensure that misalignment does not occur due to bending.

	<ul style="list-style-type: none">• If the motors are stored, the shaft must be turned by hand at least once a month.• If the motor has been stored for more than one year before installation, dismantle the motor and check rotating parts before use.• After a long period of storage, the pump should be inspected before it is put in operation. Ensure impeller can rotate freely.
---	--



DANGER

- The unit has water lubricated journal and thrust bearings and must never be run dry. Starting the pumpset for a short period without water must be avoided entirely as operation under such conditions will damage the bearings.



Headquarters :

1 Keong Saik Road,
Unit 10 - The Working Capitol
Singapore 089109
Tel. +65 6813 2111
Email. info@samudra.net

India Operations :

Office Block 1, Ground Floor,
Senthil Towers, 1078 Avinashi Road,
Coimbatore - 641 018, Tamilnadu, India.
Tel. +91 422 498 22 55
Email. info@samudra.net