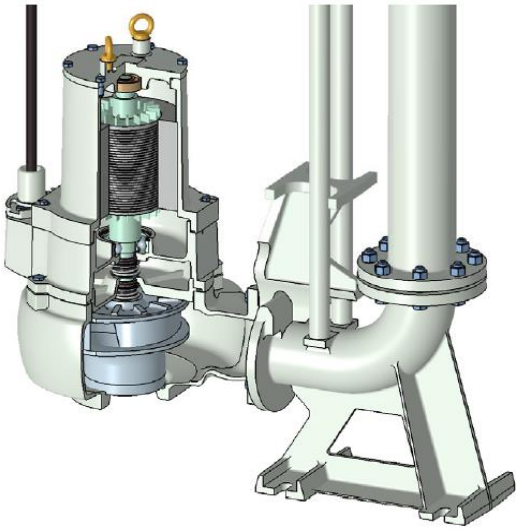
Installation, Operation and Maintenance Manual



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Introduction

Berkeh BSW[1] pumps is an integrated solution which has vast application in irrigation, drainage, waste water transport, industrial and municipal water transport. Meanwhile, according to the easy installation of submersible pump, the pumping station will be ready to utilize rapidly. Quick installation, easy operation, low cost and simple maintenance are some advantages of submersible electro pumps. All required information of pump's performance including sealing, ball bearing and motors can be accessed through the control panel. Also it is possible to add an alarming system to pump, thus upon any error the system alarms.

BSW pump consists of three main housings as follows:

1-1 Electro motor casing: a sealed space to mount stator, rotor, ball bearing, moisture and thermal sensors. Power wires are in junction box.

1-2 Stuffing box: a space between pump casing and motor casing. This space is sealed by two sets of seal. The space between two seals filled by oil.

1-3 Pump casing: media is passing through this part .impeller and sealing are in this part.

Pump Specification

Flange Size	DN 32 Up to 350 ($1\frac{1}{4}$" up 14")
Head	Up to 80 m
Capacity	Up to 1300 m^3/h
Nozzle	Acc. To DIN Standard
Sealing	Mechanical Seal
Pump Material [2]	Cast Iron , Ductile cast iron , Bronze , Carbon Steel , Stainless Steel

[1] Submersible Sewage Pumps (Stationary & Portable Ins.)
[2] Material is Changeable on request

1-Transportation

To transport the pump set, attach the chain to the top of the motor casing.

Eye bolts and chain are used to lift the pump. Look at the Fig. 1:

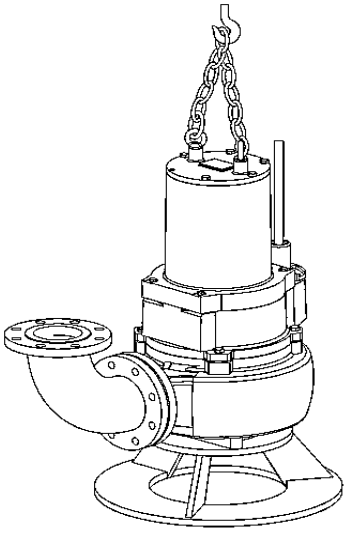

Fig. 1

NOTE:

- The chain or the supplied rope must only be used for hoisting the pump set.
- Never use it to hoist any other loads.
- Do not suspend the pump set using the motor cable!
- Do not switch on the pump set without oil.

2-Installation

2-1- Before mounting the pump check the operating voltage/ direction of rotation (2-1-1) and oil level (2-1-2).

2-1-1 Operating voltage/Direction of rotation check

The motor operating voltage should correspond to the nameplate. Do not remove the protective cap on the cable ends until just before connecting up the cables. After the unit has been connected up as per 3, observe the following: Correct direction of rotation: Anticlockwise viewed from the suction side. If the correct mains phase sequence is known, then connecting up in accordance with 3 automatically means the pump rotates in the correct direction (motor anticlockwise).

Otherwise check the direction of the rotation as follows:

Procedure:

First ensure there are no solid particles in the pump casing.

Do not reach with your hands inside the pump!

1. Manual check

Place the pump in horizontal position and switch it on, then off again immediately. Observe the direction of rotation of the impeller from the suction side. It must correspond to the arrow on pump's name plate casing.

2. Check by means of current consumption

In the event of reverse running, the current consumption will rise, as the throughput increases, up to 2 x I_N (especially on pumps with free flow impellers).

2-1-2 Oil Level Check

The pump is supplied with the oil chamber full. Re-check the

Oil fill before pump start-up.

For all BSW pumps mechanical seal lubricated by oil and not grease or like that.

Procedure:

Position the pump horizontally as shown in Fig. 2 Unscrew the threaded plug (903) including gasket (411.03). The oil level must not be more than 50 mm below the outer edge of the upper hole. Top up with oil if necessary until chamber overflows.

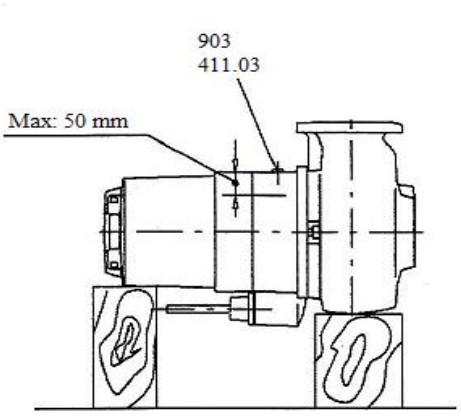

Fig. 2

Example of a nameplate

A separate nameplate with all pump and motor data is supplied with the pump and should be attached outside the pump sump in a visible place (control cabinet, pipe, bracket).

2-2 Stationary Installation

90 MM

BERKEH

Submersiblel Pump

TYPE: BSW 200-400/M		S.No.:	967344	
CAPACITY: 420	M³/H	HEAD:	20	M
P: 45	KW	SPEED:	998	RPM
MOTORTYPE:3PH,50 HZ		LIQ TEMP.:	AMB	°C
VOLTAGE: 380	V	CURENT:	87	A

60 MM

90 MM

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60 MM

2-2-1 Items of supply

- Installation set for stationary version

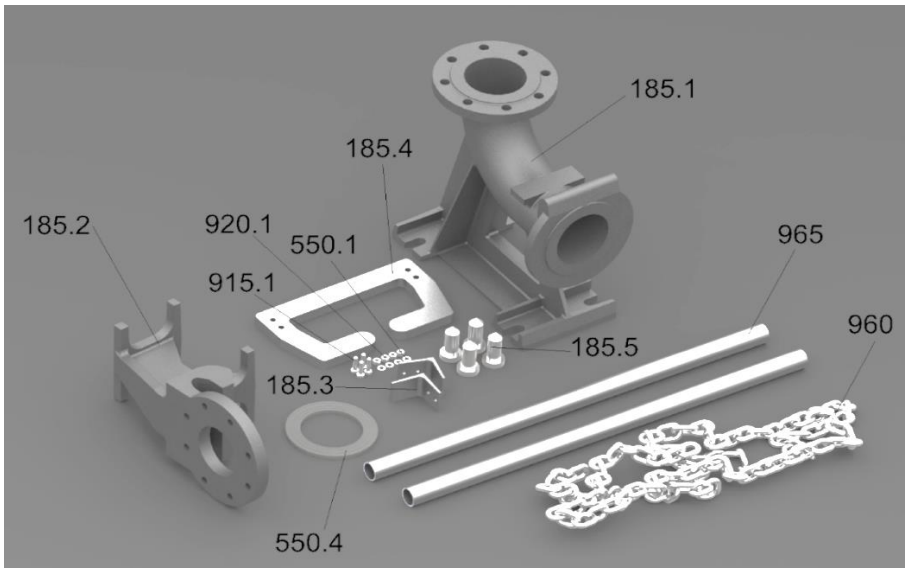


Fig. 3

Installation set comprising :

Part No.	Description	Part No.	Description
185.1	Duck Foot Bend	915.1	Hexagonal Screw
185.2	Clamp	920.1	Hexagonal Nut
185.3	Structural equal leg	960	Chain
185.4	Bracket	965	Guide pipe
185.5	Guide cap	-	
550.1	Flat Washer	-	
550.4	polyethylene washer	-	

2-2-1-2 Guide rail installation method:

Required accessories:

1-Bracket (185.4), 2-Chain (960), 3-Guide Pipe (965), 4-Clamp (185.2), 5-Duck foot bend (185.1).

To install the pump in a stationary version, the pump station should be prepared based on following steps:

-Installation of duck foot bend on the sump base. The duck foot bend is bolted to concrete base by stainless steel bolt.

Installing and adjustment of pipe guide according to below steps:

-Temporary installation of bracket.

-Adjustment and fixing of guide pipe.

-Fixing bracket.

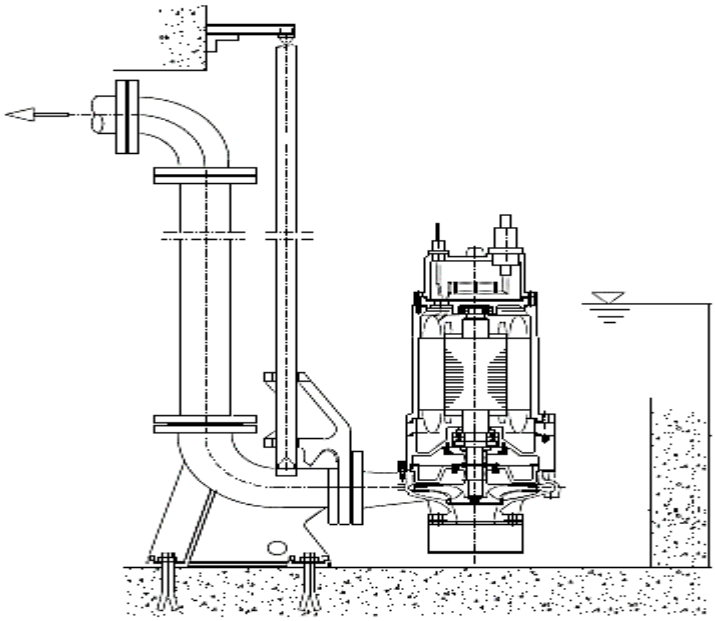


Fig. 4

2-2-2 Installing the pump

Attach the chain to the pump on the opposite side to the discharge nozzle (see fig.5). Locate the pump clamp over the guide wire and lower the pump into position. The pump automatically attaches itself to the duck foot bend (185.1) and hence to the discharge pipe ready for operation.

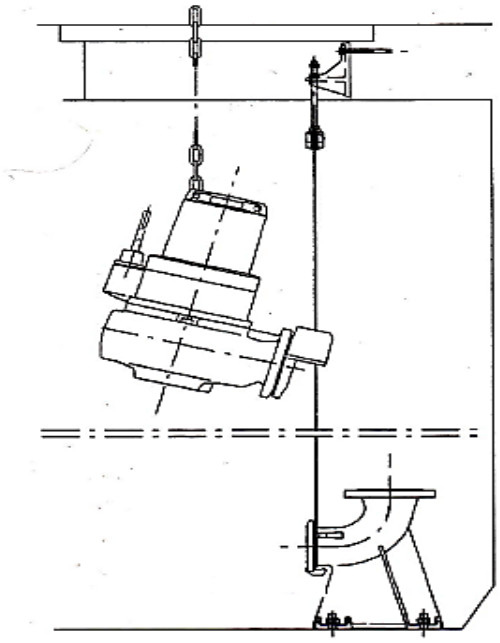


Fig. 5

2-2-3 Connecting the Piping

Ensure the connection of the discharge pipe to the duck foot bend is stress-free. When draining low-level installations provide a non-return flap valve in the discharge pipe to avoid backwash from the drain; the discharge pipe is routed upwards, i.e. above backwash level (street level), and then back into the sewer duct. Fit the non-return flap valve at least 0.5 mm above the duck foot bend(185.1) .If fitting the valve directly on the duck foot bend cannot be avoided, drill a vent hole in the bend (at least 15 mm dia. When handling untreated sewage 25 mm dia).

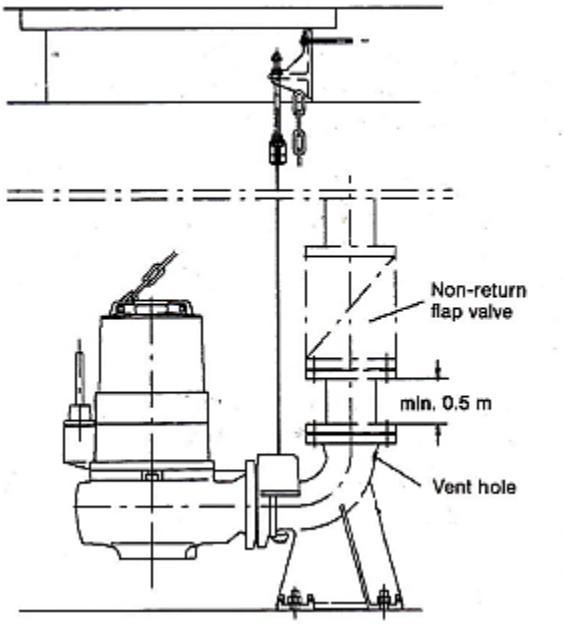


Fig. 6

2-3 Installing the Pump (portable)

Needed equipment: 1- Portable Support, 2- Connecting the Piping (Out).

2-3-1 Installing the Pump

Suspend the pump from the chain which is attached to the pump on the same side as the discharge nozzle (see fig.1). This causes the discharge nozzle to tilt upwards thereby automatically venting the pump as it is lowered into position. The pump must be installed in the vertical position, motor above, on a solid floor.

Part No.	Description
185	Support
550.1	Flat Washer
915.1	Hexagonal Screw
920.1	Hexagonal Nut
960	Chain

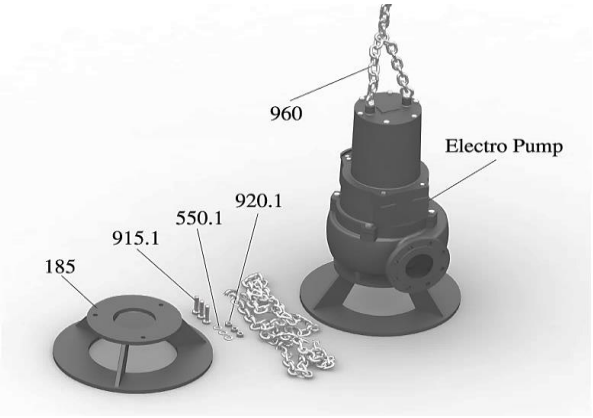


Fig. 7

3- Electrical connections

General

The pump set must only be connected up by a qualified electrician. The local regulations must be complied with. The circuit diagram of the plant is relevant for connecting up the pump set.

The pump is supplied complete with a power supply cable. The cable conductors each have a yellow cable marker at the end with black lettering (e.g. U, V, W, 21, 22 or 10, 11). If it is necessary to shorten the cable, use the cable identification numbers or colors along each conductor to avoid mixing them up. In this case the yellow cable marker should be removed and after shortening the cables properly attached again. The cable identification numbers are printed along each conductor.

When running an earthing cable between the pumping station and an electrical switchgear you must also run a multicore control line (min. 1.5 mm^2) for the motor temperature and level control etc. The number of conductors depends on each requirement. In hazardous areas all electrical cables must be connected to the earthing cable through flameproof boxes or approved synthetic resin connectors. The power cable should be routed upwards as taut as possible so that it cannot be caught by the suction forces.

Running of the pumps is done by direct or STAR/DELTA methods. Boarding panel of the pumps should have below protections:

- Phase control board protects system against power cut or phase replacing
- Current control protection or b-metal: for protecting motors against absorbing high voltage of power

Note:

B-metal must adjust according to the MAX absorb current of motor. Otherwise the motor might be harmed. Motor cable referring to the type of pump and the operation method has 3 or 6 wires and 1 wire earth.3 to 6 wires are for running motor and the rest are for connecting moisture and thermal sensors to the running panel.

In direction connection related wires to motor have U,V and W sign.in DELTA/STAR method related wires to motor are (U1,U2),(V1,V2),(W1,W2).

4-Running and utilizing

Note:

- Never run the pump outside water.
- Minimum needed depth of water is when the pump is sunk.
- The max temperature of the water must not go higher than 40C.
- Running pump outside the water cause serious harm to the motor.in this regard, the level of water shall cover the casing of the motor.

5-maintenance and lubricating

Please note the following items in maintaining processes :

I- Embedded ball bearings in BSW pumps do not need lubricating otherwise unless is mentioned by Berkeh Company.

II- Electro pump shaft is sealed by 2 sets of mechanical seal, one of them is oil lubricated and the oil in the stuffing box shall be renewed each 6 months. When the color of oil is black, the sealing must be renewed.

III- The used oil is SAE 10W and SAE 20W.

IV- It is recommended to empty the oil in the casing if the pump is not working for a long period of time.

Lubrication Schedule

Description	Oil refill	Grease refill
Bearings	-	No regreasing
Stuffing box	Each 6 months	-

6- Guide for inspection and maintenance

For running the pumps, first of all check the impeller from external objects. In the next step please check the direction of the rotation. Run the pump shortly; because working pump without water causes high temperature.

If you want to run the pump after a long period, it is highly recommended to check the oil level avoiding problems. In a case of color changing of oil you should empty the oil and refill it with fresh oil.

For maintenance following below:

1. Check electrical condition of insulation on power cable(s) and on all phases of the motor (in Meg Ohms).
2. Check for any loose or faulty electrical connections within the control panel.
3. Measure resistance between stator windings (in Ohms).
4. Check voltage supply between all phases of the electrical control panel.
5. Check voltage balance between all phases on the load side of the pump / mixer control panel with pump / mixer running (VAC).
6. Check amperage draw on all phases of the motor (in Amps).
7. Check condition and operation of the motor thermal protection control system (if equipped).
8. Removal of pump / mixer from the lift station for physical inspection.
9. Check condition of upper and lower shaft seals (inspect condition of motor / stator housing, if applicable).
10. Check condition and operation of leakage and bearing sensors (if equipped).
11. Drain oil from oil housing and replace with new oil.
12. Check for worn or loose impeller or propeller.
13. Check impeller wear rings (rotating & stationary) – Note wear rings are a wear item and are not included in the cost of this
contract.
14. Adjust clearances as needed for optimal operation.
15. Check for any unusual noise in the upper and lower bearings.
16. Clean, reset and check operation of the level control system (if equipped).
17. Check for physical damage of power and control cables.
18. Check for correct shaft rotation.
19. Reinstall the pump / mixer and check operation (if liquid level in the station permits).
20. Test the pump / mixer operating cycle, under load (if liquid level in the station permits).
21. Perform draw down test on pumps to establish GPM being produced (when possible).
22. Perform shut off head test on pumps to establish pressure being produced (when possible).
23. Check operation of valves and associated equipment.

6-1 using proper strainer

Proper strainer is really helpful to prevent hard material to enter into impeller. Not using proper strainer cause serious damages to pumps including clogged impeller and motor burning.

6-2 periodical monitoring of pumps

Please check the pump condition each month on a regular basis.

6-2-1 checking oil level: In periodical monitoring of the pumps, it is highly recommended to check the oil level and the color of oil. The color of the oil corresponds to the condition of the sealings. In this way when the color of oil is black please renew the mechanical seals.

6-2-2 refurbishment of casing and impeller free passage: the passage of media will be cleaned perfectly and make sure that there would be no hard material in impeller free passage.

6-2-3 cleaning strainer: cleaning strainers on a regular basis is perfectly helpful for pump performance.

6-2-4 changing pipe guide and chain on-time: change the guide pipe and chain on a regular basis to improve pump performance.

7-BSW pump protection

Stators in all BSW pump have thermal switch which is run through control board.

Control system of electro pumps:

All BSW pumps could get equipped to this system. Control system is able to protect the electro motors against any harm during running. Moisture sensor alarms when water get through the electromotor casing and stop motor working. PTC sensor is mounted on the proximity of motor coil, thus in the case of increasing the temperature in coil, PTC commands the system to stop. Floating switch is able to alarm when the level of water descends.

Note:

-You need proper switchgear panel in which all protective measures have been adopted. Appropriate switchgear has two main requirements:

1-Phase control relay

2-Current control: this part controls motor absorbed current.

-It is highly recommended to check the direction of impeller rotation

How to connect wires to the pump:

Input threads of electro pumps have following numbers:

Group 1: In DOL method wires should be connected according to below guide to the terminal box:

U1, W2 threads together to terminal R

V1, U2 threads together to terminal S

W1, V2 threads together to terminal T

Most available electro motors are made 380/660 voltage.in this way, running is according to Delta/Star.

Group 2: 22, 21 two mentioned threads for thermal control of electro pumps are used by a thermal switch with NC.

The electro pump shall be in series arrangement with contactor in the control circuit, such as installing bi-metals or phase control. Hence in the event of overheating, the electro-motor can be switched off and after cooling it is automatically re-run.

Group 3: E thread is earth cable.

Group 4: 31, 32 These wires are used to connect the humidity sensor inside the electro-pump so that it can interfere with the control circuit and interrupt the power circuit in the case of leakage into the engine and prevent potential hazards.

Name Plate: Δ

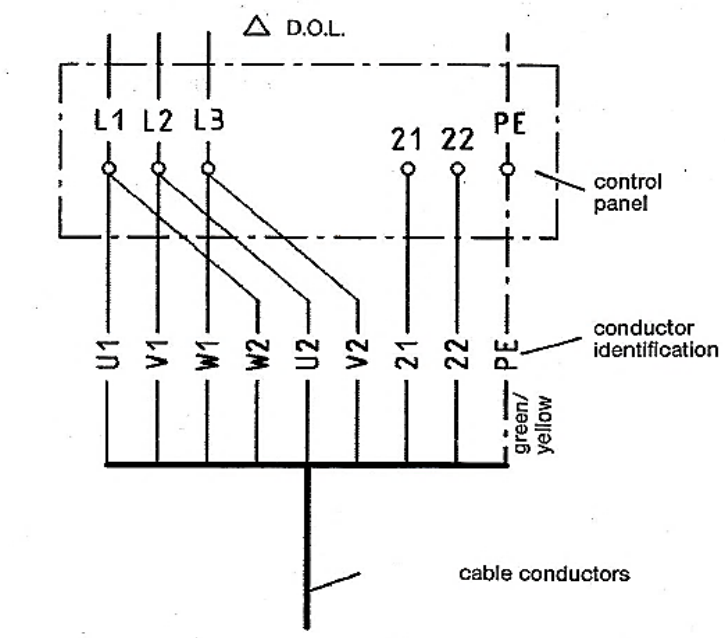


Fig. 8

Name Plate: γ

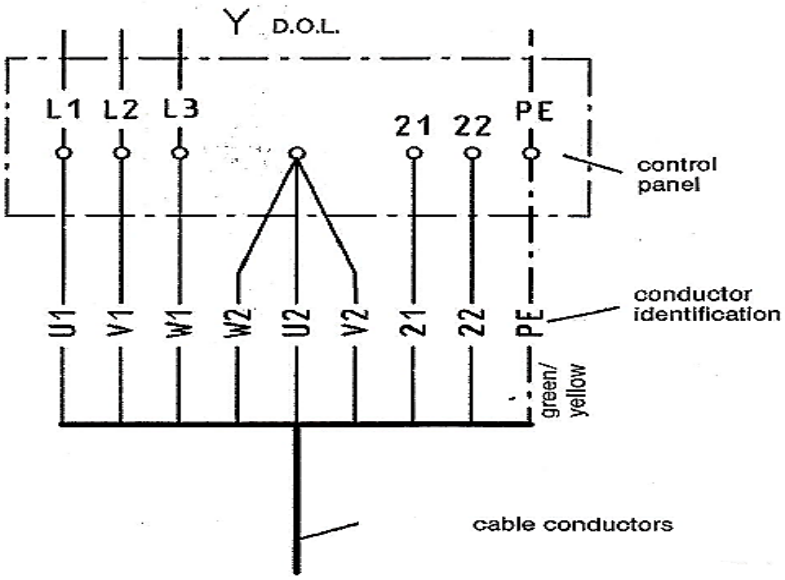


Fig. 9

BSW Pump ; Sample Part List

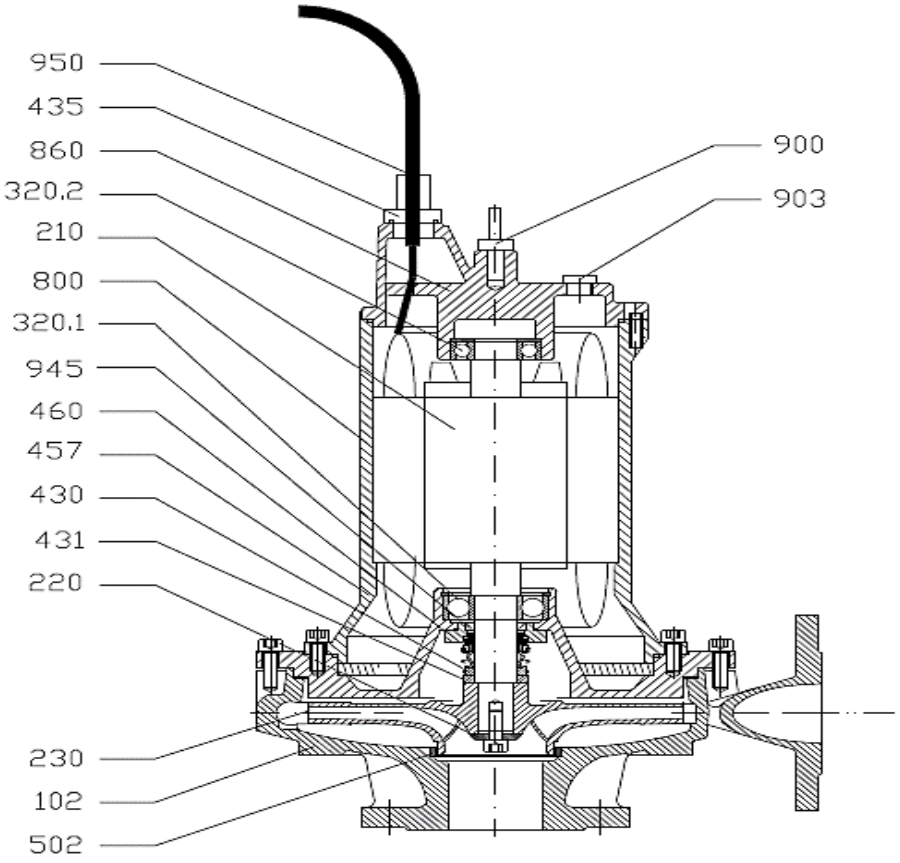


Fig. 10

Part No.	Part name	Part No.	Part name
102	Volute (Casing)	457	Pump Cover
210	Motor Assembly	460	Seal Cover
220	Impeller Ring	502	Casing Wear Ring
230	Impeller	800	Motor Casing
320.1	Lower ball bearing (Single Row Deep Groove ball bearing)	860	Motor Cover
320.2	Tap ball bearing (Single Row Deep Groove ball bearing)	900	Lifting Eye Bolt
430	Mechanical Seal	903	Plug
431	Seal Ring	945	Oil Seal
435	Gland	950	Cable

Parts for installation to the stationary base

Guide rail method: Pipe guide, Chain, Bracket.

Different Type of installation:

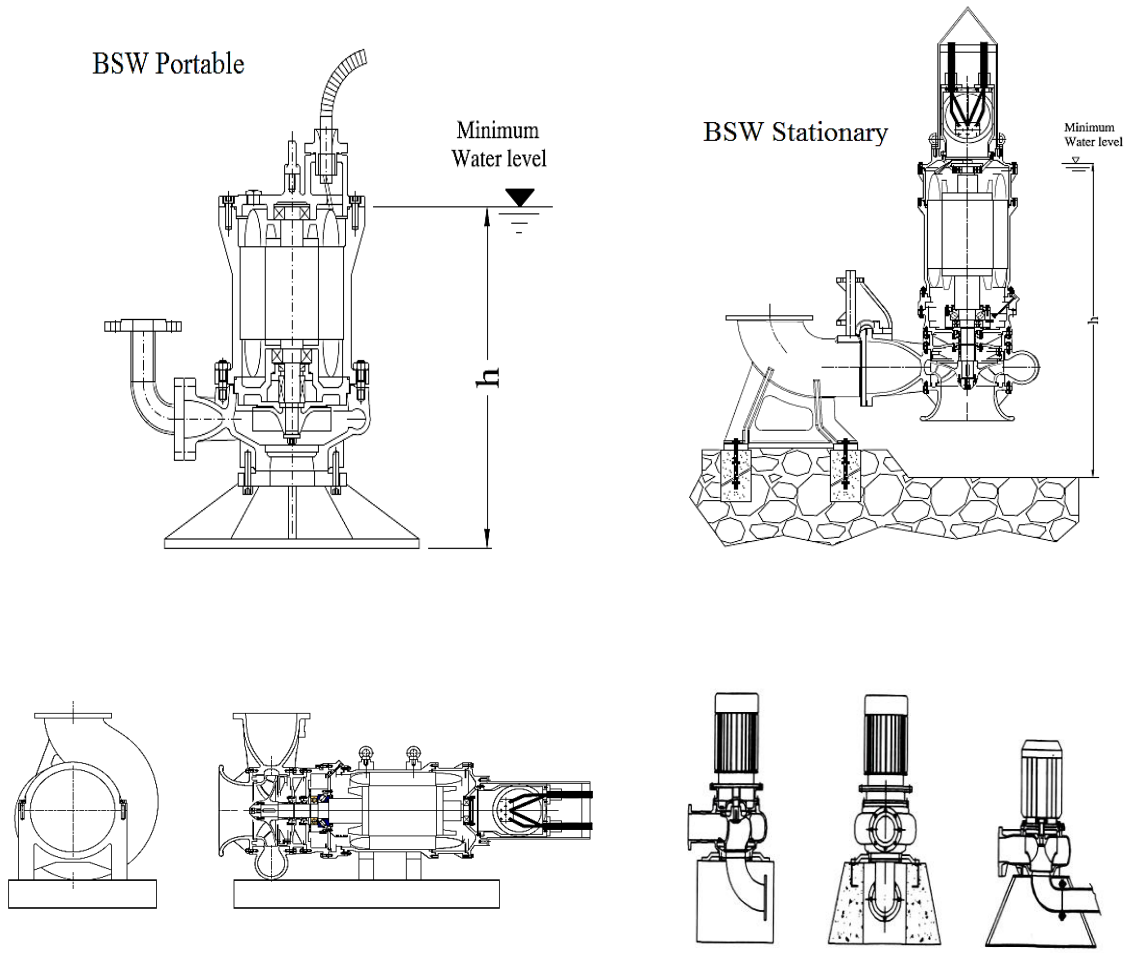


Fig. 11

Different Type of impeller:

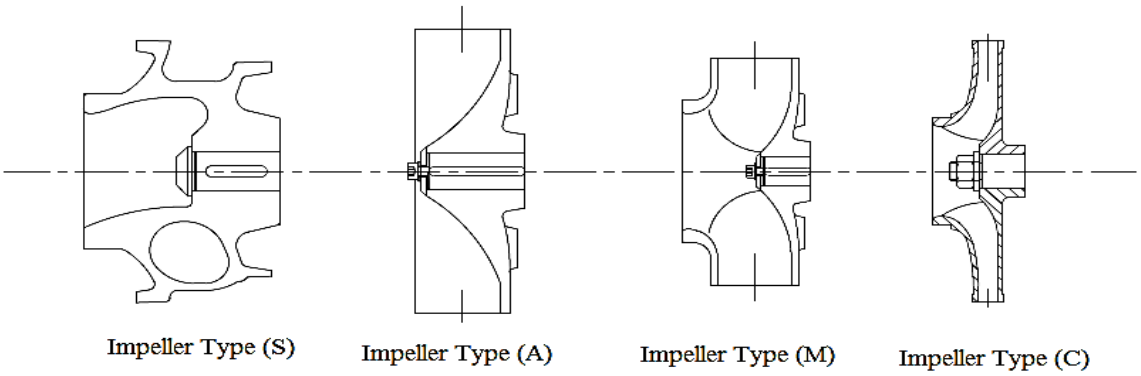
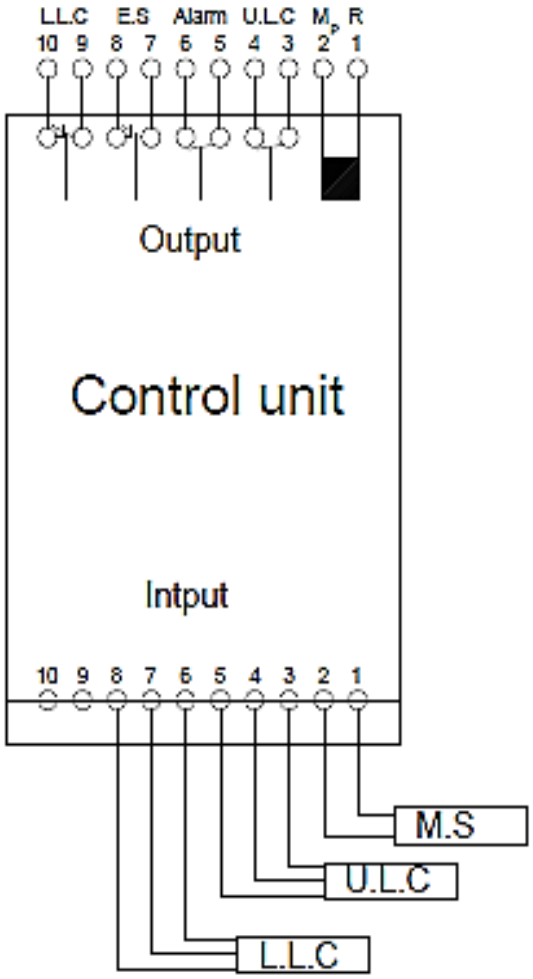


Fig. 12

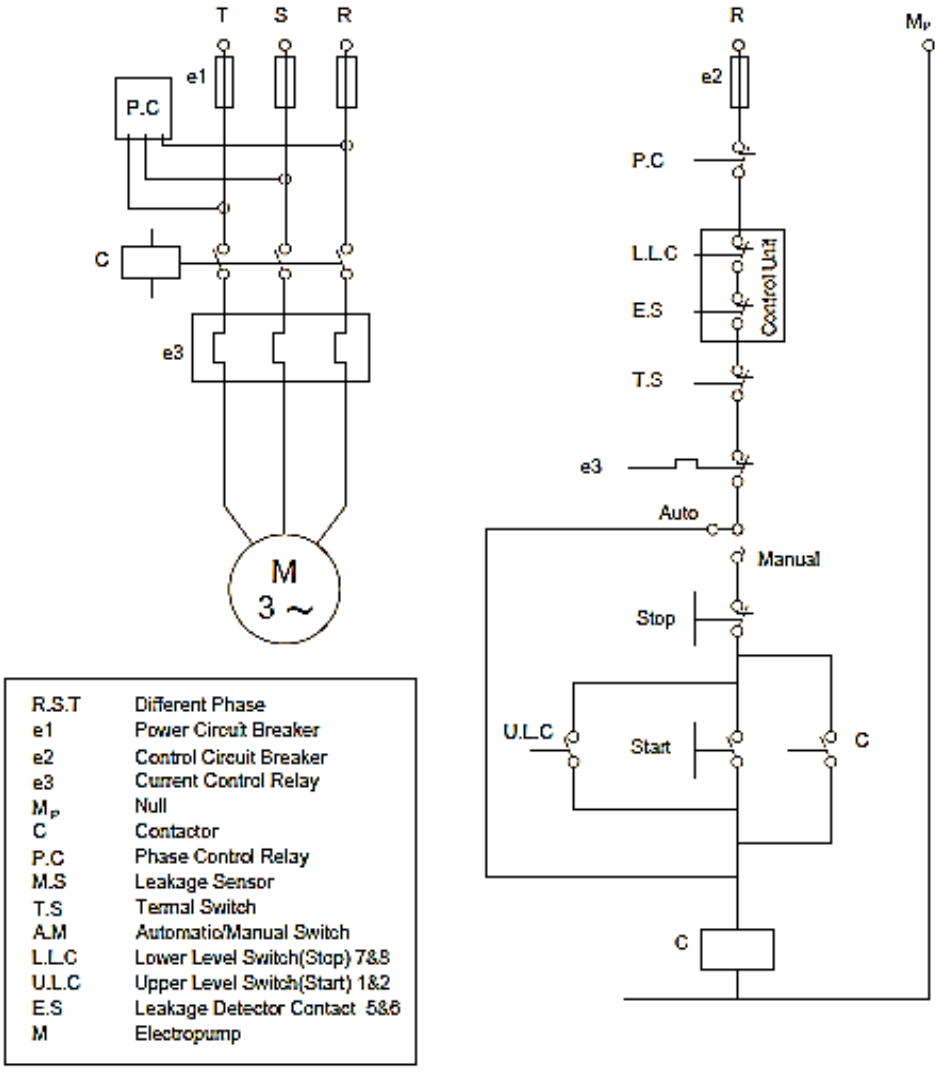
Termination & Wiring Diagram Guide for Control Unit



Output	
1,2	Power Supply
3,4	Upper Level Contact(N.O.)
5,6	Alarm Contact(N.O.)
7,8	Moisture Sensor Contact(N.C.)
9,10	Lower Level Contact(N.O.)

Output	
6,7,8	Lower Level Switch
3,4,5	Upper Level Switch
1,2	Moisture Sensor

Fig. 13



R.S.T	Different Phase
e1	Power Circuit Breaker
e2	Control Circuit Breaker
e3	Current Control Relay
M_P	Null
C	Contactor
P.C	Phase Control Relay
M.S	Leakage Sensor
T.S	Termal Switch
A.M	Automatic/Manual Switch
L.L.C	Lower Level Switch(Stop) 7&8
U.L.C	Upper Level Switch(Start) 1&2
E.S	Leakage Detector Contact 5&6
M	Electropump

Fig. 14

Electropump Wiring Diagram Guide Y-Δ

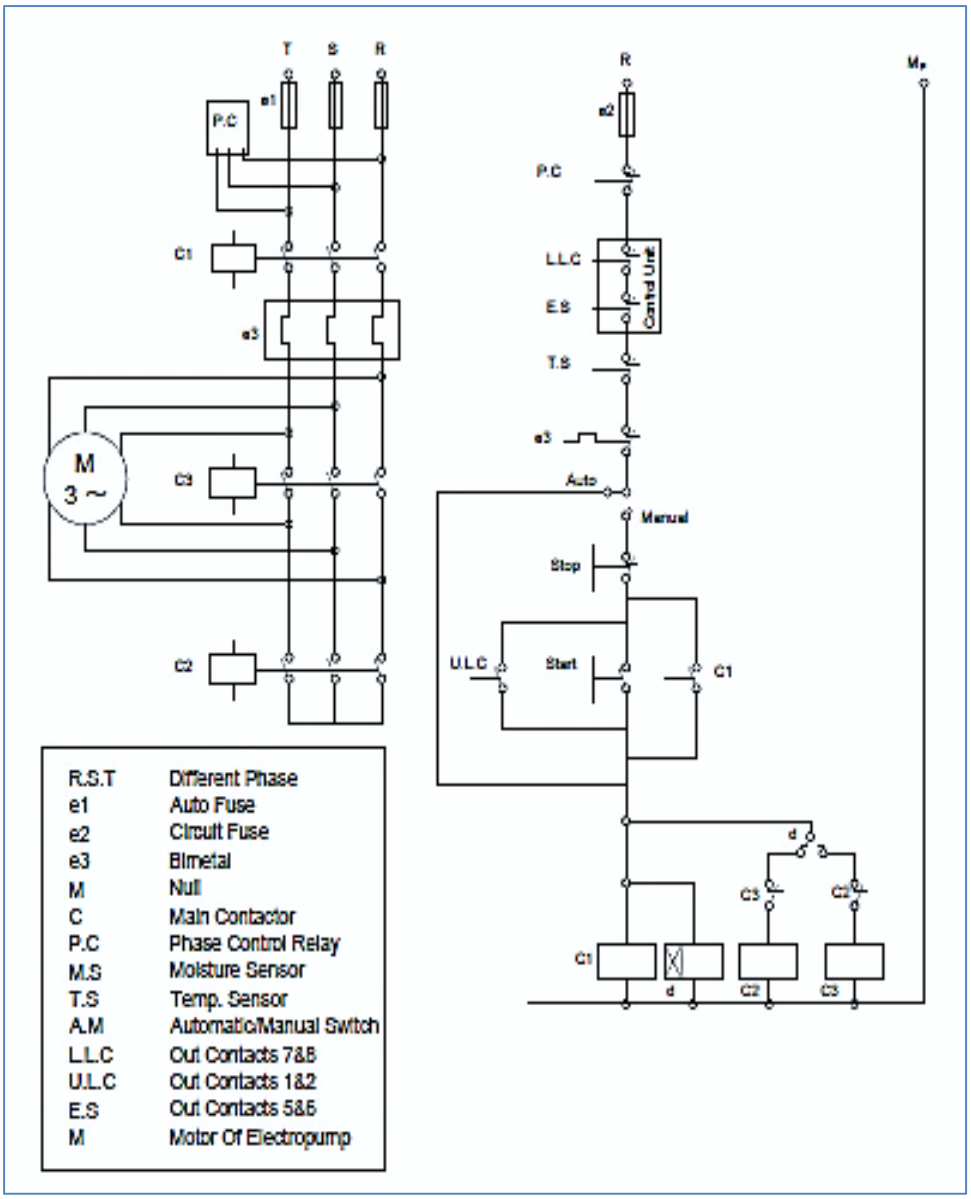

T
S
R
e1
P.C
C1
e3
M
3 ~
C3
C2
R
e2
P.C
L.L.C
E.S
Control Unit
T.S
e3
Auto
Manual
Stop
U.L.C
Start
C1
d
C3
C2
C1
d
C2
C3
R.S.T Different Phase
e1 Auto Fuse
e2 Circuit Fuse
e3 Bimetal
M Null
C Main Contactor
P.C Phase Control Relay
M.S Moisture Sensor
T.S Temp. Sensor
A.M Automatic/Manual Switch
L.L.C Out Contacts 7&8
U.L.C Out Contacts 1&2
E.S Out Contacts 5&6
M Motor Of Electropump

Fig. 15

8- Trouble shooting

Item	Defect or Malfunction	Trouble shooting
1	Pump does not start	- Check the power cable connections on junction box. - Check the cables resistance by multi meter. - Check the whole cables (3 phases) for probable damages. - Mechanical obstacle. Try to rotate the impeller manually. If impeller rotates hardly or is jammed, it shall be checked for mechanical defects.
2	Pump starts but there is no flow in discharge or flow rate is much less than preferred flow rate	- Check the direction of impeller rotation. If the impeller rotates in reverse direction, amendment shall be done by changing two cable phases on JB. - Check the suction flange. If an obstacle is trapped in impeller or in the inlet of the suction flange, it shall be removed before operation. - Control the outlet flange of the pump and discharge piping. There might be an entanglement which shall be removed. - Check the absorbed current for overloading of the pump. In this case switch off the pump and check above mentioned items. - Contact the manufacturer.
3	Overloading absorbed current	- Check and adjust the outlet pressure by valve. - Control the mechanical entanglement of piping and dis. suc. Nozzles. - Contact the manufacturer.
4	Noise from pump/piping	- Switch off the pump and check the mechanical obstacles which might be trapped in the impeller or pipeline. - Contact the manufacturer.
5	Pump trip	- Moisture detected by sensors. In this case contact manufacturer. - Temperature rises over the preferred temp. in this case contact the manufacturer. - Check mechanical entanglement and remove if there is any obstacle.
6	Flow rate/pressure fluctuating	- Check the voltage of JB. - Check mechanical entanglement and remove if there is any obstacle. - Contact the manufacturer.