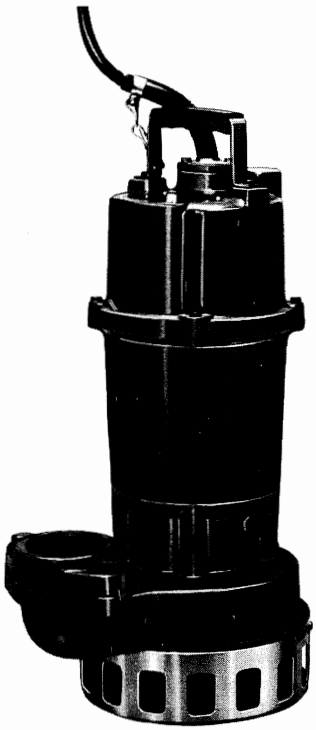
Instruction Manual

EBARA Submersible Sewage Pumps

MODEL DS, DN

Model DS



Model DN

Introduction

Check the following points upon receipt of your pump:

(1) Is the pump exactly what you ordered? Check the nameplate. **It is especially importaht that you check whether the pump is to be used with 50Hz or 60Hz.**

(2) Has any damage occurred during shipment? Are any bolts or nuts loose?

(3) Have all necessary accessories been supplied? (For a list of standard accessories see **Construction.**)

We recommend that you keep a spare pump on hand in case of emergencies. Keep this instruction manual in a safe place for future reference.

Specifications

Check the nameplate for your pump's head (HEAD), discharge volume (CAPACITY), and speed (SPEED), motor voltage and current. Other specifications are listed in the chart below.

		DS	DN
Liquid	Name	Sewage	
	Temperature	DS, DSA, DN, DNA . . . . . 0~40°C DSJ, DNJ . . . . . 0~32°C	
	Max. size of foreign matter	around 10% of pump discharge size	ϕ40 . . . . . 15mm ϕ50 . . . . . 19mm (1.5kW~ . . . . 25mm) ϕ65, ϕ80 . . . . . 35mm
Impeller	Materials	Cast iron or Ductile cast iron, Bronze (option)	
	Type	Semi-open	
Motor		Submersible dry 2 pole motor	
Shaft seal			
	Type	Double mechanical seal	
	Lubrication	Turbine oil (ISOVG32)	
Max. submersible depth		0.15~1.5kW. . . 4m 2.2~7.5kW. . . . 8m	
Installation		Floor model	

Be careful not to exceed the given specifications in the use of your pump.

Installation

1. Check the following before beginning installation.

Insulation resistance measurement:

For three phase motor:

With the motor and cable (excluding the power supply connections) immersed in water, use a megger to measure the insulation resistance between the ground wire and each phase of the motor, and between each phase of the motor itself.

For single phase motor:

Use a megger to measure the insulation resistance between both prongs of the plug and grounding wire.

The megger should indicate an **insulation resistance of not less than 20mega ohms.** While making the measurement, keep the power supply cable off the ground.

2. Installation

Fig. 1 is an example of pump installation. Refer to the figure as you read the following paragraphs.

(1) Under no circumstances should the cable be pulled while the pump is being transported or installed. Attach a chain or rope to the grip and install the pump.

(2) This pump must not be installed on its side or operated in a dry condition. Ensure that it is installed upright on a secure base.

(3) Install the pump at a location in the tank where there is the least turbulence.

(4) If there is a flow of liquid inside the tank, support the piping where appropriate.

(5) Install piping so that air will not be entrapped. If piping must be installed in such a way that air pockets are unavoidable, install an air release valve wherever such air pockets are most likely to develop.

(6) Do not permit end of discharge piping to be submerged, as backflow will result when the pump is shut down.

(7) Non-automatic pumps (model DS, DN) do not have an atuomatic operating system based on built-in floats. Always keep an eye on pump operating water level. Do not operate the pump for a long time with the water level near the minimum operating level as the automatic cut-off switch incorporated inside the motor will be activated. To avoid dry operation, install an automatic operating system, as shown in **Fig. 2** and **Table 1** and maintain a safe operating water level.

(8) For automatic pumps (DSA, DNA) install the floats as shown in **Fig. 3.** The pump may not start if a float switch touches the wall of the water tank or the piping. Install the floats so that this will not happen.

(9) Models DSA, DNA and DSJ, DNJ, will undergo automatic alternate operation when they are paired. Position the floats for these automatic alternate operation pumps as shown in **Fig. 4** and **Table 3.** The pumps may not operate correctly if the floats are in the wrong location.
Refer to the quick discharge connector instruction manual for details on the installation of pumps so equipped.

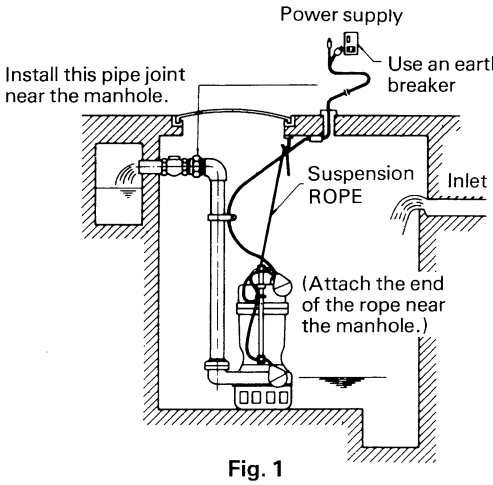


Fig. 1

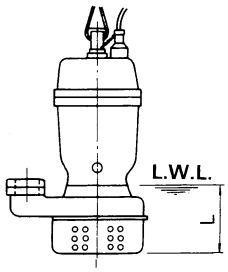


Fig. 2

Table 1

Output	L (mm)	
kW	DS	DN
0.15	85	—
0.25	85	97
0.4	110	108
0.75	110	109
1.5	110	—
2.2	160	—
3.7	160	—
5.5	200	—
7.5	200	—

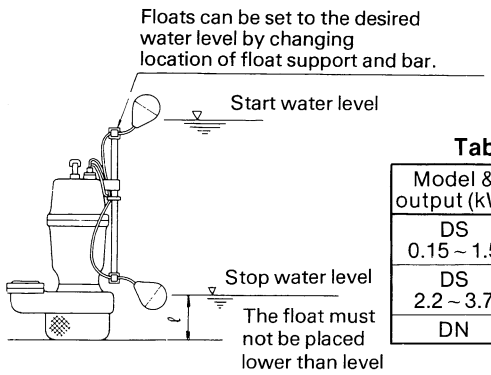


Fig. 3

Table 2

Model & output (kW)	ℓ(mm)
DS 0.15 ~ 1.5	170
DS 2.2 ~ 3.7	300
DN	150

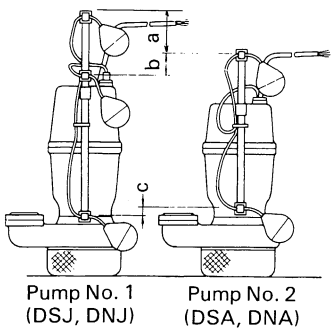


Fig. 4

Table 3

	Minimum length (mm)
a	90
b	80
c	30

3. Electrical wiring

(1) Wiring
   a) Wire as indicated for the appropriate start system as shown in **Fig. 5.**
   b) Loose connections will stop the pump. Make sure all electrical connections are secure.

(2) Cable
   a) Never let the end of the cable contact water.
   b) If the cable is extended, do not immerse the splice in water.
   c) Fasten the cable to the discharge piping with tape or vinyl strips.
   d) Install the cable so that it will not overheat. Overheating is caused by coiling the cable and exposing it to direct sunlight.

(3) Grounding
   a) For single-phase, ground with an alligator clip as shown in **Fig. 6.**
   b) For three-phase, ground the green wire (label E) as shown in **Fig. 6.**
   Under no circumstances should the green wire be connected to the power supply.

(4) Use short circuit breakers to prevent danger of electrical shock.

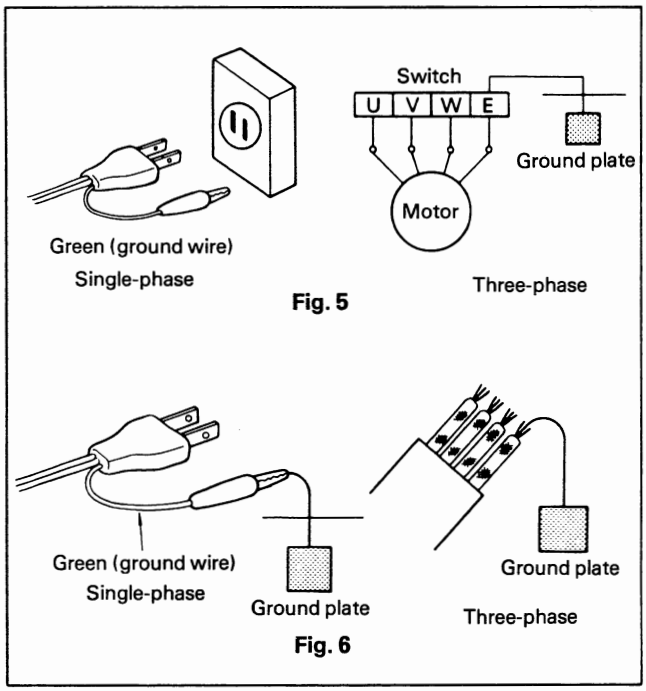


Fig. 5

Fig. 6

Operation

1. Before starting the pump

(1) After completing installation, measure the insulation resistance again as described in **Installation.**

(2) Check water level.
If the pump is operated continuously for an extended period of time in a dry condition or at the lowest water level, the motor protector (less than 7.5kW) or the thermal detector (more than 11kW) will be activated. Constant repetition of this action will shorten pump service life. Do not start the pump again in such a situation until after the motor has completely cooled.

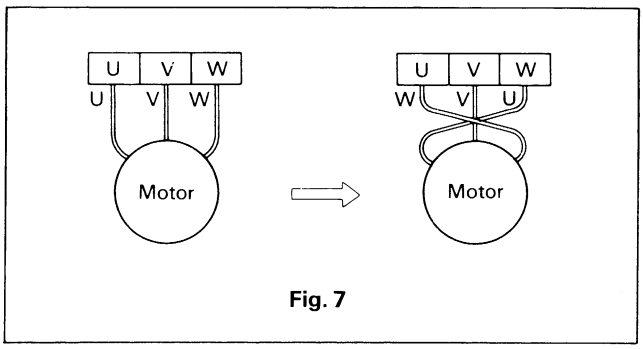


Fig. 7

2. Test operation.... Manual type (DS, DN) Automatic type (DSA, DNA)

(1) Turn the operating switch on and off a couple of times to check for normal pump start.
For the DSA, DNA pump, the upper float switch must be raised for the pump to start.

(2) Next, check direction of rotation. If discharge volume is low or unusual sounds are heard when the pump is operating, rotation has been reversed. When this happens, reverse two of the three wires (see **Fig. 7**).

(3) When you have confirmed that rotation direction is correct, gradually open the cut off valve and check pressure, capacity, current, etc. (Refer to **Troubleshooting**.
Reconsider your plans if current exceeds its rated value and there is no cut-off valve.

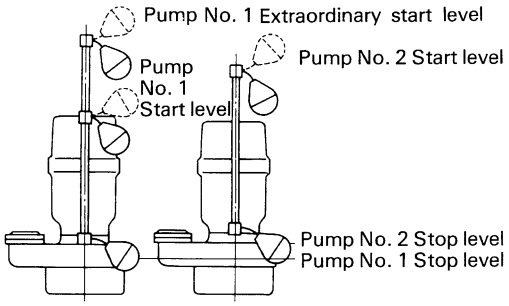


Fig. 8

3. Test operation.... Automatic alternate pumps (DSJ, DNJ)

Check automatic alternate operation of pump No. 1 (DSJ, DNJ) and pump No. 2 (DSA, DNA) as follows (see **Fig. 8**).

(1) When the water level reaches pump No. 1 start level, pump No. 1 will start and water will be pumped until pump No. 1 stop water level is reached.
At this point the automatic alternate operation circuit built into pump No. 1 will stop the pump.
The water level will now be at pump No. 2 start level. Pump No. 2 will start and pump water until its stop water level is reached. The process is repeated when the water level is again at pump No. 1 start level.

(2) If the water flowing into the water tank exceeds the amount being pumped by pump No. 2 (abnormal water increase) and the water level rises to pump No. 1 abnormal start water level, pump No. 1 will start to operate. The two pumps will then be operating simultaneously in parallel operation.

(3) When pumps No. 1 and No. 2 are operating, check the rotation direction for both pumps in the same manner as 2. (2).

(4) When you have confirmed that rotation direction is correct, gradually open the cut-off valve and check pressure, capacity, current, etc. (Refer to **Troubleshooting**.)
Reconsider your plans if current exceeds its rated value and there is no cut-off valve.

4. Operation

(1) Normal operation can be begun immediately after test operation is completed.

Maintenance

Check pressure, output, voltage, current and other specifications. Unusual readings may indicate trouble. Refer to **Troubleshooting** and correct as soon as possible.

1. Daily inspections

(1) Check current and ammeter fluctuation daily. If ammeter fluctuation is great, even though within the limits of pump rating, foreign matter may be clogging the pump.
If the quantity of liquid discharged falls suddenly, foreign matter may be blocking the suction inlet.

2. Regular inspections

(1) Monthly inspections
Measure the insulation resistance. The value should be more than 1M ohm. If resistance starts to fall repidly even with an initial indication of over 1M ohm, this may be an indication of trouble and repair work is required.

(2) Annual inspections
The service life of the mechanical seal can be prolonged by replacing the oil in the mechanical seal chamber once a year. Water mixed with the oil or a cloudy texture are indications of a defective mechanical seal requiring replacement. When replacing the oil, lay the pump on its side with filler plug on top as shown in **Fig. 9.**
Refill with turbine oil No.32(ISO VG-32) until it overflows.

(3) Inspections at 3-5 year intervals
Conduct an overhaul of the pump. These intervals will preclude the possibility of future trouble.

3. Precautions when operation is suspended

(1) If operation is to be suspended for a prolonged period of time with the pump immersed in water, measure the insulation resistance of the motor occasionally. If resistance is normal, operate pump to prevent rust from developing on moving parts. Follow the instructions under **Operation** when pump operation is to be resumed.

(2) For dry storage, clean out pump and store in a dry place. Follow the instructions under **Installation** and **Operation** when pump operation is to be resumed.

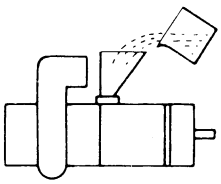


Fig. 9

4. Resuming Operation

(1) For re-use, follow the instructions given in the sections on **Installation** and **Operation.**
When using a single phase motor with liquid which solidifies as it dries, remove the strainer and revolve motor by hand to ensure that if rotates smoothly before commencing operation.

NOTE: For cold weather storage, turn the unit on its side, discharge elbow in the down position. This is to make sure all water has drained from the volute. Then store the unit in a dry place.

5. Parts that will need to be replaced

(1) Replace the appropriate part when the following conditions are apparent.

Replaceable part	Mechanical seal	Gasket	Oil filler plug gasket	Lubricating oil	O-ring
Replacement guide	Whenever oil in mechanical seal chamber is clouded	Whenever disassembling for inspection	Whenever oil is replaced or inspected	Whenever clouded or dirty	Whenever pump is overhauled
Frequency	Annually	—	A half yearly	A half yearly	Annually

Above replacement schedule is based on normal operating conditions.

(2) The replaceable parts for these pumps are as follows.

Model DS

Part name \ Motor output	0.15kW	0.25kW	0.4kW	0.75kW	1.5kW	2.2kW	3.7kW	5.5kW	7.5kW
Mechanical seal	13ϕ		15ϕ		20ϕ	30ϕ		35ϕ	
Packing (PCD)	134		160		168	210		225	
Gasket for filler plug	10ϕ(Inner dia meter)×18ϕ(Outer dia meter)×0.8(Thickness) or 13ϕ(Inner dia meter)×23ϕ(Outer dia meter)×0.8(Thickness)								
Lubrication oil (Turbine oil No. 32)	120cc		180cc		650cc	1180cc		1700cc	
"O" ring	G80		G95		G105	3ϕ × 170ϕ		3ϕ × 200ϕ	

Model DN ※A,J,HType 645cc

Part name \ Motor output	0.25kW	0.4kW	0.75kW	1.5kW	2.2kW	3.7kW
Mechanical seal	13ϕ	15ϕ		20ϕ	30ϕ	
Packing (PCD)	134	150		170 (Size 50) 180 (Size 65,80)	170 (Size 50) 180 (Size 65,80)	
Gasket for filler plug	10ϕ(Inner dia meter)×18ϕ(Outer dia meter)×0.8(Thickness) or 13ϕ(Inner dia meter)×23ϕ(Outer dia meter)×0.8(Thickness)					
Lubrication oil (Turbine oil No. 32)	120cc	180cc		650cc	1650cc	
"O" ring	G80	G95		G105	3ϕ × 170ϕ	

Troubleshooting

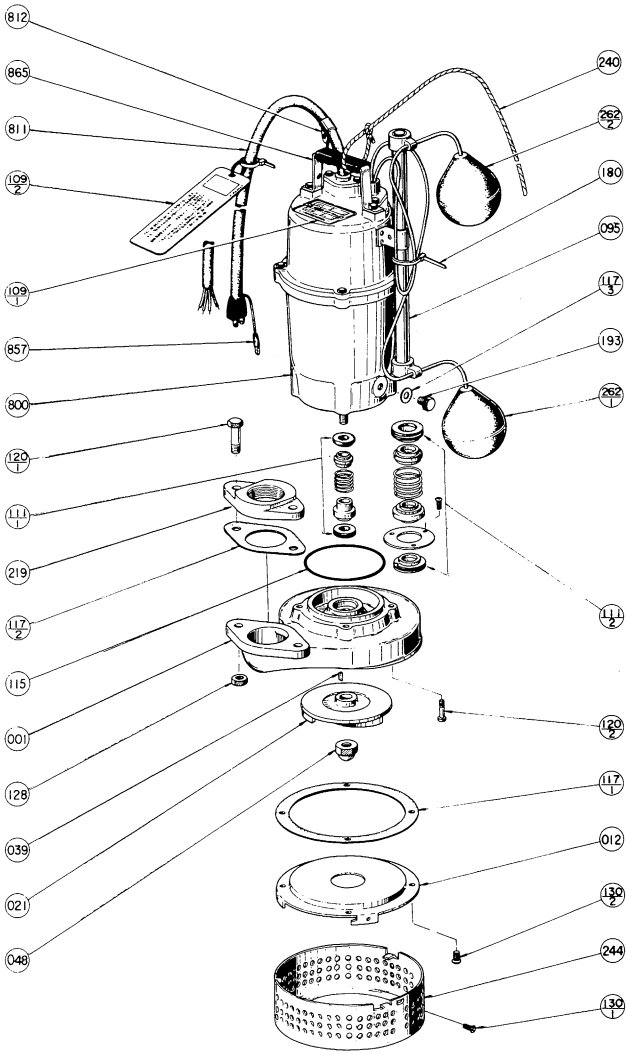
Trouble	Cause	Remedy
Does not start. Starts, but immediately stops.	(1) Power failure	(1)~(3) Contact electric power company and devise counter-measures
	(2) Large discrepacy between power source and voltage	
	(3) Significant drop in voltage	
	(4) Motor phase malfunction	(4) Inspect connections and magnetic switch
	(5) Electric circuit connection faulty	(5) Inspect electric circuit
	(6) Faulty connection of control circuit	(6) Correct wiring
	(7) Fuse blown	(7) Check and replace with correct type of fuse
	(8) Faulty magnetic switch	(8) Replace with correct type of switch
	(9) Water is not at level indicated by Float	(9) Raise water level
	(10) Float is not at appropriate level	(10) Move float to appropriate start level
	(11) Defective float	(11) Repair or replace
	(12) Short circuit breaker is functioning	(12) Repair short circuit
	(13) Foreign matter clogging pump	(13) Remove foreign matter
	(14) Motor burned out	(14) Repair or replace
	(15) Motor bearing broken	(15) Repair or replace
Operates, but stops after a while.	(1) Prolonged dry operation has activated motor protector and caused pump to stop	(1) Raise stop water level
	(2) High liquid temperature has activated motor protector and caused pump to stop	(2) Lower liquid temperature
Does not pump. Inadequate volume.	(1) Reverse rotation	(1) Correct rotation (see Operation 2, (3))
	(2) Significant drop in voltage	(2) Contact electric power company and devise counter-measures
	(3) Operating a 60Hz pump on 50Hz	(3) Check nameplate
	(4) High discharge head	(4) Recalculate and adjust
	(5) Large piping loss	(5) Recalculate and adjust
	(6) Low operating water level causes air suction	(6) Raise water level or lower pump
	(7) Discharge piping leak	(7) Inspect, repair
	(8) Discharge piping clog	(8) Remove foreign matter
	(9) Foreign matter in suction inlet	(9) Remove foreign matter
	(10) Foreign matter clogging strainer.	(10) Remove foreign matter.
	(11) Foreign matter clogging pump	(11) Disassemble and remove foreign matter
	(12) Worn impeller	(12) Replace impeller
Over current	(1) Unbalanced current and voltage	(1) Contact electric power company and devise counter-measures
	(2) Significant voltage drop	(2) Contact electric power company and devise counter-measures
	(3) Motor phase malfunction	(3) Inspect connections and magnetic switch
	(4) Operating 50Hz pump on 60Hz	(4) Check nameplate
	(5) Reverse rotation	(5) Correct rotation (see Operation 2. (3))
	(6) Low head. Excessive volume of water	(6) Replace pump with low head pump
	(7) Foreign matter clogging pump	(7) Disassemble and remove foreign matter
	(8) Motor bearing is worn or damaged	(8) Replace bearing
Pump vibrates; excessive operating noise.	(1) Cutoff valve closed too far	(1) Open cutoff (valve)
	(2) Piping resonates	(2) Improve piping
	(3) Reverse rotation	(3) Correct rotation

Construction

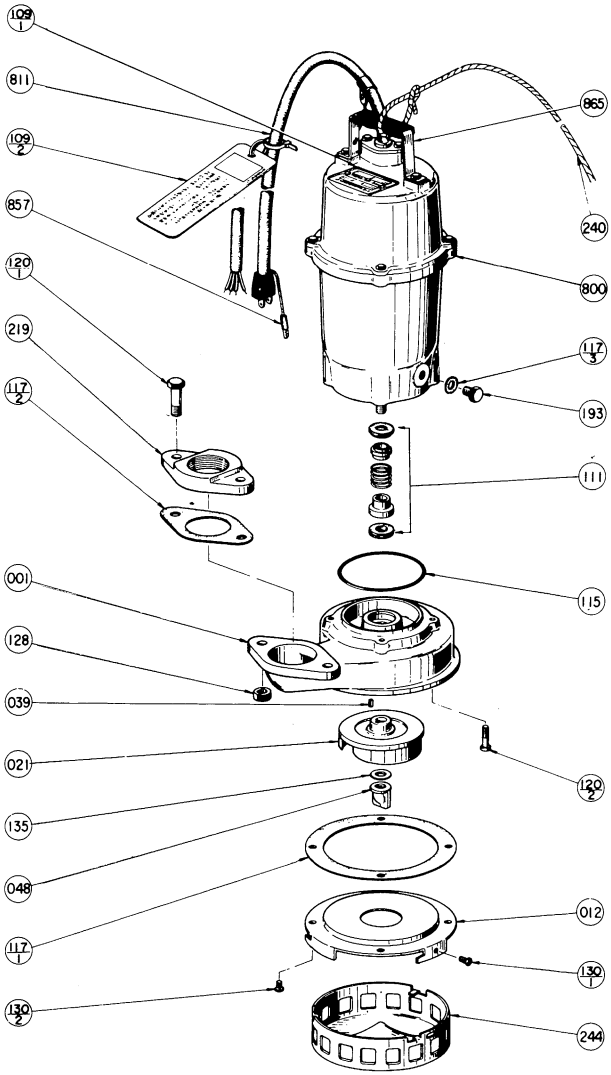
1. Sectional view

This drawing represents one of the standard model DS & DN.
There may be some variations according to model.

Model DSA



Model DN



PART NO.	PART NAME	NO. FOR 1 UNIT
001	CASING	1
012	SUCTION COVER	1
021	IMPELLER	1
039	KEY	1
048	IMPELLER NUT	1
095	FLOAT SUPPORT	1
109-1	NAME PLATE	1
109-2	NAME PLATE	1
111-1	MECHANICAL SEAL	1
111-2	MECHANICAL SEAL	1
115	"O" RING	1
117-1	GASKET	1
117-2	GASKET	1
117-3	GASKET	1
120-1	BOLT	2
120-2	BOLT	3 or 4

PART NO.	PART NAME	NO. FOR 1 UNIT
128	NUT	2
130-1	SCREW	1
130-2	SCREW	3-4 or 6
135	WASHER	1
180	HOSE CLAMP	1
193	OIL PLUG	1
219	COMPANION FLANGE	1
240	SUSPENSION ROPE	1
244	STRAINER	1
262-1	FLOAT SWITCH	1
262-2	FLOAT SWITCH	1
800	MOTOR	1
811	SUBMERSIBLE CABLE	6m
857	EARTH	1
865	HANDLE	1

2. Standard accessories

Submersible cable . . . . . 6 m
Suspension rope . . . . . 5 m

Disassembly and Assembly

1. Disassembly

When disassembling pump, provide a piece of cardboard or plywood to place the different parts on as you work.

Do not pile parts on top of each other. They should be laid out neatly in rows. As the "O" ring and gasket can not be used again once they are removed, have replacement parts ready.

Disassemble in the following order, referring to the sectional view.

Be sure to cut off power source before beginning disassembly.

(1) Drain all water from casing.

(2) Remove screw (130-1) which holds the strainer in place and remove strainer.

(3) Remove screws (130-2) holding suction cover in place, and remove cover to check impeller and casing.

(4) To remove impeller, remove nut (048), place screw driver between casing and impeller, and push out impeller.

(5) Remove plug (193) and drain oil inside the mechanical seal chamber.
Next, remove hexagonal bolts (120-2) so that casing can be removed from motor frame.
If pump has an intermediate casing, remove both intermediate and pump casings, and then remove intermediate casing from motor.

(6) Carefully remove mechanical seal, taking care not to scratch sliding surface.

2. Assembly

Reassemble in reverse order of disassembly.

Be careful of the following points.

(1) Replace "O" rings.

(2) Replace all worn or damaged parts.

(3) Secure the bolts slowly and symmetrically so as to prevent one-sided tightening.

(4) After completion of assembly, ensure pump can be turned smoothly by hand.

Please obtain "O" rings, gaskets and other parts from pump dealer. The table of dimensions is given in "**Maintenance**".

All specifications subject to change without notice.
In this catalog, the particulars in [ ] are in accordance with the International System of Units (SI) and given for reference only.

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