



This operational instruction manual shall be handed to the user.

EBARA

Submersible Sewage Pumps

Model DL

Model DL with cutter

Instruction Manual



Request

Welcome to the EBARA submersible sewage pump. EBARA fabricated the pump with special care for assuring safe handling. Since, however, mal-operation of the pump may induce accident, correct use of the pump referring to the instruction manual is requested.

The Instruction Manual shall be stored at a place allowing ready reference.

To the personnel of installation works

The Instruction Manual shall be handed to the user who conducts operation, maintenance, and inspection of the pump.



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1 Warning indication



The precautions given here are to assure safe and correct operation of the pump and to prevent injury of you and other people, and damage of facilities. The precautions are classified to "Warning" and "Caution" for the details of danger and damage expected to arise in case of mal-handling of the pump in terms of the magnitude and the urgency of injury and damage. Since both the "Warning" and the "Caution" describe serious matter relating to safety, the contents shall be observed in any case.

Description of the indication



















Terms of warning	Description
 Warning	Wrong handling expects to raise a danger resulting in death or serious injury of the operator.
 Caution	Wrong handling expects to raise a danger resulting in slight injury of the operator or sole physical damage.



















Note	Providing specific precautions or specifically emphasizing information.
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Description of symbol

	Forbidden (not allowed to execute) matter. Detail forbidding contents are instructed in or near the symbol by a sketch or a sentence.
	Compulsory (forceful execution) matter. Detail compulsory contents are instructed by a sketch of a sentence given near the symbol.

2 Precautions of safety

 Warning	On handling and installation work of the pump, assure safety by confirming the mass and the shape of the pump referring to the appearance this instruction manual, drawing, the catalogue, and other materials. There are dangers of dropping the pump and the injury of worker.	
	Never execute the operation of the pump and the mounting work of parts in a lifted position. That type of work is dangerous causing dropping of the pump and injury of worker.	
	Do not damage, break, machine, forcefully bend, stretch, or twist the power cable, bind the power cable into a bundle, or place a heavy load on the power cable. Those kinds of handling cause fire and electric shock.	
	Execute correct wiring work by a qualified technician conforming to the appropriate legal standards. Wrong wiring by non-qualified worker is illegal and may induce electric shock and fire.	
	Do apply grounding wiring. The Green and Yellow stripe cord or the Green cord is the grounding line. Never connect the Green and Yellow stripe cord to the power source because there is a possibility of electric shock in case of trouble or electric leak.	
	To prevent electric shock, install an exclusive use ground fault breaker. The electric leak may cause electric shock and fire.	
	If any dust is attached to a blade or blade-attaching face of the power source plug, fully wipe the dust off with a dry-cloth. The attached dust may cause fire.	
	During operation of the pump, do not insert hand or foot in the suction opening of the pump to avoid injury at the rotary section.	
	Never operate the pump in water in the presence of personnel. If electric leak occurs, the personnel may suffer electric shock.	
	Disassembling, repairing, and modifying the pump shall be limited to a repair technician. There is a possibility of injury caused by electric shock, ignition, abnormal functioning, trouble, etc.	
	Before entering inspection and repair, cut OFF a power source at a main disconnect device which is equipped with an operating handle which is lockable in OFF position. There is a possibility of electric shock and of injury caused by sudden start of the pump in automatic operation mode.	
	To stop operation for a certain period, cut OFF the power switch. Deterioration of insulation may cause electric shock, electric leak, and fire.	
	The user of a standard model shall refer to the columns of standard specification. Do not use the pump at outside the range of the specification in terms of handling liquid, installing site, power source, etc. Operation at outside the specification may cause pump trouble, injury, electric shock, electric leak, and fire.	
	Do not execute dry operation in air. That type of operation causes deterioration in insulation to lead to electric shock and electric leak.	
	If the insulation resistance decreases to 1MΩ or less, immediately cut OFF the power switch, and request the inspection and repair of the pump to the supplier or EBARA CORP. There is a possibility of motor burn out, electric shock, and fire.	
	Confirm non-loosening at the wirings of motor, at the primary and secondary terminals of control panel, and at the connection and wiring terminals of the power devices in the control panel. Remove dust from these sections. Imperfect connection of wiring caused by loosening and attached dust may cause ignition resulting in fire.	
	Do not attach parts other than EBARA's standard products, and do not modify EBARA's products. There is a possibility of electric shock and ignition, or injury caused by abnormal functioning, break, etc. Furthermore, there may fail in performing normal functioning.	

 Warning	The handling and installation work of the pump shall be done only by a qualified technician in accordance with the applicable legal standards. Unless follow the rule, the work becomes illegal and there is a possibility of inducing accident such as fire and injury.	
	Mount a ground fault breaker exclusive to the pump. Recommended one is a wiring ground fault breaker equipped with an electric leak alarm. There is a possibility of electric shock and fire.	
	This submersible pump must be equipped with a main disconnect device in accordance with requirements of appropriate legal standard (EN60204-1, clause 5.3.2). A suitable rating over current protective device also needs to be provided in the final installation.	
	It is recommended to use a circuit breaker as main breaker that is suitable for isolation according to appropriate legal standard (EN60947-2) and is equipped with an operating handle which is lockable in OFF position and complies with the other requirements of appropriate legal standard (EN60204-1, clause 5.3).	
 Caution	Do not operate a pump of 50Hz at 60Hz. The operation at wrong frequency induces break of pump and other devices caused by excess pressure and motor burn-out caused by overload.	
	Do not operate a pump of 60Hz at 50Hz. The pump performance deteriorates.	
	The pump cannot be used for food processing, food transportation, and other food-relating uses. There is a possibility of generation of various bacteria and of inclusion of foreign matter.	
	Do not use the pump at facilities for organisms (fish farm, fish preserve, aquarium, etc.) There is a possibility of extinction of organisms caused by leak current or by leakage of enclosed liquid from mechanical seal.	
	Do not use the pump at an important facility (computer cooling apparatus, cooling apparatus for refrigerator, etc.)	
	Since machining oil, rubber-releasing agent, and foreign matter, used in pump-production line, enter the handling liquid, operation of the pump shall be done after fully flushing the pump to confirm the absence of foreign matter, depending on the facility.	
	Limit the handling liquid to water. Do not handle oil, seawater, organic solvent, etc. other than water because these liquids cause trouble of pump to result in electric leak and electric shock.	
	The pump is a submersible sewage pump. Do not operate the pump for a long period of time or under vigorous startup-shutdown conditions. Such operations may lead to liquid leak from mechanical seal to induce trouble of the pump within a short period of operation.	
	If the pump failed to operate or if there occurred abnormality, immediately cut OFF the power switch to prevent accident, and give request to the supplier or EBARA CORP. for inspection and repair. Wrong operation and work may induce accident.	
	Install a stand-by pump preparing for an accidental stop of the operating pump. There is a possibility of suspension of water supply to stop the facilities.	
	Consumable parts shall be regularly replaced. If the deteriorated or worn parts are used, they may lead to serious troubles of water leak, seizing, and break of pump parts. For regular inspection, parts replacement, and related works, request the work to the supplier or EBARA CORP.	
	Do not lay the water level signal cable and the power cable in a single conduit. There is a possibility of mal-functioning resulting from noise.	
	Assure the tightening of connection screws at the electric-conduction section. There is a possibility of heat generation, trouble, and burn-out.	

On receiving the pump, promptly check the following items.

1. Confirmation of pump and accessories



- 1) Confirm non-occurrence of damages and of loosening of bolts and nuts, which may be generated during transportation.

- 2) Confirm the presence of full-set of accessories.

(For the standard auxiliaries, refer to the section of 9 "Structure".)

2. Confirmation of nameplate

- 1) The nameplate gives basic specification of the pump. Confirm the specification of your pump on the nameplate. Specifically, care shall be paid on the frequency (50 Hz or 60 Hz).

 Caution	<p>Do not operate a pump of 50Hz at 60Hz. The operation at wrong frequency induces pump break caused by excess pressure and motor burn-out caused by overload.</p> <p>Do not operate a pump of 60Hz at 50Hz. The pump performance deteriorates.</p>	
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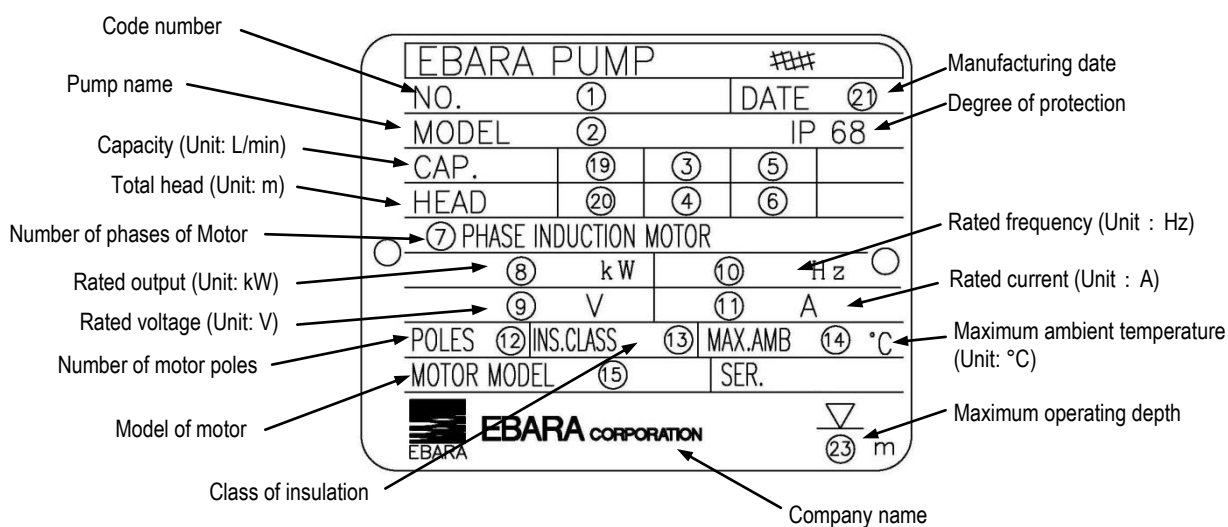













Fig. 1 Indication on nameplate

For the performance of your pump, refer to the nameplate in terms of total head (HEAD), discharge rate (CAP.), rated voltage (V), rated current (A), etc. Other specifications are listed in the following table.

 Warning	The user of a standard model shall refer to the columns of standard specification. Other than the standard model, a modified specification is available as a special specification on request of the user. Do not use the pump at outside the range of the specification, such as handling liquid, installing site, and power source. Operation at outside the specification may cause pump trouble, injury, electric shock, electric leak, and fire.	
	Mount a ground fault breaker exclusive to the pump. Recommended one is a wiring breaker equipped with an electric leak alarm. There is a possibility of electric shock and fire.	
 Caution	The pump cannot be used for food processing, food transportation, and other food-relating uses. There is a possibility of generation of various bacteria and of inclusion of foreign matter.	
	Do not use the pump at facilities for organisms (fish farm, fish preserve, aquarium, etc.) There is a possibility of extinction of organisms caused by leak current or by leakage of enclosed liquid from mechanical seal.	
	Do not use the pump at an important facility (computer cooling apparatus, cooling apparatus for refrigerator, etc.)	
	Since machining oil, rubber-releasing agent, and foreign matter, used in pump-production line, enter the handling liquid, operation of the pump shall be done after fully flushing the pump to confirm the absence of foreign matter, depending on the facility.	
	Limit the handling liquid to water. Do not handle oil, seawater, organic solvent, etc., other than water. These liquids cause trouble of pump to result in electric leak and electric shock.	
	The pump is a submersible sewage pump. Do not operate the pump for a long period of time or under vigorous startup-shutdown conditions. Such operations may lead to liquid leak from mechanical seal to induce trouble of the pump within a short period of operation.	
	Install a stand-by pump preparing for an accidentally stop of the operating pump. There is a possibility of suspension of water supply to stop the facilities.	

■ Standard specification

Standard specification				
Handling liquid	Liquid property		Liquid containing foreign matter (PH 5-9, concentration of residual free chlorine: 10mg/L or less, Concentration of chlorine ion: 200mg/L or less)	
	Liquid temperature		0-40°C : Non-automatic type	
	Size of foreign matter Max. (mm)	Diameter of spherical shape (mm)	(Bore DIA.) Φ65 -----35 Φ80,Φ100(80) -----50 Φ100 -----60	(Bore DIA.) Φ150-----70 Φ200-----76 Φ250-----82 Φ300-----90
		Length of fibrous shape (mm)	(Bore DIA.) Φ65 -----195 Φ80,Φ100(80) -----240 Φ100 -----300	(Bore DIA.) Φ150-----400 Φ200-----500 Φ250-----550 Φ300-----600
Max. submersible depth of the pump			Refer to Fig.1	
Pump	Structure	Impeller	Non-clog	
		Shaft seal	Single coil-double mechanical seal(1.5kW~3.7kW) Tandem double mechanical seal(5.5kW~22kW)	
	Material	Bearing	Sealed ball-bearing (inside the motor)	
		Casing	FC200	
Impeller		FC200 or FCD400		
Motor *1,*2	Shaft seal	SiC/SiC: sliding material at liquid side		
		Ceramics-carbon: sliding material at motor side		
	Sealed liquid at shaft seal	NBR : rubber material Turbine oil ISO VG 32		
Motor *1,*2	Material	Frame	FC200	
		Main shaft	SUS403	
		Cable	200V : Only1.5kW H07RIV-F / To7.5kW VCT / From11kW 2PNCT 400V : H07RIV-F	
Connection with piping			Flange	
Environment of installation site			free from corrosive gas and vapor	
Installation method			Vertical position	
Mass of pump			Refer to Fig.8	
Direction of rotation			Clock wise from top of motor	
Flow, Head			Refer to Fig.8	
Temperature of shipping, store keeping			-5~40°C	

*1 Cannot be driven by the inverter.






*2 Allowable range of voltage fluctuation is $\pm 10\%$. Allowable range of frequency fluctuation is $\pm 1\%$. Allowable simultaneous fluctuation of voltage and frequency is 10% as the sum of the absolute values of them. For both cases, however, the characteristics and the temperature rise of motor are independent of the rated values.

1. Confirmation before installation

Measurement of insulation resistance

Measure the insulation resistance between the ground and the grounding wire and between phases using a megger in a state that the motor and the cables (excluding the power source connection section) are immersed in water. If the insulation resistance at the respective sections is 20MΩ or more, there is no problem. During the measurement, keep the power source connection section of cables distant from the ground.

2. Installation

 Warning	On handling and installation work of the pump, assure safety by confirming the mass and the shape of the pump referring to the appearance this instruction manual, drawing, the catalogue, and other materials. There are dangers of dropping the pump and the injury of worker.	
	Never execute the operation of the pump and the mounting work of parts in a lifted position. That type of work is dangerous causing dropping the pump and injury of workers.	
	Do not damage, break, machine, forcefully bend, stretch, or twist the power cable, bind the power cable into a bundle, or place a heavy load on the power cable. Those kinds of handling cause fire and electric shock	
	The handling and installation work of the pump shall be done only by a qualified technician in accordance with the applicable legal standards. Unless follow the rule, the work becomes illegal and there is a possibility of inducing accident such as fire and injury.	

Note	Apply repair painting at an interval depending on the use environment. Depending on the use environment, there may be generated rust at threaded sections, machined sections with rust-proof coating, rust-proofing sections, etc.
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- 1) On transporting and installing the pump, never apply tension to the cables. Those works shall be done by attaching chain or rope to the handle.
- 2) The pump cannot be operated in horizontal position and in lifted position. Operate the pump at vertical position on a base.
- 3) Install the pump at a place of free from turbulence in the tank, as far as possible. For a pump equipped with a float, select the place of installation of the pump so as to avoid direct hitting of the flowing-down liquid to protect the float.
- 4) If there is a flow in the tank, support the pipe at an adequate position, (refer to Fig. 2).
- 5) Avoid the generation of air-pocket in the pipe.
- 6) Do not immerse the discharge end of the pipe in water. Immersed end of the pipe induces backflow on stopping the operation of the pump.
- 7) Apply a sewage check valve to every pump.
- 8) Since non-Automatic type pump (Model DL) has no Automatic operation device which is actuated by a float in the pump, care shall be given to the pump operating water level. If that type of pump is operated continuously for 10 minutes or longer period at near the operable minimum water level, the Auto-cut in the motor is actuated. Therefore, the Automatic operation device shall be installed as illustrated in Fig. 3, and the stop-operation water level shall be set at a position higher than the operable minimum water level to avoid dry operation. The operation-start water level shall be set to a position higher than the level of fully immersing the pump.

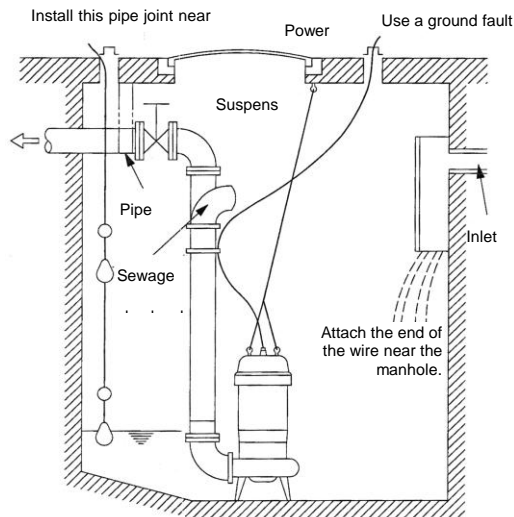


Fig. 2

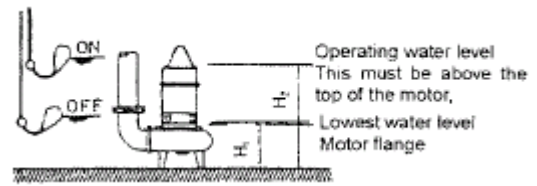


Fig.3

Note

Limit the continuous operation time at the operable minimum water level to 10 minutes. Operation longer than 10 minutes actuates Auto-cut in the motor to stop the operation of the pump.

- 9) Mounting a full-water alarm in the tank is recommended. The alarm panel and the float switch for water-level control are available from EBARA CORP.
- 10) When an electrode is used in the Automatic operation unit, care shall be paid not to entangle dirt around the electrode rod or not to adhere oil to the rod. Those phenomena may induce error in functioning.
- 11) Installation of an attaching-detaching device shall conform to the instruction manual "Quick Discharge Connector".

Note

Packing materials after installation, and wasted lubricant oil and grease, and parts after inspection and repair shall be transferred to a qualified waste-treatment contractor observing the applicable laws and the regional regulations.

Caution

Install a stand-by pump preparing for an accidental stop of the operating pump. There is a possibility of suspension of water supply to stop the facilities.



- 12) For automatic pumps (DLA), install the floats as shown in Fig. 4. The pump may not start if a float switch touches the wall of the water tank or the piping. Install the float so that this will not happen.
- 13) Models DLA and DLJ will undergo automatic alternate operation only when they are paired. Position the floats for these automatic alternate operation pumps (DLJ) as shown in Fig. 5. The pumps may not operate correctly if the floats are in the wrong position.

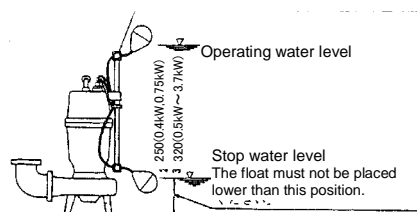


Fig. 4

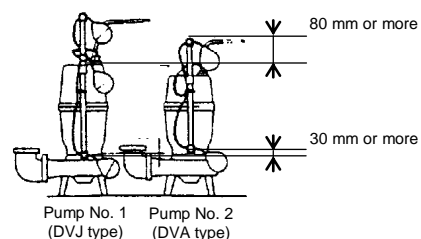










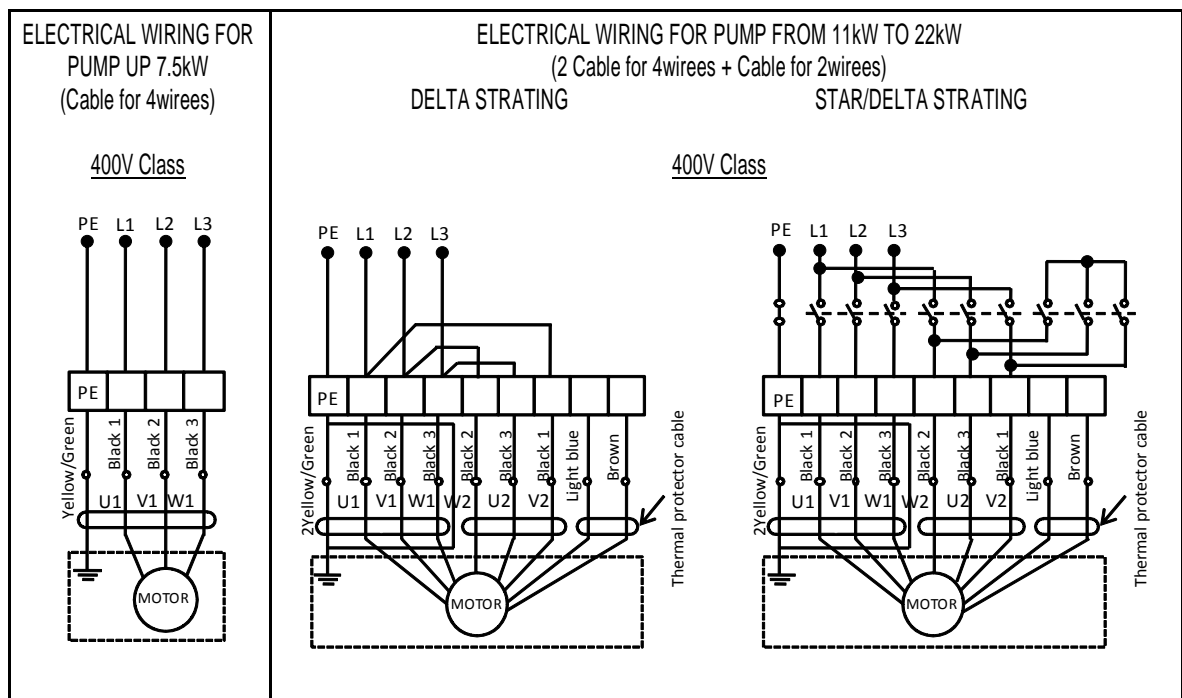


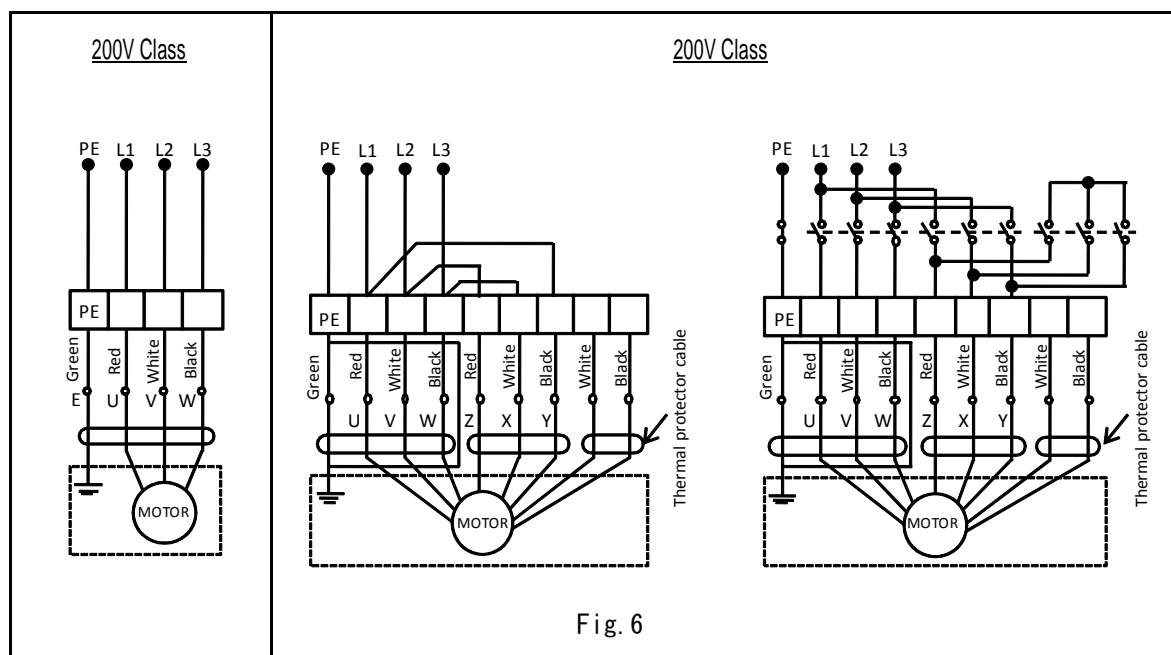
Fig. 5

3. Electric wiring

 Warning	Execute correct wiring work by a qualified technician conforming to the applicable legal standards. Wrong wiring by non-qualified worker is illegal and may induce electric shock and fire.	
	Do apply grounding wiring. The Green and Yellow stripe cord or the Green cord is the grounding line. Never connect the Green and Yellow stripe cord or the Green cord to the power source because there is a possibility of electric shock in case of trouble or electric leak.	
	To prevent electric shock, install an exclusive use ground fault breaker. The electric leak may cause electric shock and fire.	
	If any dust is attached to a blade or blade-attaching face of the power source plug, fully wipe the dust off with a dry-cloth. The attached dust may cause fire.	
	Confirm non-loosening at the wirings of motor, at the primary and secondary terminals of control panel, and at the connection and wiring terminals of the power devices in the control panel. Remove dust from these sections. Imperfect connection of wiring caused by loosening and attached dust may cause ignition resulting in fire.	
	This submersible pump must be equipped with a main disconnect device in accordance with requirements of appropriate legal standard (EN60204-1, clause 5.3.2). A suitable rating over current protective device also needs to be provided in the final installation.	
 Caution	It is recommended to use a circuit breaker as main breaker that is suitable for isolation according to appropriate legal standard (EN60947-2) and is equipped with an operating handle which is lockable in OFF position and complies with the other requirements of appropriate legal standard (EN60204-1, clause 5.3).	
	Assure the tightening of connection screws at the electric-connection section. There is a possibility of heat generation trouble and burn-out. Do not lay the water level signal cable and the power cable in a single conduit. There is a possibility of mal-functioning resulting from noise.	

Execute correct power source work of motor and wiring work by a qualified technician conforming to the applicable legal standards. Wrong wiring and grounding work by non-qualified worker is illegal and very dangerous. To prevent electric shock, install a ground-fault breaker exclusively for this products.





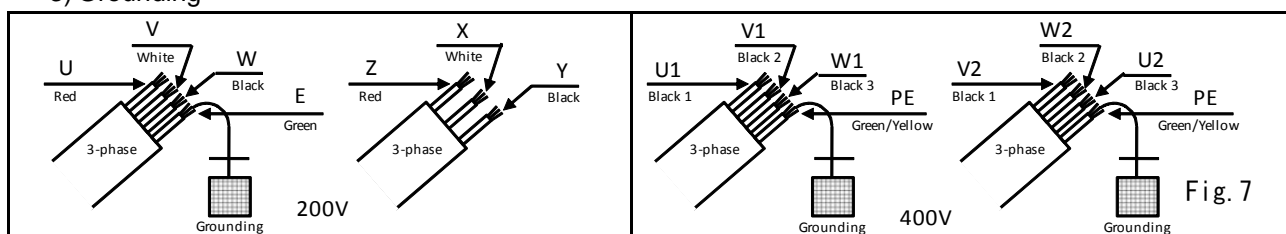
1) Wiring

Perform the wiring shown in Fig.6. After doing so, make sure that the pump's cable is securely connected to the panel's terminals.

2) Cable

- Never immerse the cable end in water.
- If a cable is extended by connecting other cable, do not immerse the connected section in water.
- Support the cable by the discharge pipe using an adhesive tape, a PVC band, etc.
- Lay the cables with care to avoid overheating. Overlap winding or direct exposure to sunray may cause overheating.

3) Grounding



a) For 3-phase, grounding shall be done using Green cord (Label E) Or Green and Yellow stripe cord (Label PE) or the Green cord (Label E) among the four lines, as shown in Fig. 7. Never connect the Green and Yellow stripe cord or the Green cord to the power source. The grinding shall be surely conducted conforming to the Technology Standard of Electric Facilities.

b) For the cases of long cable or other situations, the ground fault breaker is actuated in spite of fully grounding of motor, checked by a megger. The phenomenon occurs from an electrostatic capacity between the cable and the ground. Specifically, a rush current at start of pump likely induces the actuation of the ground fault breaker. In that case, the ground fault breaker shall be the one having low sensitivity of sensitive current. On adopting the ground fault breaker with low sensitivity of sensitive current, care shall be given to electrical safety by assuring grounding, etc.

4) Motor protection

a) Auto-cut

The motor (standard model of 7.5kW or less) has a built-in Auto-cut that covered from overload, short cooling and etc.





Thermal Protection	
Contact rating	AC230V, 13A (Max) AC200V-6mA or DC12V-10nA (Min)
Contact type	Break Contact (Normal: on, At temp. rise: OFF)
Contact Cable	2 cores PVC, Cab-tyre Cable 1mm ² Brown, Light Blue (non-polarity)

b) Thermal protector

The motor (standard 11kW or larger and special model of 2.2kW~7.5kW) has a built-in thermal protector that outputs signals via a cable. Connect the thermal protector cable's wires to the control panel in accordance with the specifications in the table on the right, so that the pump will be stopped if the motor's internal temperature rises too high.

Use this protector in combination with a 3E relay or similar for phase failure.

6 Operation

 Warning	During the operation of the pump, do not insert hand or foot in the suction opening of the pump to avoid injury at the rotary section.	
	Never operate the pump in water in the presence of personnel. If electric leak occurs, the personnel may suffer electric shock.	
	Do not execute dry operation in air. That type of operation causes deterioration in insulation to lead to electric shock and electric leak.	

1. Before starting

- 1) After completing the installation work, measure again the insulation resistance in accordance with

5 -1 "Confirmation before installation".

- 2) Confirm that the water level is satisfactory. If the pump is operated for a long period of time under dry condition or at near the operable minimum water level, the Auto-cut in the motor is actuated. If the situation is repeated, the pump life becomes short. Once the Auto-cut is actuated, the motor does not start until it is cooled. (Even during the period of Auto-cut functioning, the power is supplied up to the pump. Since the pump will restart without indication, the inspection shall be given after cut OFF the power source.)
- 3) Operate the pump within the range given in the chart.
- 4) Frequent start-stop operations damage the pump in early stage of life. Limit the starting frequencies as below.

Motor out put	Less than 7.5kW	11~22kW
Frequencies of starting	Ten times per hour	Six times per hour

2. Test operation ... Non-automatic type pump (Model DL)

... Automatic type pump (Model DLA)

- 1) Turn the switches 1 - 2 on and off a couple of times with the gate valve slightly opened to check that it starts up normally. It should be noted that a DLA model pump does not start unless the upper float is positioned up.

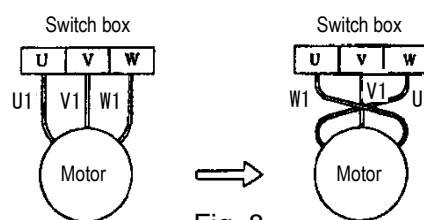


Fig. 8

- 2) Next, check the direction of rotation. Reverse direction of rotation is indicated by low capacity and abnormal noise and vibration. If the pump is found to be running in reverse rotation, change around the onnections of 2 of the 3 phases to obtain the regular rotation direction (See Fig. 8).

3. Test operation ... Automatic alternate type pumps (DLJ)

Check automatic alternate operation of pumps No. 1 (DLJ) and pump No. 2 (DLA) as follows (See Fig. 9).

- 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.

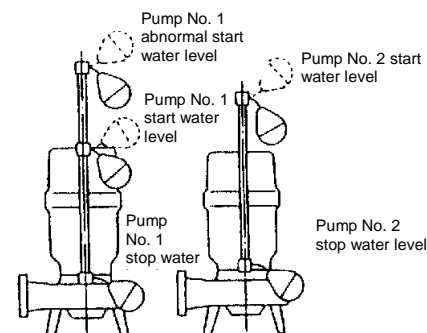


Fig.9

- 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.

* Check the direction of rotation for each pump using the same measure described in (2) of 2 while the pump is operating.

- 3) Once the direction of rotation is verified, gradually open the gate valves to check for abnormal conditions in pressure, discharge quantity, current value, etc., referring to **8** "Troubleshooting." Do not operate the pump with the gate valve fully closed.







4. Operation




After the test operation is completed, the pumps are now ready for operation.

Note

Operate the pump at a discharge rate suitable for the facilities.
(Operation at excessively small or large capacity causes noise and vibration, and consumes unnecessary power.)

7 Maintenance

 Warning	Disassembling, repairing, and modifying the pump shall be done only by a repair technician. There is a possibility of electric shock, ignition, or injury caused by abnormal functioning, break, etc.	
	Do not attach parts other than EBARA's standard parts, and do not modify EBARA's standard products. Use of other than the standard parts may result in electric shock, ignition, or injury caused by abnormal functioning or break, or may fail to perform normal functioning.	
	Before entering inspection and repair, cut OFF a power source at a main disconnect device which is equipped with an operating handle which is lockable in OFF position. There is a possibility of electric shock and of injury caused by sudden start of the pump in automatic operation mode.	
	To stop operation for a certain period, cut OFF the power switch. Deterioration of insulation may cause electric shock, electric leak, and fire.	
	If the insulation resistance decreases to 1MΩ or less, cut immediately OFF the power switch, and request the inspection and repair of the pump to the supplier or EBARA CORP. There is a possibility of motor burn-out, electric shock, and fire.	

 Caution	If there occurred abnormality such as failing in starting, immediately cut OFF the power switch to prevent accident, and request the inspection and repair to the supplier or EBARA CORP. Mal-operation or wrong work may induce accident.	
	Consumable parts shall be regularly replaced. If the deteriorated or worn parts are used, they may lead to serious failures of water leak, seizing, and break of pump parts. For regular inspection, parts replacement, and related works, request the matter to the supplier or EBARA CORP.	

If inspection of pressure, discharge rate, voltage, current, etc. finds any difference from those of normal state, the phenomenon is a sign of accident. Therefore, it is important to give quick action to the matter referring to [8] "Troubleshooting". To do this, keep daily operational record. Preparation of a standby pump is recommended to respond to an accident.

Note	The table of standard pump performance is available from EBARA CORP.
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1. Daily inspection

- 1) Check current and ammeter fluctuation every day. If ammeter fluctuation is significant even it is within the limit of pump rating, the pump may have caught foreign matter.
- 2) If the discharge rate showed a sudden decrease, foreign matter may have clogged the suction opening.

2. Regular inspection

1) Once a month

Measure the insulation resistance. If the insulation resistance is 1MΩ or more, there occurs no problem on operating the pump. If, however, a sudden drop appeared in the insulation resistance even if the value is at or above 1MΩ, the phenomenon is abnormal, and repair of the pump is required.

2) Once every six months

Replace oil in the mechanical seal chamber at every six months. If water enters the oil to give significant cloudiness, replace the mechanical seal. As illustrated in Fig. 7 oiling shall be done at a specified quantity while the oiling plug faces upright and the pump is positioned horizontally. After the oiling, fully tighten the plug with a seal washer.

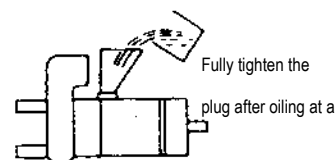


Fig. 7

3) Once a year

Replace mechanical seal at an interval of one year or 6000 hours of total operating hours, either shorter one. By the replacement, the pump life extends.

4) Once every two to five years

Overhaul of the pump assures safe and long period of operation. For the case of high frequency of operations, early overhaul is requested.

3. Precautions during stop operation

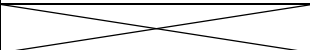
- 1) When the pump is left underwater in stop-operating state, measure the insulation resistance of motor intermittently. If there is no abnormality in the insulation resistance, operate the pump to prevent the sliding section of the pump from rusting. When the pump is entered restarting, the procedure shall conform to [6] "Operation".
- 2) When the pump is stored on ground, clean the pump and then store it at a dry site. (temperature of storage: -5~40°C) On reusing the pump, follow the instructions of [5] "Installation" and [6] "Operation".

4. Consumables

- 1) Replace the parts when they enter the following-described condition.

Consumable parts	Mechanical seal	Sheet packing	Seal washer	Lubricant oil	O-ring	Power relay	Float switch
Symptoms or approximate period for replacement	Oil in the mechanical seal chamber becomes cloudy.	At every disassembly for inspection.	At every oil replacement.	Lubricant becomes cloudy or blackish.	At every disassembly for inspection	Every 20000 cycles of operation	Every 100000 cycles of operation
Expected replacement time	One year or 6000 hours of total operating hours, either of shorter one.	_____	_____	Once every six months.	_____	_____	_____

The above-given replacement time is a standard under normal operation.

<div>Parts name</div> <div>Output</div>	1.5kW	2.2kW	3.7kW	5.5kW	7.5kW	11kW	15kW	18.5kW	22kW
Mechanical seal	Φ25	Φ30		Φ40			Φ45		
Seal washer	Φ11.8×Φ22(inner dia. × outer dia.) Nominal W12(SUS)								
Lubricant oil (Turbine oil)	For the quantity of oil, refer to the appearance dimensional drawing.								
Oil seal				VC68x90x7			VC75x100x7		
O-ring	Φ3× Φ150	Φ3×Φ170		Φ3×Φ180			Φ3×ϕ 220		

For detail of Model, etc. of individual parts, inquiry shall be given to the supplier or EBARA CORP.

5. Action when protective device is activated

- 1) When thermal protector is activated:

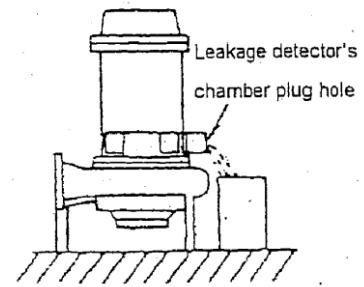
Investigate the cause of the activation, take measures to eliminate the cause, then restart operation.

Thermal Protection	
Contact rating	AC230V, 13A (Max) AC200V-6mA or DC12V-10mA (Min)
Contact type	Break Contact (Normal: on, At temp. rise: OFF)
Contact Cable	400V:2 cores YZW, Cab-tyre Cable 1mm ² Blue Brown, (non-polarity) 200V:2 cores 2PNCT, Cab-tyre Cable 1.25mm ² White Black, (non-polarity)

2) When leakage detector is activated

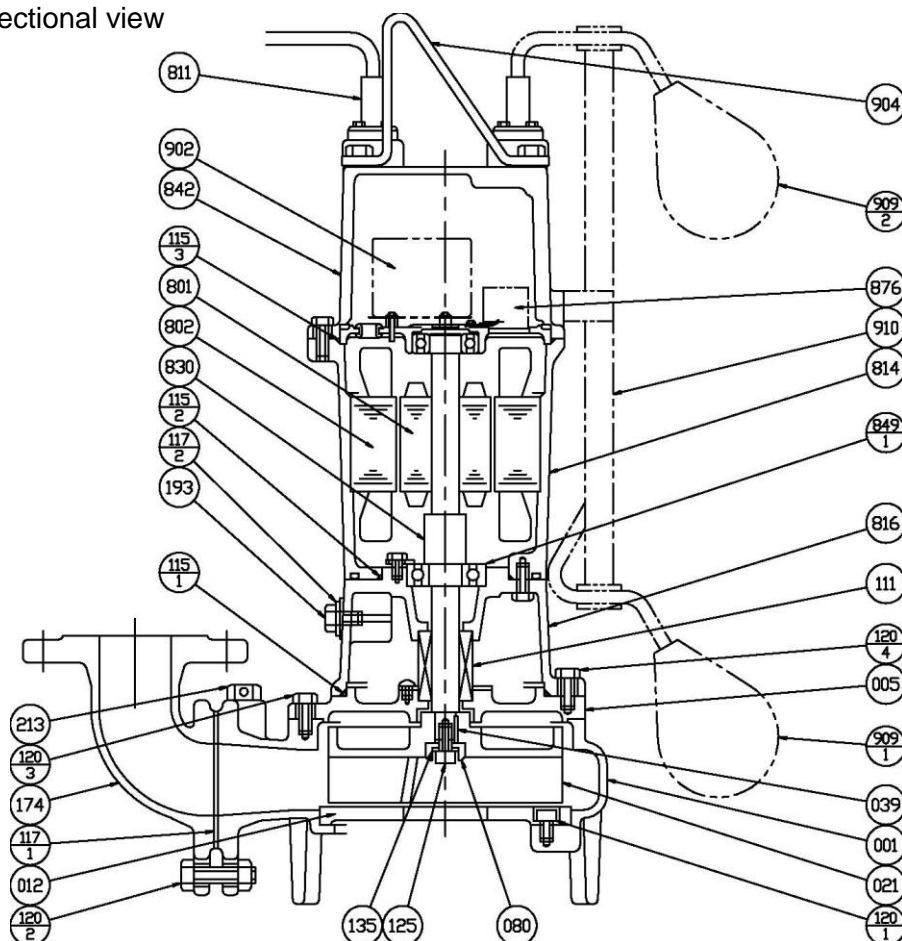
Lift the pump out and set upright. Remove the plug of the leakage detector's chamber and drain the oil and water to a container. Then clean the inside the leakage detector's chamber and motor chamber, and replace the mechanical seal as well as gaskets and O-rings.

Leakage Detector	
Contact rating	AC280V, 0.5A AC50VA
Contact type	Break Contact (Normal: on, At temp. rise: OFF)
Contact Cable	2 cores H07RIV-F ,Cab-tyre Cable 1.0mm ² Blue,Brown (non-polarity)



Trouble	Cause	Remedy
Pump does not start, or starts but immediately stops.	<ul style="list-style-type: none"> - Float movement is obstructed. - Power failure has occurred. <ul style="list-style-type: none"> - Excessive imbalance in power supply voltage. - Excessive voltage drop. - Phase interruption. - Faulty connection in power circuits. - Error in control circuit wiring. - Blown fuse. - Faulty magnet switch. - Level switches are malfunctioning or faulty. - Electrical leakage breaker activated. - Foreign matter trapped in pump. - Motor burned out. - Motor bearings worn out. - Mechanical seal locked. 	<ul style="list-style-type: none"> - Remove the obstructions. - Contact electric power company. - Contact electric power company. - Contact electric power company. - Check wiring connections and magnetic switch. - Check power circuits. - Correct wiring error. - Replace with fuse of correct capacity. - Replace with item of correct specification. - Replace or repair. - Perform repair at location of leakage. - Eliminate foreign matter. - Replace or repair. - Replace or repair. - Replace or repair.
Operates, but stops after a while.	<ul style="list-style-type: none"> - Prolonged dry operation has activated automatic cut-off function. - High liquid temperature has activated automatic cut-off function. 	<ul style="list-style-type: none"> - Raise stop water level. - Lower liquid temperature.
Thermal protector activates.	<ul style="list-style-type: none"> - Liquid temperature is high. - Pump is run in air for prolong time. - Overcurrent 	<ul style="list-style-type: none"> - Lower liquid temperature. - Raise stop water level. - Refer to the column for overcurrent.
Flood-sensing device activates.	<ul style="list-style-type: none"> - Mechanical seal leaks. - No longer serviceable. 	<ul style="list-style-type: none"> - Replace the mechanical seal. (Liquid quality and operation conditions need to be reviewed.) - Replace the mechanical seal.
Pumping not effected, or insufficient pumping capacity.	<ul style="list-style-type: none"> - Pump running in reverse rotation. - Gate valve is damaged. - Excessive voltage drop. - 60 Hz pump used with 50 Hz. - Discharge head too high. - Piping loss too large. - Water level too low, air drawn in. - Discharge pipe leaking. - Discharge pipe clogged. - Foreign matter in suction inlet. - Pump interior clogged with foreign matter. - Impeller(s) worn out. 	<ul style="list-style-type: none"> - Obtain regular rotation (Refer to 6-2. (2)). - Inspect and repair. - Contact electric power company. - See nameplate for frequency. - Rethink system plan. - Rethink system plan. - Raise water level or lower pump's position. - Inspect and repair. - Unclog pipe. - Remove foreign matter. - Disassemble pump and eliminate foreign matter. - Replace impeller(s).
Overcurrent occurs.	<ul style="list-style-type: none"> - Excessive voltage imbalance between supply phases. - Excessive voltage drop. - Phase interruption. - 50 Hz pump used with 60 Hz. - Pump running in reverse rotation. - Head too low. Water flow rate too high. - Foreign matter trapped in pump. - Motor bearing worn out. 	<ul style="list-style-type: none"> - Contact electric power company. - Contact electric power company. - Check connections and magnet switch. - See nameplate for frequency. - Obtain regular rotation (Refer to 6-2. (2)). - Turn down the gate valve. If there is no gate valve, replace the pump with the lower head pump. - Disassemble pump and eliminate foreign matter. - Replace or repair.
Vibration excessive or noise.	<ul style="list-style-type: none"> - Pump running in reverse rotation. - Foreign matter trapped in pump. - Piping resonating. 	<ul style="list-style-type: none"> - Obtain regular rotation (Refer to 6-2. (2)). - Disassemble pump and eliminate foreign matter. - Make improvements in piping to stop resonance.

1. Cross sectional view



*For automatic alternate operation model only

No.	Parts name	Quantity	No.	Parts name	Quantity
001	CASING	1	174	DISCHARGE ELBOW	1
005	INTERMEDIATE CASIN	1	193	OIL PLUG	1
012	SUCTION COVER	1	200	LIFTING HANGER	1
021	IMPELLER	1	213	AIR VENT VALVE	1
039	KEY	1	801	ROTOR	1
080	BUSHING	1	802	STATOR	1
111	MECHANICAL SEAL	1 SET	811	SUBMERSIBLE CABLE	1
115-1	O-RING	1	814	MOTOR FRAME	1
115-2	O-RING	1	816	BRACKET	1
115-3	O-RING	1	817	BRACKET	1
117-1	GASKET	1	830	SHAFT	1
117-2	SEAL WATER	1	849-1	BALL BEARING	1
120-1	BOLT	3 or 4	849-2	BALL BEARING	1
120-2	BOLT	4	876	MOTOR PROTECTOR	1
120-3	BOLT	4 or 8	*902	CONTROL UNIT	1
120-4	BOLT	4	*909-1	FLOAT SWITCH	1
120-5	BOLT	2	*909-2	FLOAT SWITCH	1
125	BOLT	1	*910	FLOAT SUPPORT	1
135	WASHER	1			

▪ Accessories

Ground nameplate..... 1 sheet

Note

Drawings indicating the materials of individual parts are available from EBARA CORP.

10 Disassembly and Reassembly

Refer to the cross sectional drawing.

1. Disassembling

- 1) Remove the locking bolts on the casing. Lift the motor section. Then, remove the rotating section of the pump.
- 2) Remove the impeller bolt (125), and remove the impeller (021).
- 3) Remove the oiling plug(193), and collect the lubrication oil.
- 4) Remove the locking bolts on the intermediate casing (005). Remove the intermediate casing (005) with special care.
(Care shall be paid on removing the intermediate casing (005) because the residual lubrication oil in the mechanical seal chamber is discharged.)
- 5) Remove the mechanical seal (111) with special care not to damage the sliding face of the mechanical seal and the motor shaft.

2. Assembling

Assembly work shall be conducted in reverse steps to those of the disassembly work. The O-ring and gaskets shall be replaced with new ones.

(Note 1) On reassembling, when the mounting of impeller, Step 2), completed, rotate the impeller with hands to confirm smooth rotation. If the rotation is not smooth, repeat the steps of 3) to 5).

(Note 2) On tightening the impeller bolt, apply adhesive for thread, (Locktight #262) to the bolt for preventing loosening of the bolt.

(Note 3) After completing the reassembling work to Step 1), rotate the impeller by hands (inserting hands from the suction opening), and confirm the smooth rotation of the impeller without contacting with the suction cover. Then, enter the operation of the pump.

11 Limited Warranty

EBARA Corporation warrants to the original retail purchaser ("Customer") the followings.

- (1) This warranty valid for a period of twelve months from the date of delivery.
- (2) During the said period, EBARA will repair the pump free of charge provided that:
the trouble is due to shortcomings in design, workmanship, etc., that can be attributed to EBARA, and that the pump was being operated correctly and in a normal manner in accordance with the Instruction Manual when the trouble occurred.
EBARA takes full responsibility to repair the pump including parts necessary for replacement, however, EBARA do not take any other damages caused by the trouble.
- (3) Fees will be charged for repair and consumable items in the following circumstances:
 - (a) If the trouble occurs after the warranty has expired.
 - (b) If the trouble is caused by mal-operation, and/or caused during storage.
 - (c) If the trouble is caused by fire, flood, earthquake or other circumstances beyond EBARA's control.
 - (d) If the trouble is caused by use of parts other than those recommended by EBARA.
 - (e) If the trouble is caused by repair or remodeling of the pump carried out by a party other than EBARA or agent specified by EBARA.
 - (f) "Consumable items" refer to lubrication oil, gasket, seal washer, O-ring, mechanical seal, and other parts that will eventually require replacement.
- (4) EBARA's liability shall not extend to any other costs beyond the above.
- (5) The storage period of consumable items is 7 years after manufacturing stop.

12 Repair and After-sale service

If some failures are found ,please contact EBARA Corporation or an authorized Agent/Distributor, stating the data on the identification nameplate and detail of the trouble.(Refer to section 8 "Troubleshooting")

Note

Packing materials after installation, and wasted lubricant oil and grease, and parts after inspection and repair shall be transferred to a qualified waste-treatment contractor observing the applicable laws and the regional regulations.

If you have any enquires about the pump, please contact EBARA.

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