ORIGINAL

This operational instruction manual shall be handed to the user.

# EBARA
# Submersible Sewage Pumps

# Model DL

# 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. |

Description of symbol

| | |
|---|---|
| ⃠ | Forbidden (not allowed to execute)matter.<br>Detail forbidding contents are instructed in or near the symbol by a sketch or a sentence. |
| ❗ | Compulsory (forceful execution) matter.<br>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 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.<br>If electric leak occurs, the personnel may suffer electric shock. |  |
| | Disassembling, repairing, and modifying the pump shall be limited to a repair technician.<br>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.<br>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.<br>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. | ❗ |

## 3 Introduction

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 10 "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 | 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.<br>Do not operate a pump of 60Hz at 50Hz. The pump performance deteriorates. | ⃠ |

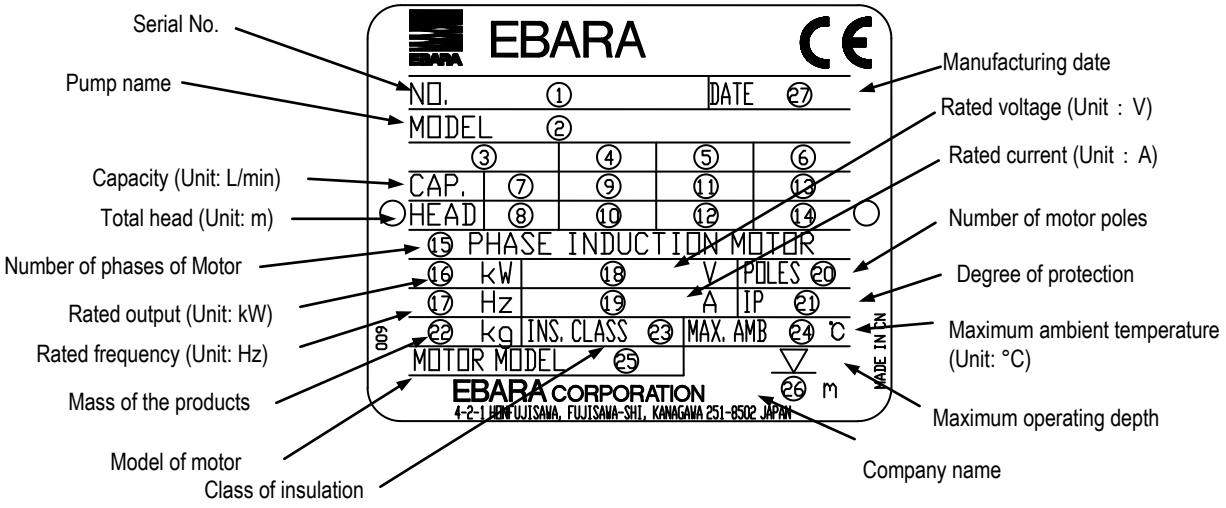



Fig. 1 Indication on nameplate

## 4 Product specification

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

| | | | | |
|---|---|---|---|---|
| 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.)<br>Φ65 ----------35<br>Φ80,Φ100(80) ---------50<br>Φ100 ----------60 | (Bore DIA.)<br>Φ150----------70<br>Φ200----------76<br>Φ250----------82<br>Φ300----------90 |
| | | Length of fibrous shape (mm) | (Bore DIA.)<br>Φ65 ----------195<br>Φ80,Φ100(80) ---------240<br>Φ100 ----------300 | (Bore DIA.)<br>Φ150----------400<br>Φ200----------500<br>Φ250----------550<br>Φ300----------600 |
| Max. submersible depth of the pump | | | Refer to Fig.8 | |
| Pump | Structure | Impeller | Non-clog | |
| | | Shaft seal | Single coil-double mechanical seal(1.5kW~3.7kW)<br>Tandem double mechanical seal(5.5kW~22kW) | |
| | | Bearing | Sealed ball-bearing (inside the motor) | |
| | Material | Casing | FC200 | |
| | | Impeller | FC200 or FCD400 | |
| | | Shaft seal | SiC/SiC : sliding material at liquid side<br>Ceramics-carbon: sliding material at motor side<br>NBR : rubber material | |
| | | Sealed liquid at shaft seal | Turbine oil ISO VG 32 | |

| | | | |
|---|---|---|---|
| Motor *1,*2 | Model, number of poles, Thermal class | | Dry submersible type, refer to Fig.8 |
| | Phase, frequency, voltage, current | | Refer to Fig.8 |
| | Built-in protective device | | 7.5kW or less: Auto-cut<br>11kW or larger: Thermal protector |
| | Material | Frame | FC200 |
| | | Main shaft | SUS403 |
| | | Cable | 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 ±10%. Allowable range of frequency fluctuation is ±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.

## 5 Installation

### 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. |

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.

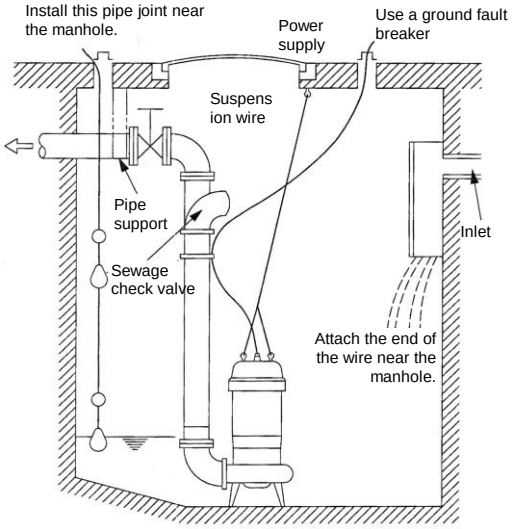



Fig. 2

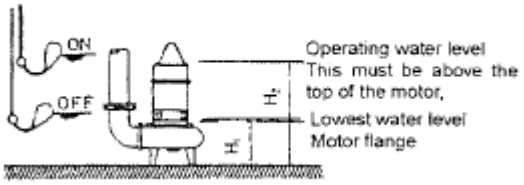



Fig.3

| | |
|---|---|
| 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. | ❗ |

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 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. | ❗ |
| | 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. | ❗ |
| | 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 | 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.

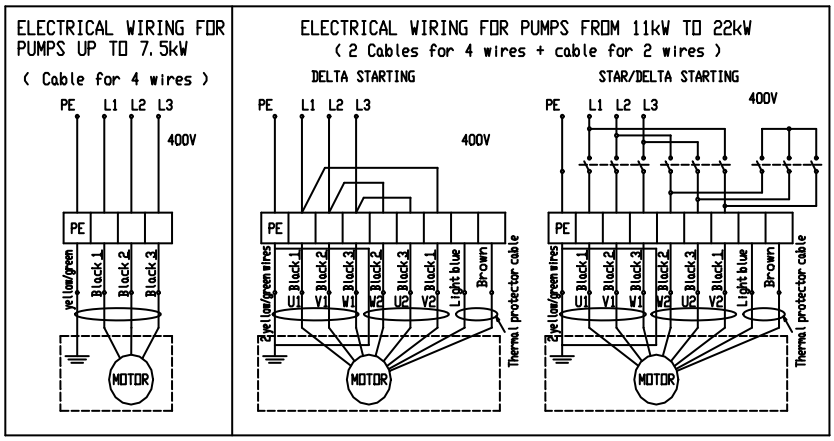



Fig. 4

1) Wiring
Perform the wiring shown in Fig.4. After doing so, make sure that the pump's cable is securely connected to the panel's terminals.

2) Cable
a) Never immerse the cable end in water.
b) If a cable is extended by connecting other cable, do not immerse the connected section in water.
c) Support the cable by the discharge pipe using an adhesive tape, a PVC band, etc.
d) 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 and Yellow stripe cord (Label PE) among the four lines, as shown in Fig. 5. Never connect the Green and Yellow stripe cord to the power source. The grinding shall be surely conducted conforming to the Technology Standard of Electric Facilities.

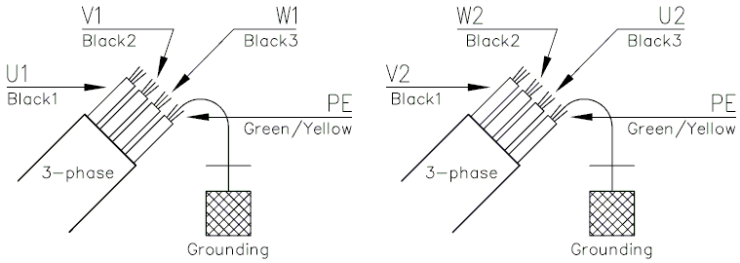



Fig.5

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.

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.

| Thermal Protection | |
|---|---|
| Contact rating | AC230V, 13A (Max)<br>AC200V-6mA or DC12V-10nA (Min) |
| Contact type | Break Contact<br>(Normal: on, At temp. rise: OFF) |
| Contact Cable | 2 cores PVC, Cab-tyre Cable 1mm$^2$ |

## 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.<br>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)

1) Confirm the absence of abnormal starting by ON and OFF the switch for once or twice in a state of slightly opened gate valve.

2) Then, confirm the rotational direction. After starting the pump, if the discharge rate is small and if an abnormal sound is generated, the rotational direction is reverse. In that case, replace two-phases from each other among three of them, (refer to Fig. 6).

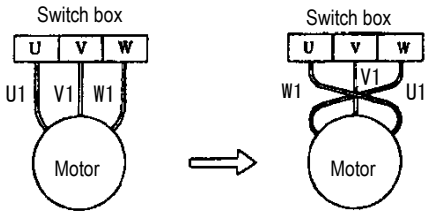



Fig. 6

3) Once the correct rotational direction is established, gradually open the gate valve, and confirm the absence of abnormality in pressure, discharge rate, current, etc. (refer to 9 "Troubleshooting"). If the current exceeds the rated current without using the gate valve, the design plan shall be reviewed.

3. Operation

After completing the test operation, the operation can immediately be started. Do not operate the pump in a state of full-opening of gate valve.

| | |
|---|---|
| Note | Operate the pump at a discharge rate suitable for the facilities.<br>(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.<br>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.<br>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 [9] "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 EBRA CORP. |
|---|---|

## 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.

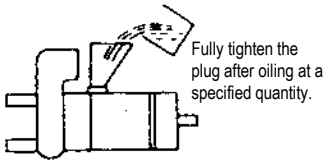



Fig. 7

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℃) 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 |
|---|---|---|---|---|---|
| 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 |
| 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.

| Parts name / Output | 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× $\phi$ 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

When thermal protector is activated:

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

## 8 Nameplate specification

DL

| 2 | 7 | 8 | 9 | 10 | 11 | 12 | 15 | 16 | 17 |
|---|---|---|---|---|---|---|---|---|---|
| MODEL | CAP. | HEAD | CAP. | HEAD | CAP. | HEAD | PHASE | kW | Hz |
| 65DL51.5 | L/min | m | 70 | 15.5 | 450 | 9.9 | 3 | 1.5 | 50 |
| 80DL51.5 | ↓ | ↓ | 200 | 12.2 | 950 | 3.3 | ↓ | ↓ | ↓ |
| 80DL52.2 | ↓ | ↓ | 100 | 15.8 | 1200 | 4 | ↓ | 2.2 | ↓ |
| 80DL53.7 | ↓ | ↓ | 100 | 19.1 | 1200 | 10.4 | ↓ | 3.7 | ↓ |
| 100(80)DLC55.5A | ↓ | ↓ | 200 | 22 | 1600 | 12.3 | ↓ | 5.5 | ↓ |
| 100(80)DLC57.5A | ↓ | ↓ | 200 | 27.3 | 1800 | 15.3 | ↓ | 7.5 | ↓ |
| 100DL53.7 | ↓ | ↓ | 500 | 14 | 1900 | 5 | ↓ | 3.7 | ↓ |
| 100DLB55.5A | ↓ | ↓ | 500 | 16.1 | 2290 | 8.3 | ↓ | 5.5 | ↓ |
| 100DLB57.5A | ↓ | ↓ | 500 | 20.8 | 2300 | 11.5 | ↓ | 7.5 | ↓ |
| 100DL511A | ↓ | ↓ | 500 | 28.4 | 2500 | 16 | ↓ | 11 | ↓ |
| 100DL515A | ↓ | ↓ | 500 | 33 | 2600 | 20.6 | ↓ | 15 | ↓ |
| 100DL518A | ↓ | ↓ | 500 | 39 | 2600 | 24 | ↓ | 18.5 | ↓ |
| 150DL55.5A | ↓ | ↓ | 1500 | 11.2 | 3050 | 5.8 | ↓ | 5.5 | ↓ |
| 150DL57.5A | ↓ | ↓ | 1500 | 15.2 | 3300 | 8.3 | ↓ | 7.5 | ↓ |
| 150DL511A | ↓ | ↓ | 1500 | 20 | 3600 | 11.5 | ↓ | 11 | ↓ |
| 150DL515A | ↓ | ↓ | 1500 | 25.8 | 3700 | 15.2 | ↓ | 15 | ↓ |
| 150DL518A | ↓ | ↓ | 1500 | 28.3 | 3800 | 18 | ↓ | 18.5 | ↓ |
| 150DL522A | ↓ | ↓ | 1500 | 33 | 4000 | 20.5 | ↓ | 22 | ↓ |

| 2 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 |
|---|---|---|---|---|---|---|---|---|---|
| MODEL | V | A | POLES | IP | MASS(kg) | INS.CLASS | MAX.AMB. TEMP(C°) | MOTOR MODEL | MAX DEPTH(m) |
| 65DL51.5 | 380/400/415 | 4.1/3.9/4.1 | 4 | 68 | 52 | F | 40 | ZDLEU | 8 |
| 80DL51.5 | ↓ | ↓ | ↓ | ↓ | 55 | ↓ | ↓ | ↓ | ↓ |
| 80DL52.2 | ↓ | 5.7/5.2/5.2 | ↓ | ↓ | 67 | ↓ | ↓ | ↓ | ↓ |
| 80DL53.7 | ↓ | 8.4/8.3/7.6 | ↓ | ↓ | 75 | ↓ | ↓ | ↓ | ↓ |
| 100(80)DLC55.5A | ↓ | 11.7/11.3/10.7 | ↓ | ↓ | 134 | ↓ | ↓ | ↓ | ↓ |
| 100(80)DLC57.5A | ↓ | 16.4/15.5/14.8 | ↓ | ↓ | 148 | ↓ | ↓ | ↓ | ↓ |
| 100DL53.7 | ↓ | 8.4/8.3/7.6 | ↓ | ↓ | 79 | ↓ | ↓ | ↓ | ↓ |
| 100DLB55.5A | ↓ | 11.7/11.3/10.7 | ↓ | ↓ | 123 | ↓ | ↓ | ↓ | ↓ |
| 100DLB57.5A | ↓ | 16.4/15.5/14.8 | ↓ | ↓ | 141 | ↓ | ↓ | ↓ | ↓ |
| 100DL511A | 380<br>400/415 | 22.5<br>21.5/21 | ↓ | ↓ | 180 | ↓ | ↓ | ↓ | ↓ |
| 100DL515A | ↓ | 30<br>28.5/27 | ↓ | ↓ | 230 | ↓ | ↓ | ↓ | ↓ |
| 100DL518A | ↓ | 36.5<br>35/34 | ↓ | ↓ | 285 | ↓ | ↓ | ↓ | ↓ |
| 150DL55.5A | 380/400/415 | 11.7/11.3/10.7 | ↓ | ↓ | 146 | ↓ | ↓ | ↓ | ↓ |
| 150DL57.5A | ↓ | 16.4/15.5/14.8 | ↓ | ↓ | 158 | ↓ | ↓ | ↓ | ↓ |
| 150DL511A | 380<br>400/415 | 22.5<br>21.5/21 | ↓ | ↓ | 199 | ↓ | ↓ | ↓ | ↓ |
| 150DL515A | ↓ | 30<br>28.5/27 | ↓ | ↓ | 237 | ↓ | ↓ | ↓ | ↓ |
| 150DL518A | ↓ | 36.5<br>35/34 | ↓ | ↓ | 300 | ↓ | ↓ | ↓ | ↓ |
| 150DL522A | ↓ | 43<br>42/40 | ↓ | ↓ | 325 | ↓ | ↓ | ↓ | ↓ |

| 2 | 7 | 8 | 9 | 10 | 11 | 12 | 15 | 16 | 17 |
|---|---|---|---|---|---|---|---|---|---|
| MODEL | CAP. | HEAD | CAP. | HEAD | CAP. | HEAD | PHASE | kW | Hz |
| 200DL55.5A | L/min | m | 2600 | 6.5 | 3800 | 4 | 3 | 5.5 | 50 |
| 200DL57.5A | | | 2900 | 9.6 | 4700 | 5.8 | | 7.5 | |
| 200DL511A | | | 3100 | 13.2 | 5000 | 9 | | 11 | |
| 200DL515A | | | 3400 | 17 | 5300 | 12 | | 15 | |
| 200DL518A | | | 3500 | 19.4 | 5300 | 13.5 | | 18.5 | |
| 200DL522A | | | 3500 | 23.2 | 5500 | 15 | | 22 | |
| 250DL57.5A | | | 3800 | 7.2 | 5850 | 4 | | 7.5 | |
| 250DL511A | | | 4300 | 10.4 | 7100 | 4.8 | | 11 | |
| 250DL515A | | | 4500 | 13 | 7250 | 6.4 | | 15 | |
| 250DL518A | | | 4500 | 15.7 | 7500 | 7.3 | | 18.5 | |
| 250DL522A | | | 4500 | 17.2 | 8000 | 8.2 | | 22 | |
| 300DL511A | | | 6000 | 5.5 | 8300 | 4 | | 11 | |
| 300DL515A | | | 6000 | 8 | 10700 | 4.4 | | 15 | |
| 300DL518A | | | 6300 | 9.5 | 11000 | 4.8 | | 18.5 | |
| 300DL522A | | | 6500 | 11.9 | 12000 | 6.4 | | 22 | |

| 2 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 |
|---|---|---|---|---|---|---|---|---|---|
| MODEL | V | A | POLES | IP | MASS(kg) | INS.CLASS | MAX.AMB. TEMP(C°) | MOTOR MODEL | MAX DEPTH (m) |
| 200DL55.5A | 380/400/415 | 11.7/11.3/10.7 | 4 | 68 | 160 | F | 40 | ZDLEU | 8 |
| 200DL57.5A | | 16.4/15.5/14.8 | | | 176 | | | | |
| 200DL511A | 380<br>400/415 | 22.5<br>21.5/21 | | | 212 | | | | |
| 200DL515A | | 30<br>28.5/27 | | | 260 | | | | |
| 200DL518A | | 36.5<br>35/34 | | | 305 | | | | |
| 200DL522A | | 43<br>42/40 | | | 330 | | | | |
| 250DL57.5A | 380/400/415 | 16.4/15.5/14.8 | | | 260 | | | | |
| 250DL511A | 380<br>400/415 | 22.5<br>21.5/21 | | | 320 | | | | |
| 250DL515A | | 30<br>28.5/27 | | | 380 | | | | |
| 250DL518A | | 36.5<br>35/34 | | | 420 | | | | |
| 250DL522A | | 43<br>42/40 | | | 440 | | | | |
| 300DL511A | | 22.5<br>21.5/21 | | | 365 | | | | |
| 300DL515A | | 30<br>28.5/27 | | | 395 | | | | |
| 300DL518A | | 36<br>35/34 | | | 440 | | | | |
| 300DL522A | | 43<br>42/40 | | | 465 | | | | |

DL with cutter

| 2 | 7 | 8 | 9 | 10 | 11 | 12 | 15 | 16 | 17 |
|---|---|---|---|---|---|---|---|---|---|
| MODEL | CAP. | HEAD | CAP. | HEAD | CAP. | HEAD | PHASE | kW | Hz |
| 65DL51.5 | L/min | m | 70 | 14.0 | 400 | 10 | 3 | 1.5 | 50 |
| 80DL51.5 | ↓ | ↓ | 400 | 9.3 | 930 | 3 | ↓ | ↓ | ↓ |
| 80DL52.2 | ↓ | ↓ | 100 | 14.5 | 1150 | 4 | ↓ | 2.2 | ↓ |
| 80DL53.7 | ↓ | ↓ | 100 | 18.4 | 1200 | 10.4 | ↓ | 3.7 | ↓ |
| 100DL53.7 | ↓ | ↓ | 500 | 13.9 | 2000 | 4 | ↓ | 3.7 | ↓ |
| 100DLB55.5A | ↓ | ↓ | 500 | 16.1 | 2250 | 8.5 | ↓ | 5.5 | ↓ |
| 100DLB57.5A | ↓ | ↓ | 200 | 21.8 | 2300 | 11.5 | ↓ | 7.5 | ↓ |

| 2 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 |
|---|---|---|---|---|---|---|---|---|---|
| MODEL | V | A | POLES | IP | MASS(kg) | INS.CLASS | MAX.AMB. TEMP(C°) | MOTOR MODEL | MAX DEPTH(m) |
| 65DL51.5 | 380/400/415 | 4.1/3.9/4.1 | 4 | 68 | 52 | F | 40 | ZDLEU | 8 |
| 80DL51.5 | ↓ | ↓ | ↓ | ↓ | 55 | ↓ | ↓ | ↓ | ↓ |
| 80DL52.2 | ↓ | 5.7/5.2/5.2 | ↓ | ↓ | 67 | ↓ | ↓ | ↓ | ↓ |
| 80DL53.7 | ↓ | 8.4/8.3/7.6 | ↓ | ↓ | 75 | ↓ | ↓ | ↓ | ↓ |
| 100DL53.7 | ↓ | 8.4/8.3/7.6 | ↓ | ↓ | 79 | ↓ | ↓ | ↓ | ↓ |
| 100DLB55.5A | ↓ | 11.7/11.3/10.7 | ↓ | ↓ | 123 | ↓ | ↓ | ↓ | ↓ |
| 100DLB57.5A | ↓ | 16.4/15.5/14.8 | ↓ | ↓ | 141 | ↓ | ↓ | ↓ | ↓ |

Fig.8

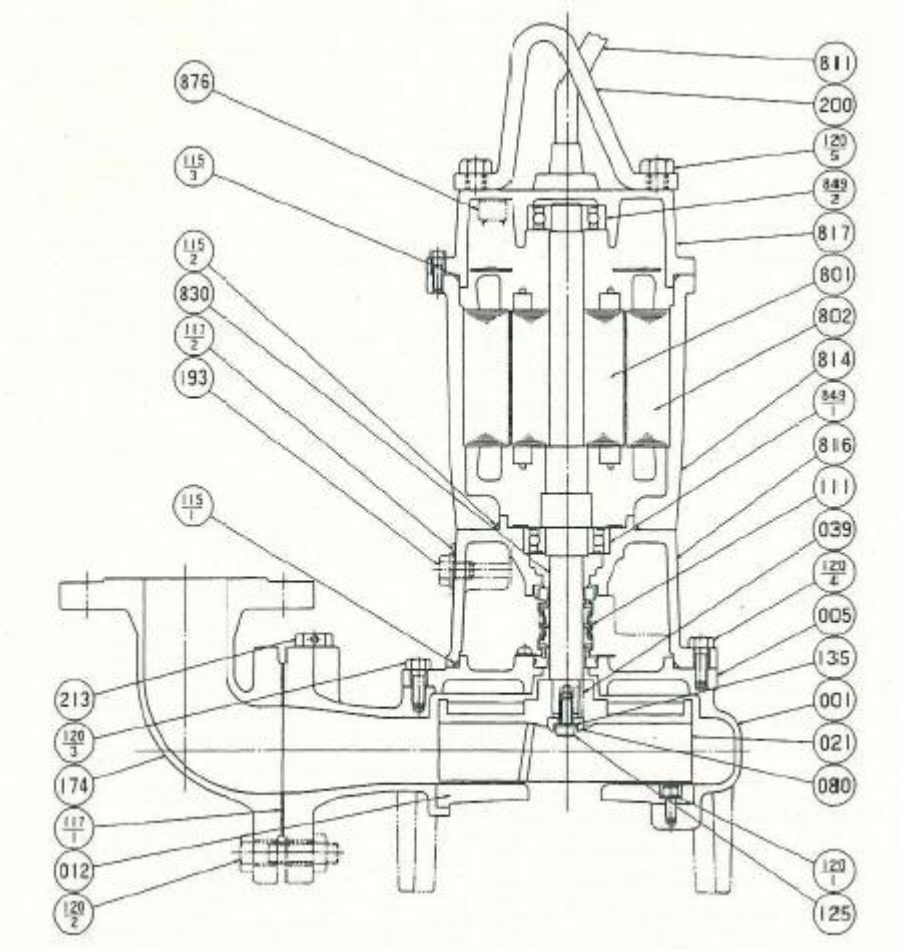
## 9 Troubleshooting

| Trouble | Cause | Action |
|---|---|---|
| The pump does not start. | ○ Obstacle inhibits the float movement. | ○ Remove the obstacle. |
| The pump starts, but it immediately stops. | ○ Power is failed. | ○ Request the electric power company for action. |
| | ○ Large fluctuation of power voltage. | ○ Request the electric power company for action. |
| | ○ Large drop in voltage. | ○ Request the electric power company for action. |
| | ○ Phase is lost. | ○ Inspect the connection section and the magnet switch. |
| | ○ Insufficient connection of power source circuit. | ○ Inspect the power source circuit. |
| | ○ Wrong wiring of control circuit. | ○ Wire in correct state. |
| | ○ Fuse is blown. | ○ Replace with adequate fuse. |
| | ○ Defective magnet switch. | ○ Replace with adequate magnet. |
| | ○ Mal-functioning or defects of level switch, etc. | ○ Repair or replace the level switch, etc.. |
| | ○ Actuation of ground fault breaker. | ○ Repair the electric-leak section. |
| | ○ Pump catches foreign matter. | ○ Remove the foreign matter. |
| | ○ Motor is burnt out. | ○ Repair or replace the motor. |
| | ○ Break of motor bearing. | ○ Repair or replace the bearing. |
| | ○ Mechanical seal stuck. | ○ Repair or replace the mechanical seal. |
| The pump can be operated, but it stops after a while. | ○ Prolonged dry operation induced the functioning of Auto-cut. | ○ Raise the water level. |
| | ○ High liquid temperature induced the functioning of Auto-cut. | ○ Lower the water level. |

| | | |
|---|---|---|
| Thermal protector is actuated. | ○ High liquid temperature.<br>○ Long dry operation.<br>○ Eddy current. | ○ Lower the liquid temperature.<br>○ Raise the stopping water level.<br>○ Refer to the section of eddy current. |
| Does not pump.<br>Insufficient pumping rate. | ○ Reverse rotation.<br>○ Broken gate valve.<br>○ Large voltage drop.<br>○ Operating the 60Hz pump at 50Hz.<br>○ High discharge head.<br>○ Large piping loss.<br>○ Low operating water level causes air suction.<br>○ Liquid leaking from discharge pipe.<br>○ Clogging of discharge pipe.<br>○ Adhesion of foreign matter in suction opening.<br>○ Foreign matter clogs the pump.<br>○ Worn impeller. | ○ Establish correct rotational direction, (refer to 6-2-2).<br>○ Repair or replace the gate valve.<br>○ Request the electric power company for action.<br>○ Check the nameplate.<br>○ Review the plan.<br>○ Review the plan.<br>○ Raise the water level or lower the pump position.<br>○ Inspect and repair the discharge pipe.<br>○ Remove the foreign matter.<br>○ Remove the foreign matter.<br>○ Disassemble the pump to remove the foreign matter.<br>○ Replace the impeller. |
| Over current | ○ Large fluctuations of power source voltage.<br>○ Significant voltage drop.<br>○ Phase is lost.<br>○ Operating the 50Hz pump at 60H.<br>○ Operating the pump in reverse rotation state.<br>○ Low head resulting in excess flow rate.<br>○ Pump caches foreign matter.<br>○ Motor bearing is broken. | ○ Request the electric power company for action.<br>○ Request the electric power company for action.<br>○ Inspect the connection section and the magnet switch.<br>○ Check the nameplate.<br>○ Establish the correct rotational direction, (refer to 6-2-2).<br>○ Narrow the opening of the gate valve. If no gate valve is used, replace the pump with the one having lower head.<br>○ Disassemble the pump to remove the foreign matter.<br>○ Repair or replace the bearing. |
| Pump vibrates, generating large noise. | ○ Pump is in reverse rotational direction.<br>○ Pump catches foreign matter.<br>○ Piping is in resonance mode. | ○ Establish the correct rotational direction, (refer to 6-2-2).<br>○ Disassemble the pump to remove the foreign matter.<br>○ Modify the piping. |

## 10 Structure

1. Cross sectional view




* Recommended spare parts.

| No. | Parts name | Quantity |
|---|---|---|
| 001 | CASING | 1 |
| 005 | INTERMEDIATE CASIN | 1 |
| 012 | SUCTION COVER | 1 |
| 021 | IMPELLER | 1 |
| 039 | KEY | 1 |
| 080 | BUSHING | 1 |
| *111 | MECHANICAL SEAL | 1 SET |
| *115-1 | O-RING | 1 |
| *115-2 | O-RING | 1 |
| *115-3 | O-RING | 1 |
| *117-1 | GASKET | 1 |
| *117-2 | SEAL WATER | 1 |
| 120-1 | BOLT | 3 or 4 |
| 120-2 | BOLT | 4 |
| 120-3 | BOLT | 4 or 8 |
| 120-4 | BOLT | 4 |
| 120-5 | BOLT | 2 |

| No. | Parts name | Quantity |
|---|---|---|
| 125 | BOLT | 1 |
| 135 | WASHER | 1 |
| 174 | DISCHARGE ELBOW | 1 |
| 193 | OIL PLUG | 1 |
| 200 | LIFTING HANGER | 1 |
| 213 | AIR VENT VALVE | 1 |
| 801 | ROTOR | 1 |
| 802 | STATOR | 1 |
| 811 | SUBMERSIBLE CABLE | 1 |
| 814 | MOTOR FRAME | 1 |
| 816 | BRACKET | 1 |
| 817 | BRACKET | 1 |
| 830 | SHAFT | 1 |
| *849-1 | BALL BEARING | 1 |
| *849-2 | BALL BEARING | 1 |
| 876 | MOTOR PROTECTOR | 1 |
| | | |

・Accessories

Ground nameplate·····1 sheet

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

## 11 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.

## 12 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.

## 13 Repair and After-sale service

If any abnormality is detected during the operation of the product, immediately stop the operation, and inspect to identify whether the abnormality is defective or not. (Refer to 9 "Troubleshooting"). If the abnormality is defective one, promptly notify the matter to EBARA CORP. or related agencies which contact addresses are listed at the end of this Instruction Manual, with the information about the description given on the nameplate and the condition of the failure (abnormality).

| | |
|---|---|
| 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. |

For any question about your pump, please inquire the matter to EBARA CORP. without hesitation.

If you have any enquired about the pump, please contact:


EBARA CORPORATION
4-2-1 Honfujisawa, Fujisawa-shi,
Kanagawa, 251-8502, JAPAN
PHONE: 81-3-6275-7578
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FAX: 39-0444-706950
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Via Campo Sportive, 30
38023 Cles (TN) ITALY
PHONE: 39-0463-660411
FAX: 39-0463-422782