



This operational instruction manual shall be handed to the user.

EBARA

Submersible Pumps

Model DML (sewage pump)

Model DMLV (vortex pump)



Instruction Manual

Request

Welcome to the EBARA submersible 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.

Contents	(page)		(page)
1 Warning indication	2	7 Maintenance	12
2 Precautions of safety	3	1. Daily inspection	12
3 Introduction	5	2. Regular inspection	12
1. Confirmation of pump and accessories	5	3. Precautions during stop-operation	13
2. Confirmation of nameplate	5	4. When motor protection activated	13
4 Product specification	6	5. Consumables	13
5 Installation	7	8 Troubleshooting	14
1. Confirmation before installation	7	9 Construction	16
2. Installation	7	1. Sectional view	16
3. Electric wiring	9	2. Accessory	17
6 Operation	11	10 Disassembling and Assembling	17
1. Before starting	11	11 Limited Warranty	17
2. Test operation	11	12 Repair and after-sale service	18
3. Operation	11		

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.




















<u>Note</u>	Providing specific precautions or specifically emphasizing information.
-------------	---

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	<p>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.</p>	
	<p>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.</p>	
	<p>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.</p>	
	<p>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.</p>	
	<p>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.</p>	
	<p>To prevent electric shock, install an exclusive use ground fault breaker. The electric leak may cause electric shock and fire.</p>	
	<p>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.</p>	
	<p>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.</p>	
	<p>Never operate the pump in water in the presence of personnel. If electric leak occurs, the personnel may suffer electric shock.</p>	
	<p>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.</p>	
	<p>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.</p>	
	<p>To stop operation for a certain period, cut OFF the power switch. Deterioration of insulation may cause electric shock, electric leak, and fire.</p>	
	<p>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.</p>	
	<p>Do not execute dry operation in air. That type of operation causes deterioration in insulation to lead to electric shock and electric leak.</p>	
	<p>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. There is a possibility of motor burn out, electric shock, and fire.</p>	
<p>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.</p>		
<p>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.</p>		

 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 (DML) or vortex (DMLV) 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 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.	
	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 **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	<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>	
--	---	---

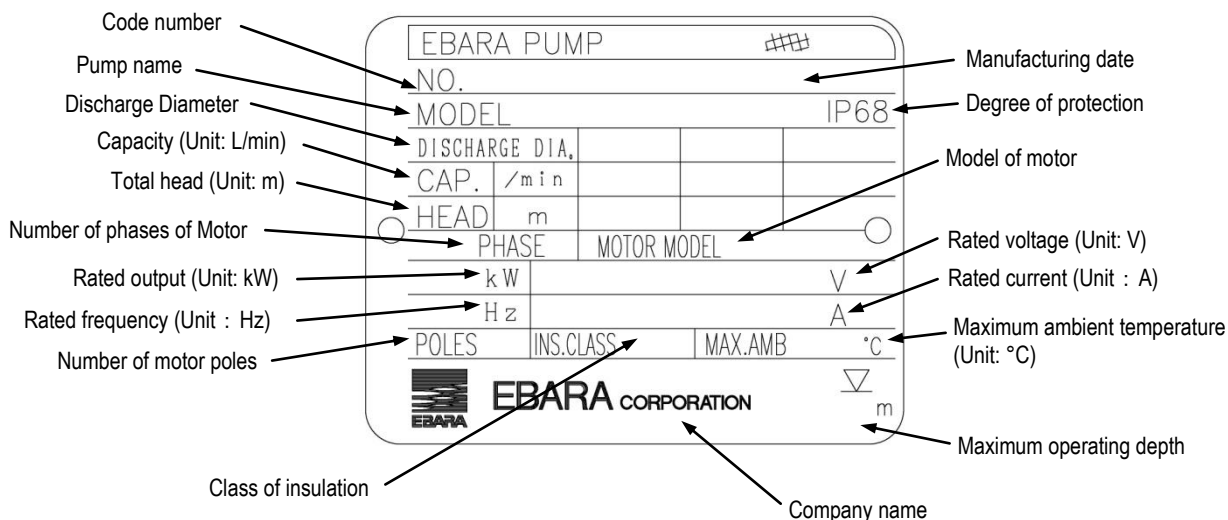


Fig. 1 Name plate

Name plate description

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.

⚠ 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) 0-40°C : Non-automatic type
	Liquid temperature	
	Size of foreign matter Max. (mm)	Diameter of spherical shape - 76 mm (DML) - Equivalent to the pump diameter (DMLV) Length of fibrous shape - 500 mm (DML) - DMLV Ø80 : 400 mm - DMLV Ø100 : 500 mm
Max. submersible depth of the pump		Refer to Fig.1
Pump	Structure	Impeller Shaft seal Bearing Single channel non-clog (DML) – Vortex (DMLV) Single coil-double mechanical seal Sealed ball-bearing (inside the motor)
	Material	Casing Impeller Shaft seal Sealed liquid at shaft seal FC200 DML : Cast iron: FC200 (except for 50Hz 22kW) Cast iron: FCD400 (for 50Hz 22kW) DMLV : Cast iron: FC200 (2,2 ÷ 11 kW) Cast iron: FCD400 (15 , 22 kW) SiC/SiC : sliding material at liquid side Ceramics-carbon: sliding material at motor side NBR : rubber material Turbine oil ISO VG 32

Motor *1,*2	Model, number of poles, Thermal class Phase, frequency, voltage, current Built-in protective device	Refer to Fig.1 Refer to Fig.1 Auto-cut (2.2kW) Thermal protector (3.7kW~22kW)
	Material	Frame Main shaft Cable FC200 SUS403 200V:VCT 400V:H07RN-F
Connection with piping		Flange
Environment of installation site		Free from corrosive gas and vapor
Installation method		Vertical position
Direction of rotation		Clock wise from top of motor
Temperature of shipping, store keeping		-5~40°C

*1 Cannot be driven by the inverter.

*2 Allowable range of voltage fluctuation is 2.2kW; -10 to 6%, 3.7kW to 22kW; $\pm 10\%$. 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.






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 20M Ω 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.	

<u>Note</u>	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) Under no circumstances should the cable be pulled while the pump is being transported or installed. Attach a chain or rope to the grip and install the pump.
- (2) This pump must not be installed horizontally. Ensure that it is installed upright on a secure base.
- (3) Install the pump at a location in the tank where there is the least turbulence.
- (4) If there is a flow of liquid inside the tank, support the piping to prevent abnormal vibration. (See Fig.2)
- (5) Install piping so that air will not stagnate
- (6) Do not permit end of discharge piping to be submerged. A backflow will result when the pump is stopped.
- (7) Manual type pumps do not have an automatic operating system based on built-in floats. Do not operate the pump more than ten minutes with the water level near the minimum operating level as the automatic cut-off switch incorporated inside the motor will be activated. To avoid dry operation, install an automatic operating system, as shown in Fig.3. Water levels H1 and H2 are shown in the following table.
- (8) When using electrodes for automatic operating system, incorrect actuation may occur caused by scum and oil attached on the electrodes.

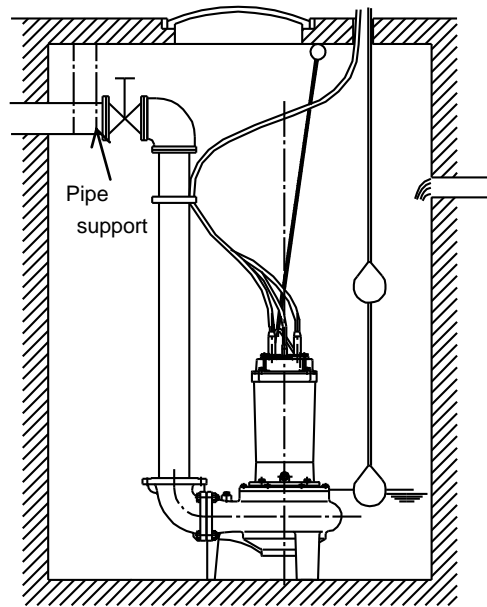


Fig. 2

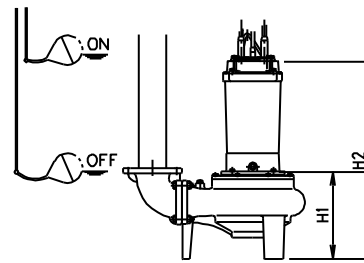


Fig. 3

Frequency		2.2kW	3.7kW	5.5kW	7.5kW	11kW	15kW	22kW
DML 50Hz	H2(mm)	547	627	724	724	778	778	841
	H1(mm)	279	279	310	310	329	329	342
DML 60Hz	H2(mm)	547	627	707	707	771	771	828
	H1(mm)	279	279	294	294	322	322	329












Frequency		2.2kW	3.7kW	5.5kW	7.5kW	11kW	15kW	22kW
DMLV 50 Hz	H2(mm)	560	620	760	760	810	810	865
	H1(mm)	200	200	250	250	250	250	250

- (9) Installation of the pump with quick discharge connector shall be performed according to the manual "Quick Discharge Connector"

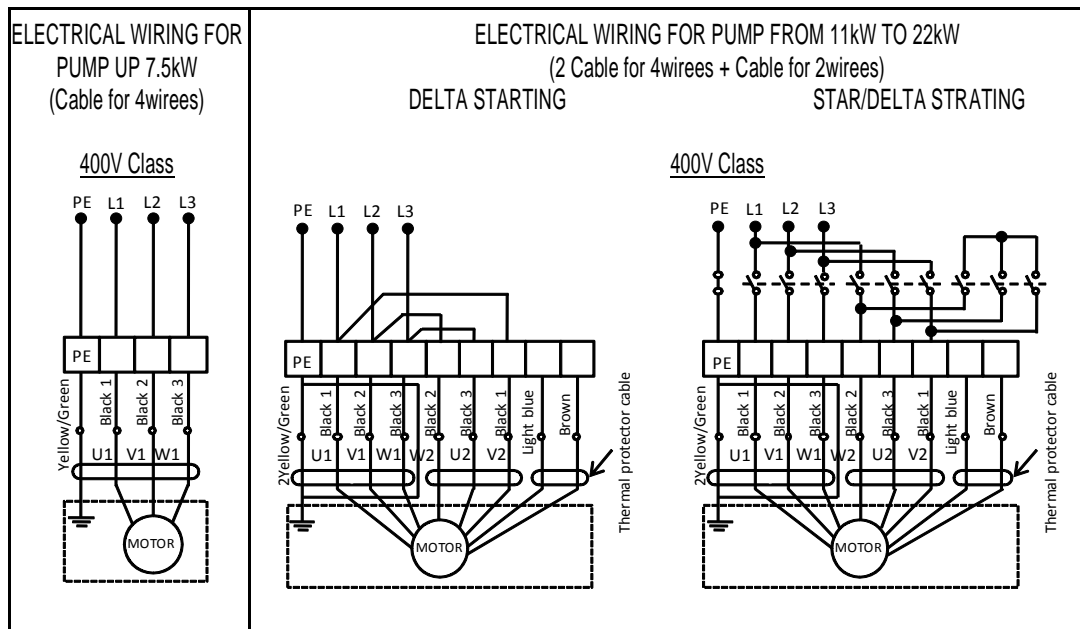
Note	Packing materials after installation, and wasted lubricant oil and grease, and parts after inspection and repair shall be transferred to a qualified waste-treatment contractor observing the applicable laws and the regional regulations.
-------------	---

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 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.	
	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 product.



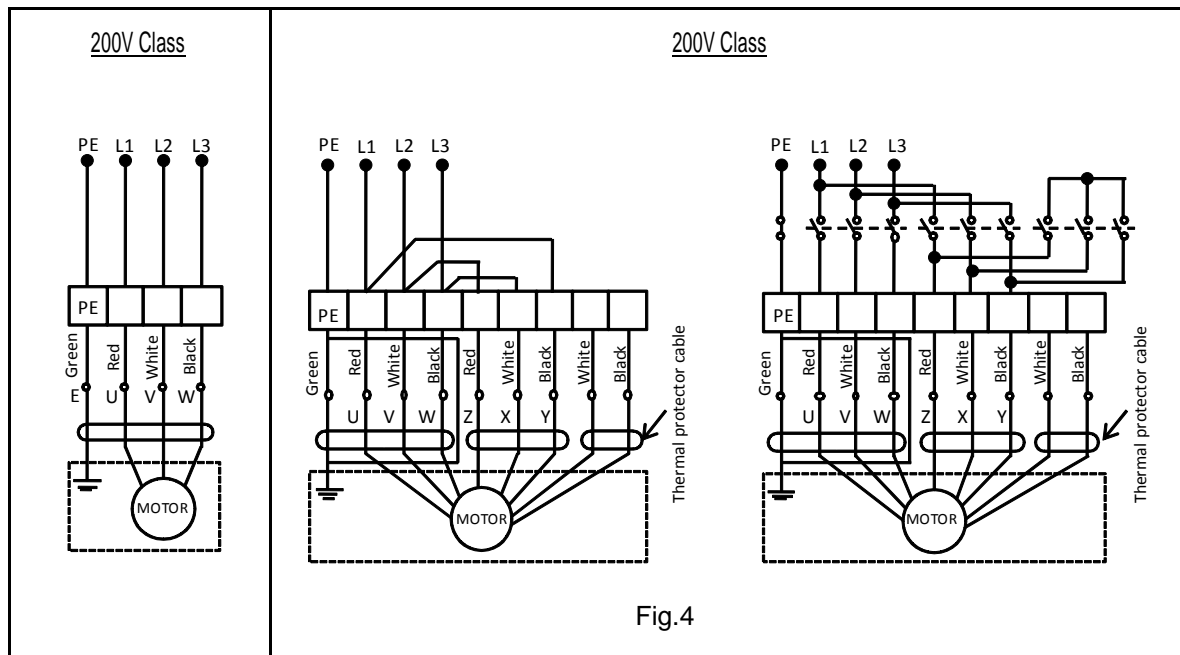


Fig. 4

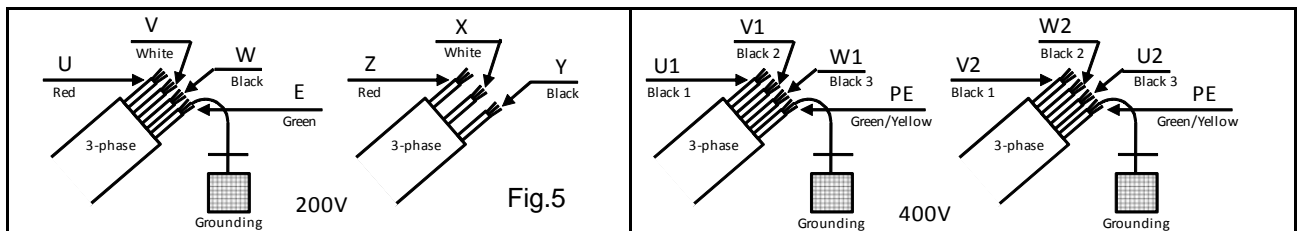
1) Wiring

Wiring should be performed as indicated for the appropriate start system as shown in Fig 4

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 and Yellow stripe cord (Label PE) or the Green cord (Label E) among the four lines, as shown in Fig. 5. 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 (Built-in in 2.2kW motor)

Auto-cut will be activated when motor is operated in abnormal conditions such as locked rotor or single phase that result in excess over heating.

(b) Thermal protector (Built-in in 3.7kW to 22kW motor)

When temperature of the winding raises and reaches the thermal protector acting point, the motor protection circuit is activated to protect motor from over heat.

Connect to the control panel in accordance with the following specifications.





Be sure to install a thermal relay on the control panel, since the thermal protector is not capable of detecting sudden temperature rises caused by single phase or locked rotor.

Contact rating: AC230V, 13A (Max.)

Contact type: break contact (normal close)

Cable: 2 cores chloroprene cabtyre cable -200V : 1.25 mm²/400V : 1.00mm² (non-polarity)

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

Output	The number of starting times per hour
up to 7.5kW	10
from 11 to 22kW	7

2. Test operation

- 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).
- 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 [8] "Troubleshooting"). If the current exceeds the rated current without using the gate valve, the design plan shall be reviewed.

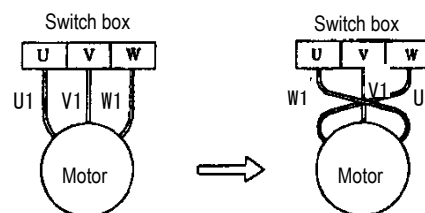




Fig. 6

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. (Operation at excessively small or large capacity causes noise and vibration, and consumes unnecessary power.)
-------------	---

 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 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 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	⚠

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
-------------	--

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.

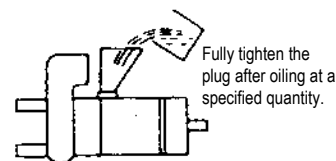


Fig. 7

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.

5) Check that there is no leakage from the joint of pump and piping. When there is leakage, tighten the connecting bolts.

6) In order to avoid the fire accident by the contact failure caused by the slack of wiring, check whether motor connections and panel connections are not loosened.

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. When motor protection is activated.

Check causes that motor protection is activated. After removing the causes, start the operation again.

5. Consumables

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

Consumable parts	Mechanical seal	Sheet packing	Seal washer	Lubricant oil	O-ring	Bearing
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.	_____	Every 6000 hours

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

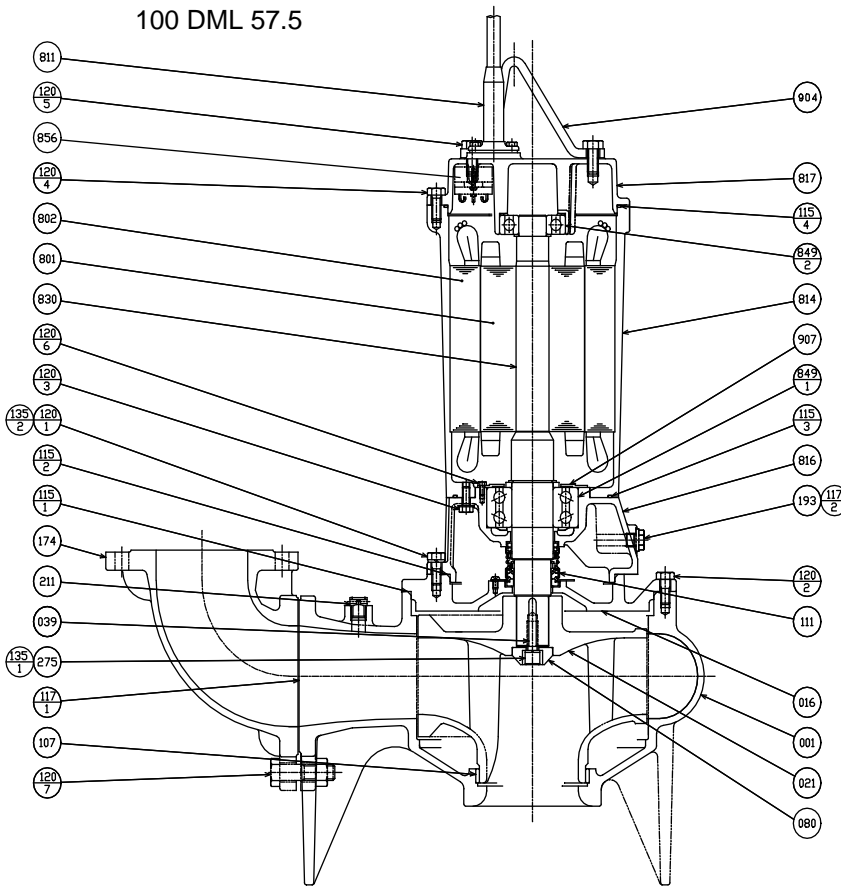
Parts name	OUTPUT						
	2.2kW	3.7kW	5.5kW	7.5kW	11kW	15kW	22kW
Mechanical seal < mm >	Φ 30		Φ 40		Φ 45		
Seal washer (W12 SUS) < mm >	Φ 22xΦ 11.8x1.2(Outer diameter x Inner diameter x thickness)						
Lubrication oil < m L > (Turbine oil ISO VG32)	DML	1100	1600		2900	3000	
	DMLV	1100	1780		3380	3550	
O-ring < mm >	φ 170x φ 3.1		φ 180x φ 3.1		φ 220x φ 3.1		

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

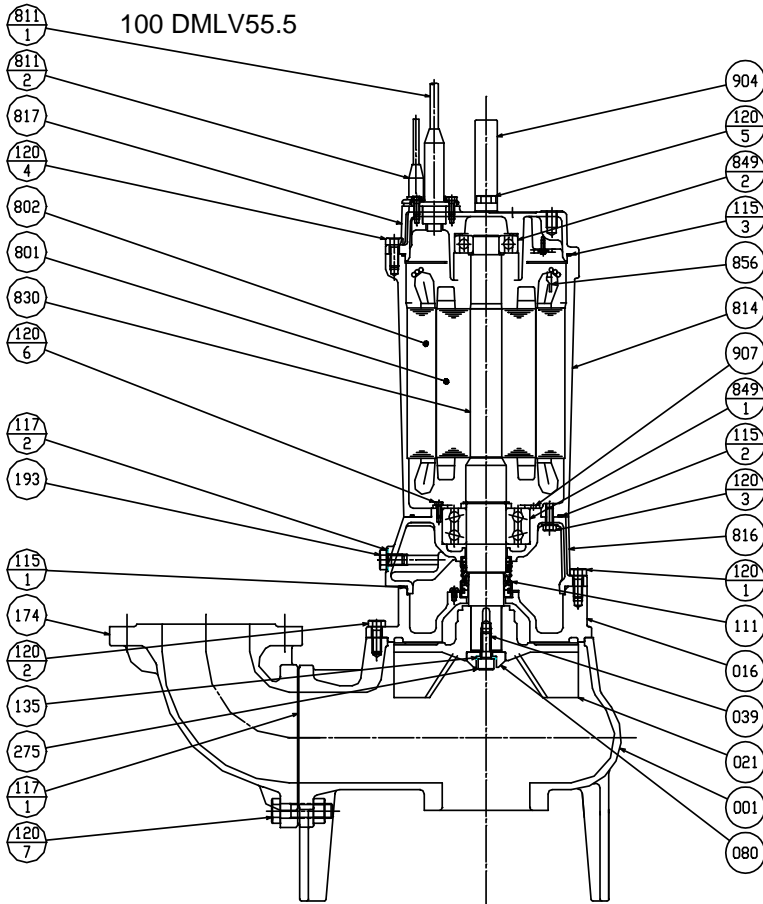
T r o u b l e	C a u s e	A c t i o n
<p>The pump does not start. The pump starts, but it immediately stops.</p>	<ul style="list-style-type: none"> ○ Obstacle inhibits the float movement. ○ Power is failed. ○ Large fluctuation of power voltage. ○ Large drop in voltage. ○ Phase is lost. ○ Insufficient connection of power source circuit. ○ Wrong wiring of control circuit. ○ Fuse is blown. ○ Defective magnet switch. ○ Mal-functioning or defects of float switch, etc. ○ Actuation of ground fault breaker. ○ Pump catches foreign matter. ○ Motor is burnt out. ○ Break of motor bearing. ○ Mechanical seal stuck. 	<ul style="list-style-type: none"> ○ Remove the obstacle. ○ Request the electric power company for action. ○ Request the electric power company for action. ○ Request the electric power company for action. ○ Inspect the connection section and the magnet switch. ○ Inspect the power source circuit. ○ Wire in correct state. ○ Replace with adequate fuse. ○ Replace with adequate magnet. ○ Repair or replace the level switch, etc.. ○ Repair the electric-leak section. ○ Remove the foreign matter. ○ Repair or replace the motor. ○ Repair or replace the bearing. ○ Repair or replace the mechanical seal.
<p>The pump can be operated, but it stops after a while.</p>	<ul style="list-style-type: none"> ○ Prolonged dry operation induced the functioning of Auto-cut. ○ High liquid temperature induced the functioning of Auto-cut. 	<ul style="list-style-type: none"> ○ Raise the water level. ○ Lower the water level.
<p>Thermal protector is actuated.</p>	<ul style="list-style-type: none"> ○ High liquid temperature. ○ Long dry operation. ○ Eddy current. 	<ul style="list-style-type: none"> ○ Lower the liquid temperature. ○ Raise the stopping water level. ○ Refer to the section of eddy current.
<p>Does not pump. Insufficient pumping rate.</p>	<ul style="list-style-type: none"> ○ Reverse rotation. ○ Broken gate valve. ○ Large voltage drop. ○ Operating the 60Hz pump at 50Hz. ○ High discharge head. ○ Large piping loss. ○ Low operating water level causes air suction. ○ Liquid leaking from discharge pipe. ○ Clogging of discharge pipe. ○ Adhesion of foreign matter in suction opening. ○ Foreign matter clogs the pump. ○ Worn impeller. 	<ul style="list-style-type: none"> ○ Establish correct rotational direction, (refer to [6]-2-2). ○ Repair or replace the gate valve. ○ Request the electric power company for action. ○ Check the nameplate. ○ Review the plan. ○ Review the plan. ○ Raise the water level or lower the pump position. ○ Inspect and repair the discharge pipe. ○ Remove the foreign matter. ○ Remove the foreign matter. ○ Disassemble the pump to remove the foreign matter. ○ Replace the impeller.

<p>Over current</p>	<ul style="list-style-type: none"> ○ Large fluctuations of power source voltage. ○ Significant voltage drop. ○ Phase is lost. ○ Operating the 50Hz pump at 60H. ○ Operating the pump in reverse rotation state. ○ Low head resulting in excess flow rate. ○ Pump catches foreign matter. ○ Motor bearing is broken. 	<ul style="list-style-type: none"> ○ Request the electric power company for action. ○ Request the electric power company for action. ○ Inspect the connection section and the magnet switch. ○ Check the nameplate. ○ Establish the correct rotational direction, (refer to 6-2-2). ○ Narrow the opening of the gate valve. If no gate valve is used, replace the pump with the one having lower head. ○ Disassemble the pump to remove the foreign matter. ○ Repair or replace the bearing.
<p>Pump vibrates, generating large noise.</p>	<ul style="list-style-type: none"> ○ Pump is in reverse rotational direction. ○ Pump catches foreign matter. ○ Piping is in resonance mode. 	<ul style="list-style-type: none"> ○ Establish the correct rotational direction, (refer to 6-2-2). ○ Disassemble the pump to remove the foreign matter. ○ Modify the piping.

1. Section drawing : Typical model



907	BEARING COVER	1
904	LIFTING HANGER	1
856	THERMAL PROTECTOR	2※3
849-2	BALL BEARING	1
849-1	BALL BEARING	1
830	SHAFT	1
817	OPPOSITE SIDE BRACKET	1
816	POWER SIDE BRACKET	1
814	MOTOR FRAME	1
811-2	SUBMERSIBLE CABLE	1※2
811-1	SUBMERSIBLE CABLE	2※1
802	STATOR	1
801	ROTOR	1
275	IMPELLER BOLT	1
211	AIR VENT VALVE	1
193	OIL PLUG	1
174	DISCHARGE PIPE	1
135	WASHER	1
135-2	WASHER	4
135-1	WASHER	1
120-7	BOLT	4
120-6	BOLT	3
120-5	BOLT	2
120-4	BOLT	4or6
120-3	BOLT	4
120-2	BOLT	8
120-1	BOLT	4
117-2	SEAL WASHER	1
117-1	FLANGE GASKET	1
115-4	O-RING	1
115-3	O-RING	1
115-2	O-RING	1
115-1	O-RING	1
111	MECHANICAL SEAL	1
107	WEARING RING	1
080	BUSHING	1
039	KEY	1
021	IMPELLER	1
016	MECHANICAL SEAL COVER	1
001	CASING	1
No.	NAME	QUANT



※1 2.2 kw : 1
 ※2 2.2 kw : 0
 ※3 2.2 kw : AUTO-CUT : 1

2. Accessory

- (1) Nameplate for ground installation : 1
- (2) Discharge pipe : 1 set

Pump might be performed design change for improvement without prior notice

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

10 Disassembly and Reassembly

Refer to the cross sectional drawing.

1. Disassembly

- (1) Unscrew and remove the bolts (120-2), and lift up the motor part. Then lay it down carefully..
- (2) Unscrew and remove the impeller bolt (275), Pull the impeller (021) out.
- (3) Unscrew and remove the oil plug (193), Withdraw oil
- (4) Unscrew and remove the bolts (120-1), and remove the mechanical seal cover (016) carefully.
(Care for flowing out oil remainder.)
- (5) Detach the mechanical seal with care lest the seal surfaces and shaft should be hurt.

2. Reassembly

Perform reassembly in a reverse order. Then exchange gasket, seal washer, o-ring for new ones.

(Note 1) Screw adhesive (LOCKTITE #638) shall be applied to bolt (120-1) to prevent loosening, after degreasing a screw hole and screw part of bolts enough.

(Note 2) After reassembly procedure (2), turn the impeller by hand to check that it rotates smoothly. When the rotating condition is not smooth, do over again according to the procedure (3) to (5).

(Note 3) Apply the adhesive (LOCKTITE #262) to the impeller bolt in the following way for looseness prevention.

- 1) Install the motor so that the shaft end serves as facing up from the level a little. After degreasing a screw hole enough, pour out the adhesive (LOCKTITE #262) until it is full of a screw hole.
- 2) An impeller bolt (275) should also degrease enough and should apply the adhesives (LOCKTITE #262) for screws to the whole screw part.

(Note 4) After reassembly is completed, turn the impeller by hand through suction inlet to check that it rotates smoothly without rubbing against wearing ring.

11 Limited Warranty

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

- (1) During the warranty 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.
- (2) 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.
- (3) EBARA's liability shall not extend to any other costs beyond the above.
- (4) The storage period of consumable items is 7 years after manufacturing stop.

12 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 [8] "Troubleshooting"). If the abnormality is defective one, promptly notify the matter to EBARA 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.

<Singapore>

Ebara Engineering Singapore Pte. Ltd.

Website: www.ebara.com.sg

E-mail: ebaranet@singnet.com.sg

<Malaysia>

Ebara Pumps Malaysia Sdn. Bhd.

Website: www.ebara.com.my

E-mail: sales@ebara.com.my

<Indonesia>

P.T. Ebara Indonesia

Website: www.ebaraindonesia.com

E-mail: marketing@ebaraindonesia.com

<Thailand>

Ebara (Thailand) Limited

Website: www.ebara.co.th

E-mail: info@ebara.co.th

<Philippines>

Ebara Pumps Philippines, inc.

Website: www.ebaraphilippines.com

E-mail: pumpsales@ebaraphilippines.com

<China>

Ebara Machinery (China) Co., Ltd.

Website: www.ebara.cn

E-mail: emc@ebara.cn

<Other countries>

Ebara Corporation (Japan)

Standard Products Business Office

Website: www.ebara.co.jp/en