Be sure to give the customer's pump operator this instruction manual.

EBARA Submersible Sewage Pumps

Model DML

Instruction Manual

⚠ Caution

Thank you for selecting the EBARA Submersible Sewage Pump MODEL DML.☐EBARA takes every caution in manufacturing the product for safe use by the customer. However unsuitable handling may reduce the performance and result in accident.
Please read this instruction manual before starting operation. We ask for appropriate utilization in accordance with this manual
Therefore keep this one in safe place where it can be consulted by pump operator anytime.

To installation personnel

Be sure to hand over this manual to the customer's operation, maintenance and inspection personnel.

CONTENTS

1 Warnings

Warnings in this manual provide information required for safe operation of the pump, and instructions for preventing danger or injury to you or other people. So that you will know the degree and imminence of danger that warnings signify, they are divided into two grades, WARNING and CAUTION, according to the seriousness of what will happen if their instructions are not heeded. Both grades of warning contain important safety information; carry out all the instructions that they give, without fail.

Warning grade	Meaning
⚠ **Warning**	Potentially hazardous situation. Failure to follow the instructions could result in death or serious injury.
⚠ **Caution**	Failure to follow the instructions could result in minor injury, or damage to the pump.

Note	Used to emphasize important information.

Meanings of symbols accompanying. WARNINGs and CAUTIONs

	Indicates prohibition (that something must NOT be done). Precisely what must not be done is indicated by pictures or words either inside the circle of the symbol or close to it.
	Indicates an imperative (that something MUST be done). Precisely what must be done is indicated by pictures or words close to the symbol.

2 Safety Cautions

⚠ **Warning**	Before lifting the pump, confirm the mass on catalogue or outline drawing. Use appropriate crane (or hoist) and check position and tightness of lift system so that mass of the pump is not unbalanced. Failure to observe this precaution can result in serious accidents.	
	On the condition of suspended pump, do not attach a part and use. It is very dangerous.	
	Do not hurt , break, bend, tug, wrest and bundle power supply cable excessively. Do not put something weighty on the cable. Otherwise it could result in electric shock and fires.	
	All wiring work should be performed correctly by a qualified electrician and all national and local electrical codes must be observed.	
	Install and ground an earth cable. Electric shock could occur during accidents or electric leakage.	
	To prevent danger of electric shock, use short circuit breakers as exclusive use.	
	Disassembly and repair of the pump should only be performed by specialist maintenance technicians. Otherwise, error by personnel could result in electric shock, and the pump catching fire or operating abnormally and causing injury.	
	Always turn the power switch OFF before inspecting or repairing the pump. Otherwise it could result in the pump starting up suddenly in auto operation, exposing personnel to danger.	
	Always turn the power switch OFF if the pump is to be out of use for a long time. . If the power is left ON and insulation deteriorates, then electric leakage and electric shock could occur.	

⚠ **Caution**	Do not operate the pump with 50Hz specifications at 60Hz. Otherwise motor should be burnt out. Do not operate the pump with 60Hz specifications at 50Hz. It will cause the pump to perform poorly.	⃠
	If you have purchased a standard pump, refer to Section n°**4"Specification"**. The optional specifications pump is made to meet the needs of some customers. Be sure not to operate your pump outside of the ranges shown in the applicable specifications.	⃠
	Do not use this pump for food processing and drinking water applications.	⃠
	Do not use this pump for living things for example fish farm, crawl, aquarium etc. When the pump breaks down, the facilities fall into oxygen deficiency.	⃠
	Do not use this pump for important equipment (computer cooling equipment and refrigerator cooling equipment etc.)	⃠
	Do not use this pump in handling oil, seawater, organic solvent, liquid except for water. The pump breaks down, then electric leakage and electric shock could occur.	⃠
	Do not insert hands, foot and so on into the suction inlet during operation. Otherwise, pump could cause injuries by the rotating parts.	⃠
	Do not use this pump when anyone is in the water. Electric shock could occur during electric leakage.	⃠
	Do not operate in the air. Otherwise, insulation deteriorates, Then electric leakage and electric shock could occur.	⃠
	In the insulation resistance under 1M☐, electric shock could occur. Turn the power switch OFF as soon as possible. . Contact the agency where you purchased the pump, or EBARA to perform an inspection and maintenance on the pump.	❗
	To prevent an accident if the pump stops running or an abnormality occurs, immediately turn off the power switch. Contact the agency where you purchased the pump, or EBARA to perform an inspection and maintenance on the pump.	❗

3 Delivery checks

When your pump is delivered, check the followings immediately.

3.1 The pump

Confirm that no damage has occurred during transportation.

3.2 Nameplate

(1) The basic specifications of the pump are listed on the nameplate. Read the data on the nameplate to check that this pump was the product that you ordered.

⚠ **Caution**	☐ Do not operate the pump with 50Hz specifications at 60Hz. It will overload the pump causing the motor to burn out. ☐ Do not operate the pump with 60Hz specifications at 50Hz. It cause the pump to perform poorly.	⃠

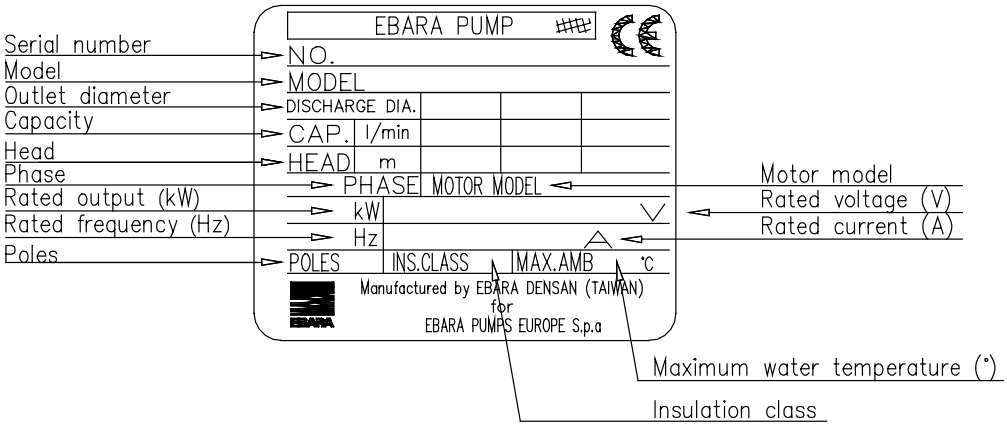


Fig.1 Data of pump nameplate

4 Specifications

For the head, capacity, speed and other major specification of your pump, see the nameplate.☐The standard specifications and optional specifications are given in the tables below.

⚠ **Caution**	If you have purchased a standard pump, refer to the standard specifications shown below. The optional specifications pump is made to meet the needs of some customers. Be sure not to operate your pump outside of the ranges shown in the applicable specifications.	⊘
	Do not use this pump for food processing and drinking water applications.	⊘
	Do not use this pump for living things for example fish farm, crawl, aquarium etc. When the pump breaks down, the facilities fall into oxygen deficiency.	⊘
	Do not use this pump for important equipment (computer cooling equipment and refrigerator cooling equipment etc.)	⊘
	Do not use this pump in handling oil, seawater, organic solvent, liquid except for water. The pump breaks down, then electric leakage and electric shock could occur.	⊘

Standard specification

Liquid handled		Sewage, waste water	
Temperature		0 ☐ 40☐	
Foreign substance		Discharge size of pump (mm)	80 , 100, 150
		Diameter of spherical body (mm)	76
		Fibriform length (mm)	500
Material	Impeller	Cast iron ; (Except for 50Hz 18.5kW, 22kW), Ductile iron ; (For 50Hz 18.5kW, 22kW),	
Motor	Phase	3-phase	
	Voltage(*1)	50Hz : 380V, 400V, 415V 60Hz : 380V, 440V, 460V, 480V	
	Starting Method	2.2kW : Direct start 3.7kW ☐ 22kW : Star-Delta start	
	Protector	2.2kW : Auto-Cut 3.7kW ☐ 22kW : Thermal Protector	
Lubricants of Mechanical seal		Turbine oil ISO VG32	
Maximum water depth		8m	
Installation		With Quick Discharge Connector or Floor mounted	

(*1); Allowable voltage fluctuation
Motor rating output 2.2 kW; -10 to 6%
3.7 kW to 22 kW; ±10%

Allowable combined fluctuation of voltage and frequency : the sum of each absolute value shall be less than 10 %

5 Installation

⚠ **Warning**	Before lifting the pump, confirm the mass on catalogue or outline drawing. Use appropriate crane (or hoist) and check position and tightness of lift system so that mass of the pump is not unbalanced. Failure to observe this precaution can result in serious accidents.	❗
	On the condition of suspended pump, do not attach a part and use. It is very dangerous.	⊘
	Do not hurt , break, bend, tug, wrest and bundle power supply cable excessively. Do not put something weighty on the cable. Otherwise it could result in electric shock and fires.	⊘

5.1 Before installation

Insulation resistance measurement: With the motor and cable (disconnecting the power supply) immersed in water, use a megger to measure the insulation resistance between the ground wire and each phase of the motor. Keep the power cable off the ground during measurement.

The value should be more than 20 meg-ohms.

2. Installation

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 above 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.

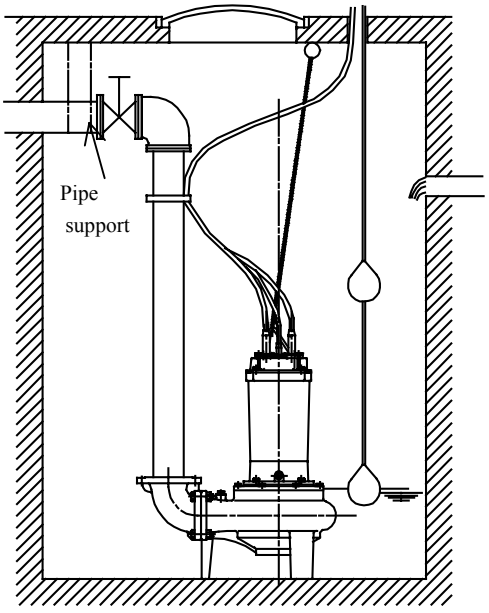


Fig.2

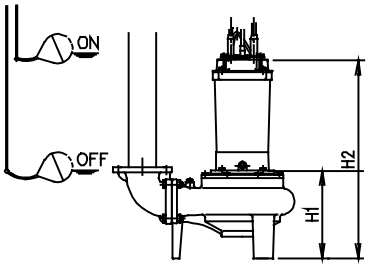


Fig.3

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

NOTE	Packing scraps should be processed properly according to the local rules.

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

5.3 Electrical Wiring

⚠ **Warning**	All wiring work should be performed correctly by a qualified electrician. And, all national and local electrical codes must be observed.	❗
	Install and ground an earth cable. Electric shock could occur during accidents or electric leakage.	❗
	To prevent danger of electric shock, use short circuit breakers as exclusive use.	❗

All electrical wiring work should be performed correctly by a qualified electrician. And, all national and local electrical codes must be observed. Incorrect wiring could result in electric shock and fires.

Install and ground an earth cable. Electric shock could occur during accidents or electric leakage.

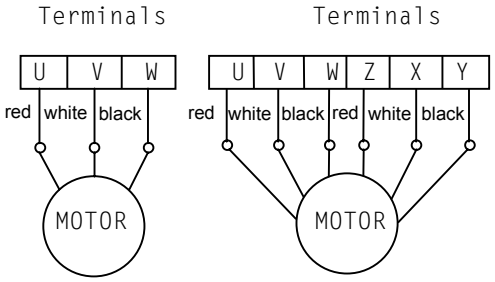


Fig.4

1) Wiring
2) Wiring should be performed as indicated for the appropriate start system as shown in Fig 4
3) Cable
   a) Never let the end of the cable contact water.
   b) If the cable is extended, do not immerse the splice in water.
   c) Fasten the cable to the discharge piping with tape or polyvinyl chloride strips.
   d) Install the cable so that it will not overheat. Overheating is caused by coiling the cable and exposing it to direct sunlight.
4) Grounding

   Install and ground an earth cable. (The earth cable is the green wire that is one of the 4 cores in cabtyre cable)

   Under no circumstances should the green wire be connected to the power supply.
5) 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 polyvinyl chloride cabtyre cable -1.25mm2 (non-polarity)

6 Operation

⚠Caution	Do not insert hands, foot etc. into the suction inlet during operation. Otherwise, pump could cause injuries by the rotating parts.	⃠
	Do not operate in the air. Otherwise, insulation deteriorates, Then electric leakage and electric shock could occur.	⃠
	Do not use this pump when anyone is in the water. Electric shock could occur during electric leakage.	⃠

6.1 Before starting the pump

1) After completing installation, measure the insulation resistances again as described in section n°**5 Installation**".
2) Check water level

If the pump is operated continuously for an extended period of time in a dry condition or at the lowest water level, the motor protector will be activated.

The repetition of this condition will shorten pump service life. Do not start the pump again in such a situation until after the motor has completely cooled.

6.2 Test Operation

1) Turn the operating switch on and off a couple of times to check for normal pump start.
2) Check the direction of rotation. If discharge volume is low or unusual sounds are heard when the pump is operating, rotation has been reversed. When this happens, reverse two of three wires (see Fig.5).
3) After confirming the direction of rotation, open gradually the discharge valve and let the pump run in continuous operation. Check current, voltage, and discharge pressure.

(Refer Section 8 "Troubleshooting)

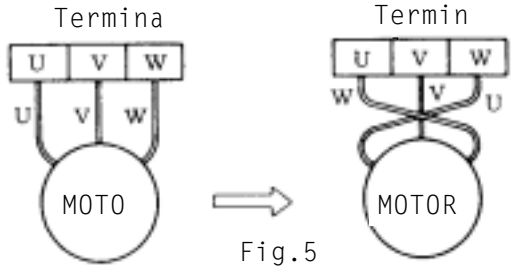


Fig.5

When amperage exceed the rated ampere without discharge valve. The plan should be reviewed.

6.3 Operation

1) After test operation, pump could be operated immediately.
2) Do not repeat starting and stop frequently.

The number of starting times per hour is shown in the following table.

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

3) Do not operate a pump in the outside of the specified range.

NOTE	Run the pump at a discharge capacity that is suitable for the equipment. (Capacity that is too large or small will cause noise and vibration, and also waste power.)

7 Maintenance

⚠ **Warning**	Disassembly and repair of the pump should be performed by a maintenance specialist. Otherwise, error by personnel could result in electric shock, and the pump catching fire or operating abnormally and causing injury.	⃠
	Always turn the power switch OFF before inspecting or repairing the pump. Otherwise it could result in the pump starting up suddenly in auto operation, exposing personnel to danger.	❗
	Always turn the power switch OFF if the pump is to be out of use for a long time. . If the power is left ON and insulation deteriorates, Then electric leakage and electric shock could occur.	❗
⚠ **Caution**	In the insulation resistance under 1M□, electric shock could occur. Turn the power switch OFF as soon as possible. . Contact the shop from where you ordered the pump, or EBARA to perform an inspection and maintenance on the pump.	❗
	To prevent an accident if the pump stops running or an abnormality occurs, immediately turn off the power switch. Contact the shop from where you ordered the pump, or EBARA to perform an inspection and maintenance on the pump.	❗

Check for abnormality in pressure, discharge capacity, voltage, current, vibration and noise. If any of these is different from normal, trouble of some kind is probably going to occur and you should take prompt corrective action. Refer to Section n°**8.Trouble shooting"**for diagnosis and corrective action.
You are advised to post a Daily Operation Condition Check Sheet to facilitate such checking.

Note	A standard pump performance curves are available from your nearest Ebara sales office or dealer.

7.1 Daily inspections

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

7.2 Regular inspections

1) Every month
Measure the insulation resistance. The value should be more than 1 meg-ohm. If resistance starts to fall rapidly even with an initial indication of over 1 meg-ohm, this may be an indication of trouble and repair work is required.

2) Every 6 months

Check the mechanical seal every six months. Check the oil in mechanical seal chamber every six months.

If the oil turns white or contains water, the mechanical seal needs to be replaced.

The service life of the mechanical seal can be prolonged by replacing the oil in the mechanical seal chamber every six months.

When replacing the oil, lay the pump down with oil plug on top as shown in Fig. 6.

(Oil quantity is described in the following table this page.)

Reinstall oil plug firmly
After filling with oil.

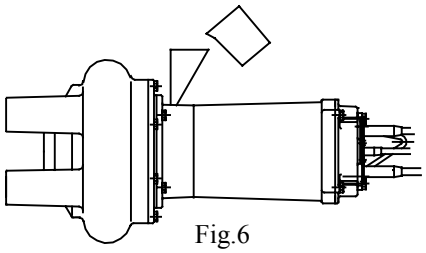


Fig.6

3) Annual maintenance.

To ensure the full service life of the pump, replace mechanical seal once a year for the pump on intermittent operation, and every 6000 hours on continuous operation.

4) Once per two to five years.

Pump can be used for a long time by overhaul.

In case of continuous operation, please overhaul the pump a little early. Confirm that connection of the terminal of a pump cable and a control panel is ensured at this time.

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.

7.3 Cautions when the pump is out of use for long period.

1) When you leave the pump submerged and out of use for long period, periodically measure the insulation resistance. If the resistance values are greater than 1 meg-ohms, operate the pump for a while to prevent rotating parts from fastening by rust. Before starting the operation again, refer to Section n°**6.Operation"**.

2) When the pump is pulled up and stored.

Clean up the pump. And keep it at dry place. Before using the pump again, refer to Sections n°**5.Installation"**and n°**6.Operation"**.

7.4 When motor protection is activated.

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

7.5 Consumable parts.

1) Replace the parts according to the conditions shown in the following table.

Parts name	Mechanical seal	Seal washer	Lubrication oil	O-ring	Bearing
Replacement condition	When oil in mechanical seal chamber is clouded	When oil is exchanged or inspected	When clouded or dirty	When pump is overhauled	□
Replacement interval	Every once a year or every 6000 hours on continuous operation.	□	Every 6 Months	□	Every 6000 hours

The above replacement intervals are applied if the pump is operating normally.

Parts name \ OUTPUT		2.2kW	3.7kW	5.5kW	7.5kW	11kW	15kW	22kW
Mechanical seal < mm >		∅30		∅40		∅45		
Seal washer (W12 SUS) < mm >		∅22×∅11.8×1.2(Outer diameter × Inner diameter × thickness)						
Lubrication oil < □□ > (Turbine oil ISO VG32)	50Hz	1100		1600		2900		3000
	60Hz	1100		1700		3000		3000
O-ring < mm >		∅170×∅3.1		∅180×∅3.1		∅220×∅3.1		

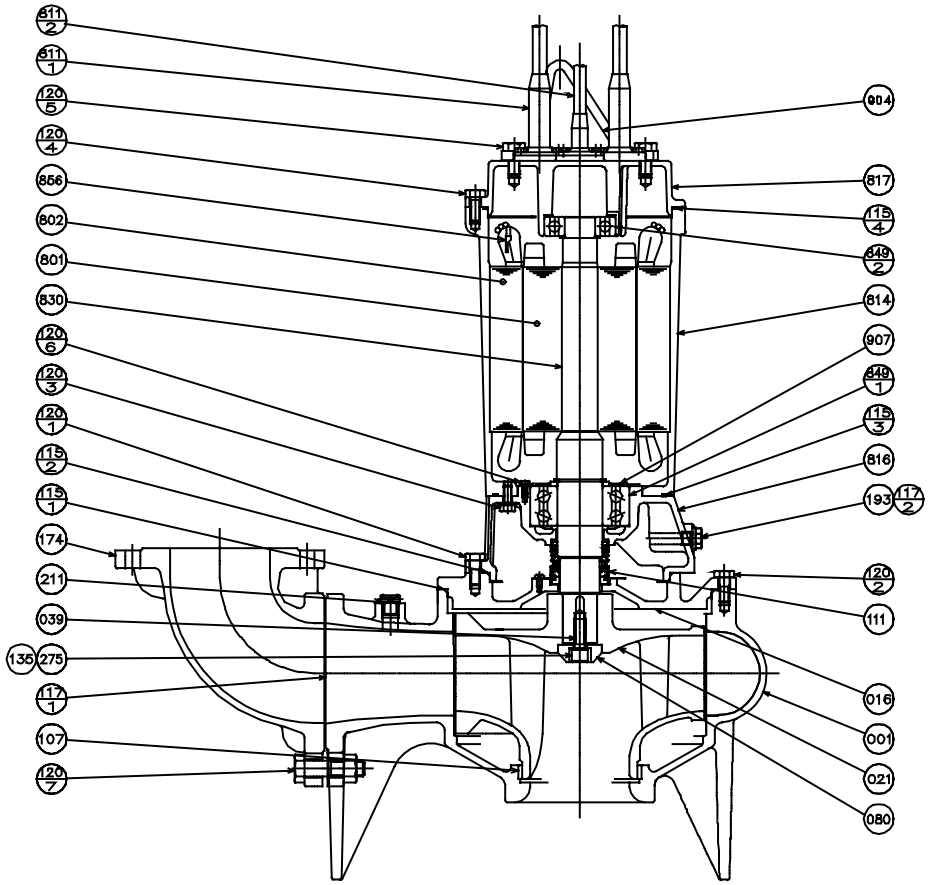
8 Troubleshooting

Trouble	Cause	Remedy
Motor won't turn. Starts, but immediately Stops.	☐Foreign matter hinders float from function	☐Remove foreign matter
	☐Power Failure	☐Contact electric power company and devise counter-measures
	☐Large voltage unbalance	☐Check the power supply
	☐Significant drop in voltage	☐Check the power supply
	☐In the case of open phase	☐Inspect connections and magnetic switch
	☐Electric circuit connection faulty	☐Inspect electric circuit
	☐Faulty connection of control circuit	☐Correct wiring
	☐Fuse blow	☐Replace with correct type of fuse
	☐Faulty magnetic switch	☐Replace with correct type of magnetic
	☐Float defective	☐Repair or replace
	☐Short circuit breaker is functioning	☐Repair location of short circuit
	☐Foreign matter clogging pump	☐Remove foreign matter
	☐Motor burned out	☐Repair or replace
	☐Motor bearing broken	☐Repair or replace
Operation, but stops after a while Thermal protector is activated.	☐Prolonged dry operation has activated motor protector and caused pump to stop	☐Raise stop water level
	☐High liquid temperature has activated motor protector and caused pump stop	☐Lower liquid temperature
Does not pump Inadequate volume	☐Reverse rotation	☐Correct rotation (see 6-2-(2))
	☐Gate valve is closed or half open.	☐Open the gate valve.
	☐Significant drop in voltage	☐Check the power supply
	☐Operating a 60Hz pump on 50Hz	☐Check nameplate
	☐Discharge head is high	☐Recalculate and adjust
	☐Large piping loss	☐Recalculate and adjust
	☐Low operating water level causes air suction	☐Raise water level or lower pump
	☐Leaking from discharge piping	☐Inspect ,repair
	☐Clogging of discharge piping	☐Remove foreign matter
	☐Foreign matter clogging pump	☐Remove foreign matter
	☐Foreign matter in suction inlet	☐Remove foreign matter
	☐Worn impeller	☐Replace impeller
Over current	☐Large discrepancy between power source and voltage	☐Contact electric power company and devise counter-measure
	☐Significant drop in voltage	☐Contact electric power company and devise counter-measure
	☐In the case of open phase.	☐Inspect connections and magnetic switch
	☐Operating a 50Hz pump on 60Hz	☐Check nameplate
	☐Reverse rotation	☐Correct rotation (see 6-2-(2))
	☐Low head. Excessive volume of discharge.	☐Turn down discharge valve to adjust to prescribed capacity.
	☐Foreign matter clogging pump	☐Remove foreign matter
	☐Motor bearing is worn or damaged	☐Replace bearing
Pump vibrates, Excessive operating noise.	☐Reverse rotation	☐Correct rotation (see 6-2-(2))
	☐Foreign matter clogging pump	☐Remove foreign matter
	☐Piping vibrates.	☐Rectify the piping.

9 Construction

9.1 Section drawing.

Typical Model ; 100 DML 57.5



907	BEARING COVER	1
904	LIFTING HANGER	1
856	THERMAL	3
849-2	BALL BEARING	1
849-1	BALL BEARING	1
830	SHAFT	1
817	OPPOSITE SIDE	1
816	POWER SIDE	1
814	MOTOR FRAME	1
811-2	SUBMERSIBLE	1
811-1	SUBMERSIBLE	2
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
120-7	BOLT	4
120-6	BOLT	3
120-5	BOLT	2
120-4	BOLT	4
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	1
001	CASING	1
No.	NAME	QUANT

Design change for improvement without prior notice.

10 Disassembly and Reassembly

☐☐Refer to section drawing

10.1 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.

10.2 Reassembly.

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

(Note 1) 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 2) It is available for preventing bolt from loosening to fasten with a screw adhesive. Screw adhesive (LOCKTITE 262) shall be applied to impeller bolt(275) to prevent loosening.

(Note 3) After reassembly is completed, turn the impeller by hand through suction inlet to check that it rotates smoothly without rubbing against wearing ring. .

11 Repairing and after service

If some failures are found ,please contact EBARA Corporation or an authorized Agent/Distributor, stating the data on the identification nameplate and detail of the trouble.(Refer to section n°**8. Troubles hooting**. ☐

NOTE	Packing scraps, unnecessary components and oil after inspection and repair should be processed properly according to the local rules.

12 DECLARATION OF CONFORMITY'

We EBARA PUMPS S..p.A., declare under our own responsability that Ebara products "DML" complies with the Machinery Directive 98/37/EC, with the Low Voltage Directive 73/23/EEC as modified by Directive 93/68/EEC and with the Electromagnetic Compability Directive 89/336/EEC as modified by Directive 93/68/EEC

SIGNED Mr. Otani Hiroshi……

TITLE Vice-President DATE 15.01.2002

CE

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

EBARA PUMPS EUROPE S.p.A.

Direzione di stabilimento
Via Pacinotti, 32
36040 BRENDOLA (VI) ITALIA
Telefono: 0444/706811
Telefax: 0444/706950
Telex: 480536

Sede legale
Via Campo Sportivo, 30
38023 CLES (TN) ITALIA
Telefono: 0463/660411
Telefax: 0463/422782