IWAKI PUMPS

IWAKI Magnet Gear Pump

MDG-M4 (built-in type)

Instruction Manual

⚠Read this manual before use of product

This instruction manual includes descriptions of the correct handling of the pump, maintenance and inspection procedures and troubleshooting. You are requested to read the manual carefully so that the pump can safely be used to the full extent of its capacity for a long period of time.

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⚠Export Restrictions

Technical information contained in this instruction manual might be treated as controlled technology in your countries, due to agreements in international regime for export control. Please be reminded that export license/permission could be required when this manual is provided, due to export control regulations of your country.

Safety Instruction

Warning

● Turn off the power supply.

Working without disconnecting the power supply may cause an electrical shock. Before engaging upon any working procedures involving the pump, make sure to turn the power supply switch off and to stop the pump and other related devices.


Electrical Shock

● Terminate operation!

When you detect or become aware of a dangerous sign or abnormal condition during operation, terminate the operation immediately and start it from the beginning again.

● For specified application only.

The use of a pump in an application other than those clearly specified may result in injury or damage to the pump. Use the pump strictly in accordance with the pump specifications and application range.


Prohibited

● No remodeling!

Never remodel a pump. Otherwise, a serious accident may result. Iwaki will not be responsible for any accident or damage of any kind which is caused by the user remodeling the pump without first obtaining permission or instructions from Iwaki.


No Remodeling

● Wear protectors.

If you touch or come in contact with any type of hazardous chemical liquid, including but not limited to chemicals, you may experience a serious injury. Wear protective gear (protective mask, gloves, etc.) during the pump operation.


Wear protective gear

Caution

● Qualified operators only!

The pump operator and pump operation supervisor must not allow any operators who have little or no knowledge of the pump to run or operate the pump. Pump operators must have a sound knowledge of the pump and its operation.


Prohibited

● Specified power only.

Do not operate the pump on voltage which is not specified on the nameplate. Failure to do so may result in damage or fire. Only the specified power level is to be applied.


Prohibited

● Do not wet or dampen!

If the motor or wiring cable becomes wet or dampened with the operating liquid by mistake, this may result in a fire or cause an electrical shock. Install the motor and wiring cable in positions which are not likely to become wet or dampened with any liquid.


Prohibited

● Ventilate!

Poisoning may result during an operation which involves toxic or odorous liquid. Ventilate the operating site sufficiently.


Caution

● Spill-out accident!

Protective measures should be taken against any accidental spill-out or leakage of the operating liquid as a result of unexpected damage on the pump or the related piping.


Caution

Caution

● Damaged pump

Never operate a damaged pump. A damaged pump may cause leakage or electrical shock.


Prohibited

● Operating site must be free of water and humidity

The pump is not designed to be water-proof or dust-proof. The use of the pump in places where water splashes or humidity is high may result in an electrical shock or short circuit.


Prohibited

● Do not damage or change power cable!

Do not scratch, damage, process, or pull the power cable forcibly. An extra load onto the cable, such as heating the cable or placing something heavy on the cable, may damage the cable and finally cause a fire or an electrical shock.


Caution

● Do not cover the motor!

Running a covered motor may accumulate heat inside the motor and cause a fire or a mechanical failure. Ventilate the motor sufficiently.

● Arrange grounding!

Do not operate the pump without connecting the grounding wire. Otherwise, an electrical shock may result. Make sure the grounding wire is connected with the grounding terminal. Ex


Grounding

Caution

● Install an earth leakage breaker (option)!

The operation of a pump without using an earth leakage breaker may cause an electrical shock. Please purchase an optional leakage breaker and install in the system.


Electrical Shock

● Power cable cannot be replaced.

Never use a damaged or affected power cable. Otherwise, a fire or an electrical shock may result. Handle the power cable carefully, as it cannot to be replaced with a new cable. (The pump unit itself must be replaced in that circumstance.)


Caution

● Limited operating site and storage

Do not install or store the pump in the following places:
* Places where a flammable gas or material is used or stored.
* Places where the ambient temperature is extremely high (40˚C or higher) or extremely low (0˚C or lower).


Prohibited

● Do not drain the liquid in the site.

The liquid discharged out of the pump, including a hazardous chemical liquid, must be drained into a special container. Never drain such liquid directly onto the floor in or near the operation site.


Prohibited

● Disposal of used pump

Disposal of used or damaged pumps must be done in accordance with the relevant local laws and regulations. (Consult a licensed industrial waste products disposing company.)

Explosion Protection
This symbol identifies information about avoiding explosions in potentially explosive atmospheres in accordance with EC Directive 94/9/EC (ATEX).

① Inspection after Unpacking

Upon unpacking, check the following points to confirm that the product is what you have ordered. If you find anything wrong, please contact the dealer you placed your order with.

◈① Do the model of pump, discharge, discharge pressure, voltage, and other items shown on the nameplate correspond with those of the pump ordered by you?

◈② Is the product not damaged or are the nuts and bolts not loosened during delivery? Please examine by sight or touch.

② Principle of Operation

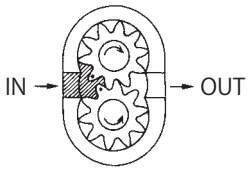


Fig.A

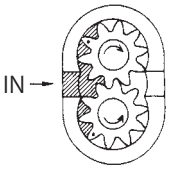


Fig.B

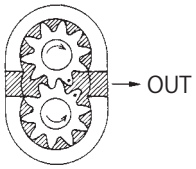


Fig.C

The Iwaki Magnet Gear Pump comprises a pair of gears driven by a magnet coupling and casing in which the gears are fitted exactly. (Fig. A)

Liquid introduced from the IN side feeds into the grooves between the teeth of the gears and is transferred to the OUT side by rotation of the gears. (Fig. B)

This liquid is forced out of the grooves between the gear teeth by meshing of the gears. (Fig. C)

③ Pump Identification Codes

MDG - M4 S 6 B 115 H
①　②　③　④　⑤

① Represents the temperature range and viscosity limit of the liquid to be handled.

S : Temperature ..... between 0 and 50ºC
Viscosity ..... below 30mPa·s

T : Temperature ..... between 0 and 95ºC
Viscosity ..... below 80mPa·s (100W motor)
below 200mPa·s (150W motor)

② Represents the maximum discharge pressure.

6 : 0.6MPa

③ Connection

B : 1/4NPT

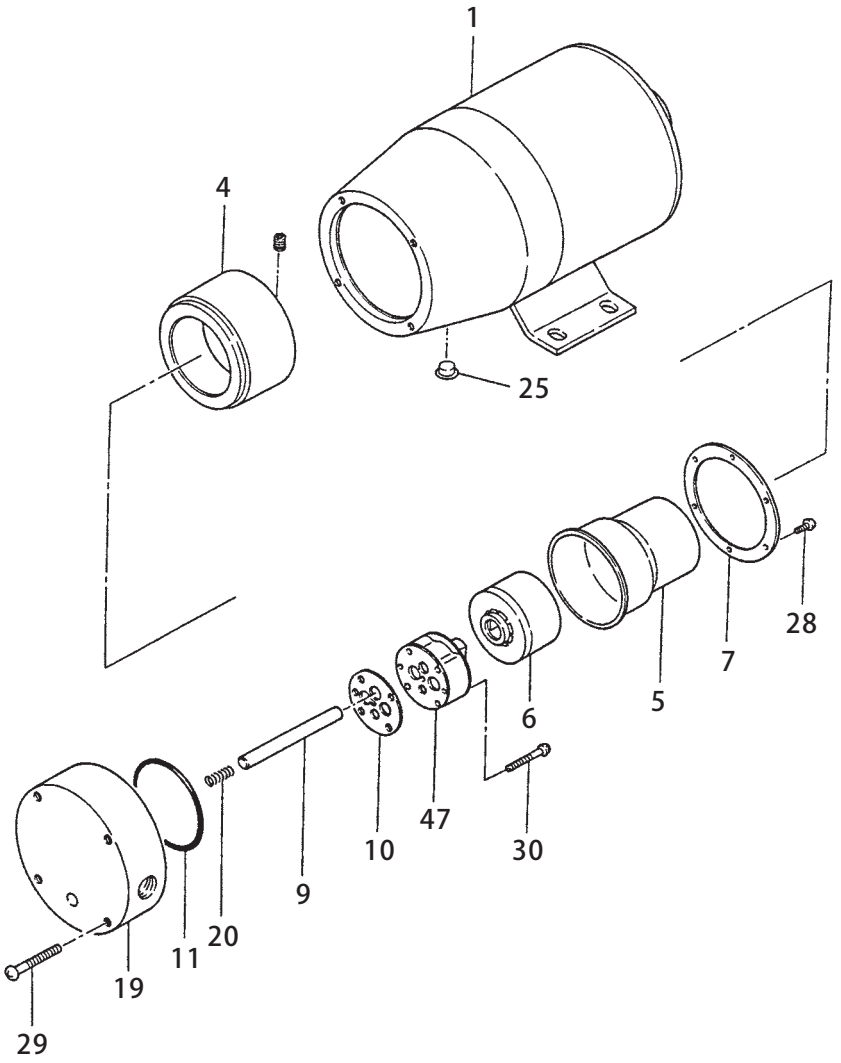
④ Line voltage

115 : AC115V single phase
220 : AC220 ~ 240V single phase

⑤ Non-standard specification code

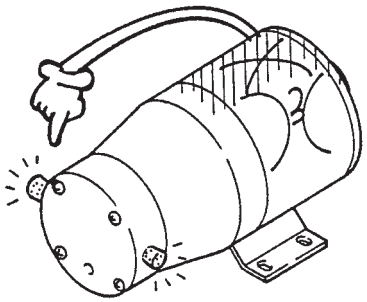
Without code : Equipped with a 100W motor
H : Equipped with a 150W motor

④ Names of Parts and Structure

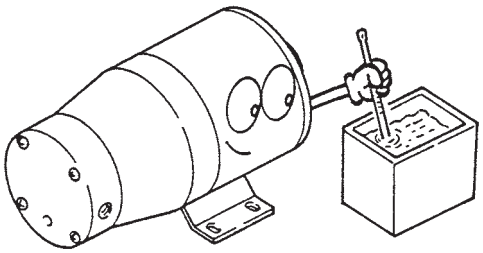


No.	Name	Number	No.	Name	Number
1	Motor	1	19	Pump body	1
4	Driving magnet ass'y	1 set	20	Shaft spring	1
5	Rear casing	1	25	Cap	1
6	Magnet capsule	1	28	Screw M3 × 10	6
7	Mounting plate	1	29	Screw M4 × 35	4
9	Driving gear shaft	1	30	Screw M3 × 25	4
10	Gasket	1	47	Gear case unit	1 set
11	O ring	1			

⑤ Precautionary measures

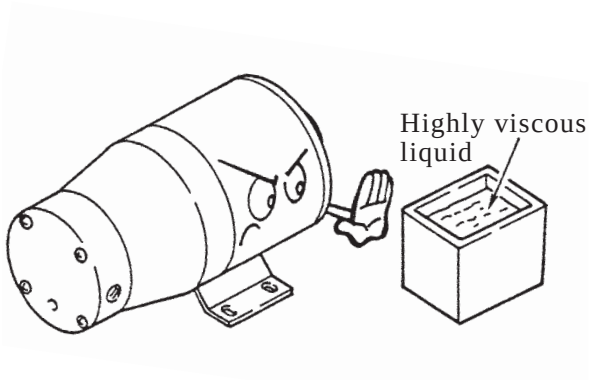


◈① Do not operate the pump dry.
The pump should not be operated dry or while the suction side is closed. This will wear out the gears and bearings. Ⓔx

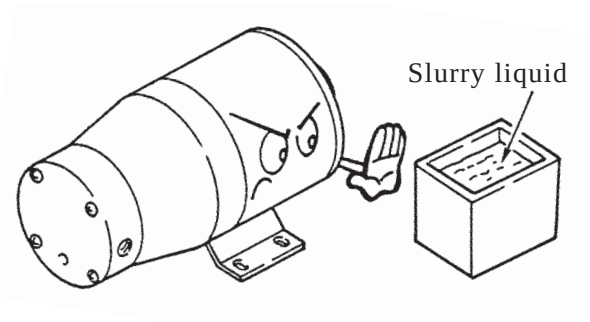


◈② Range of liquid temperatures
The pump can be used with liquids in the following temperature range. The performance will change depending on the temperature of the liquid.
- Type S : 0 ~ 50ºC
- Type T : 0 ~ 95ºC

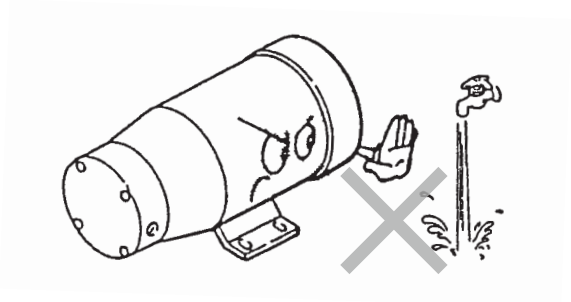
In case the liquid being handled is a solvent, the gears may swell to force the pump to stop, in the worst case. For further information, please contact us.



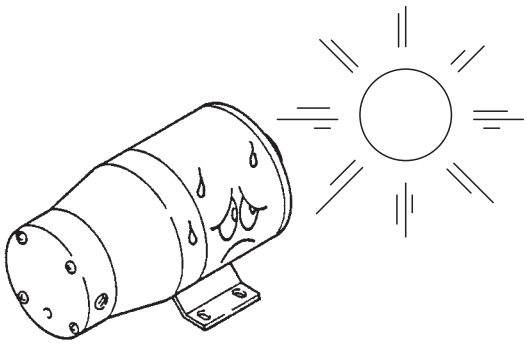
◈③ Liquid viscosity
Highly viscous liquid cannot be transferred.
- Type S : up to 30mPa·s
- Type T : 80mPa·s(with a 100W motor)
  200mPa·s(with a 150W motor)



◈4 Do not use the pump for transferring slurry liquid or liquid which begins to crystallize when stationary. Ex



◈5 Do not splash water on the motor. This may cause an electric leak or burning.



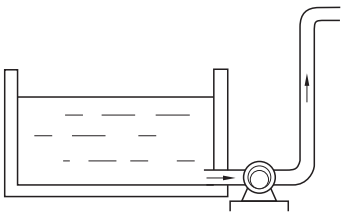
◈6 Do not cover the motor unit tightly with a cover, etc. Avoid operating the pump at an ambient temperature above 40ºC. The relative humidity should be below 85%. Do not splash water on the motor. It may cause an electric leak or damage by fire.

⑥ Installation, Piping and Wiring

■ Installation

◇1 Choose a place which has an ambient temperature below 40°C and a relative humidity less than 85%, and is convenient for maintenance and checking. The pump must not be installed outdoors without suitable protection.

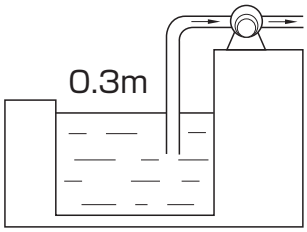
Flooded suction



◇2 To prevent dry running, install the pump in a position lower than the surface of the liquid in the tank on the suction side (Flooded suction).

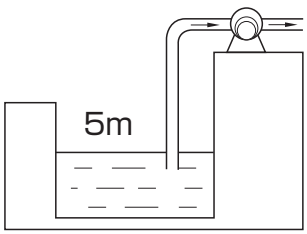
Priming method
(In case the pump chamber is wet)

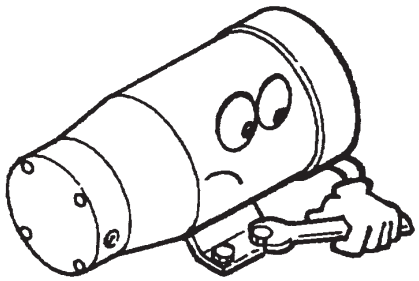
①There is no liquid in the suction piping (This is not allowed for the T type).



◇3 In case it is necessary to install an S type pump in a position in which the inlet of the pump remains higher than the liquid surface (a suction lift), refer to the illustrations opposite. In this position, the pump does not suck if the pump chamber is not wet.
(The T type pumps do not function on a suction lift.)

②There is liquid inside the suction piping.

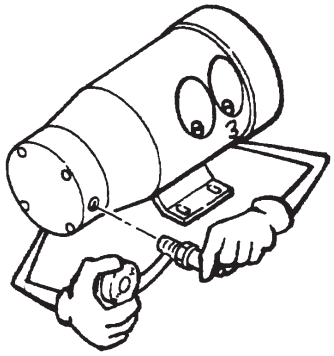




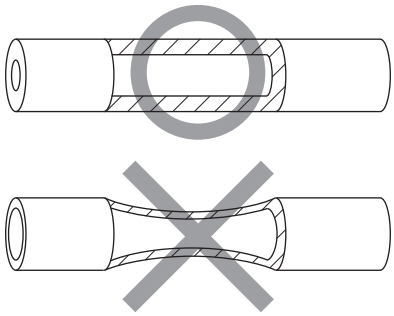
④ For fixing the pump, use M6 small screw. In the event floor on which the pump is installed is resonant and causes a loud noise, fix the pump with rubber mountings. Ex

■ Piping

① In order to reduce the friction resistance of liquid, the piping should be as short and with as few bends as possible.



② The inlet and outlet joints of the pump should be completely sealed with sealing tape, etc. To prevent them from sucking air. If sealing is incomplete on the suction side, in particular, air is sucked in and the performance of the pump is lowered.



③ For connection, use a thick hose which can withstand pump pressure. Since the hose on the suction side, particularly, tends to be crushed by sucking force, the use of for example, a Teflon hose is recommended. (In the case of hot liquid, particular care should be taken.)

■ Wiring

① Use proper wiring connections. Wiring should be carried out in accordance with the technical standard of electric installation and interior wiring regulations, referring to the opposite diagram.

② Make sure to include a ground wire or a ground terminal in the wiring. Ex

- Rated Electric Current Value 50/60Hz

Model of Pump	Rated Voltage (V)	Rated Current (A)
MDG-M4[S/T]6B115	115	1.5 / 1.7
MDG-M4[S/T]6B220	220 ~ 240	0.70 / 0.84
MDG-M4T6B220H		1.4 / 1.5

⑦ Operation

■ Notes on Operation

◈1 Dry running is strictly prohibited. This will damage the inside of the pump. Ex

◈2 The pump should not be operated with closed valves. If this happens, the bearing will abnormally worn away. Ex

◈3 In case liquid which solidifies or causes precipitation is handled, the pump should be flushed clean when it is out of operation.

◈4 In cold weather, the pump should be kept warm so as not to be frozen.

◈5 When operation is restarted after having been stopped for a long time, the same points as in starting up should be confirmed.

■ Starting up

The following items must be checked when starting up the pump.

No.	Item	Remarks
1	Confirmation of piping, wiring and voltage	● Confirm piping and electrical wiring, referring to descriptions in piping and wiring sections. ● Confirm that power voltage is appropriate.
2	Confirmation of valves	● Valves on suction side and discharge side should be fully opened.
3	Confirmation of liquid in pump	● When S type pump is used for suction lift, prime pump sufficiently. T type pumps cannot be used for suction lifting. Fill piping with liquid before starting operation.
4	Starting up	● After confirming items 1~3 above, start operation. ● During operation, watch for items listed in following section.

■ Notes on During Operation

The following points must be checked while the pump is in operation. If something abnormal occurs, stop the operation immediately and take proper measures by referring to the section ‘‘Causes of Trouble and Troubleshooting’’ (Page 16). In case the pump still cannot be restored to normal condition, please contact your supplier.

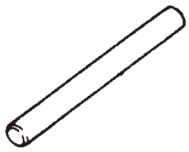
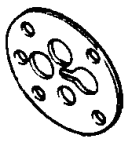
No.	Check Point	Remarks
1	Is pump transferring liquid properly?	● Whether liquid is transferred. ● Whether suction and discharge pressures are at normal levels.
2	Is there abnormal noise or vibration? ⟨Ex⟩	● If pump does not function normally, abnormal noise or vibration tends to be generated. ● Base on which pump is mounted sometimes becomes resonant, increasing noise. If separation of pump from base decreases noise, anti-vibration measure such as anti-vibration rubber should be mounted.
3	Is liquid leaking or air being sucked out from joints of pump?	● Clamp connections more tightly. ● If many air bubbles are found in discharged liquid, air is being sucked out. Examine piping and clamp connection more tightly.
4	Is temperature of pump unit surface, motor surface, etc., abnormally high?	● Pump unit surface temperature is same as that of liquid handled. ● Temperature of motor surface is within about 40°C above ambient temperature. Sometimes it is too hot to touch, but it is normal if temperature is within this range.

⑧ Maintenance and Inspection

■ Daily Inspection

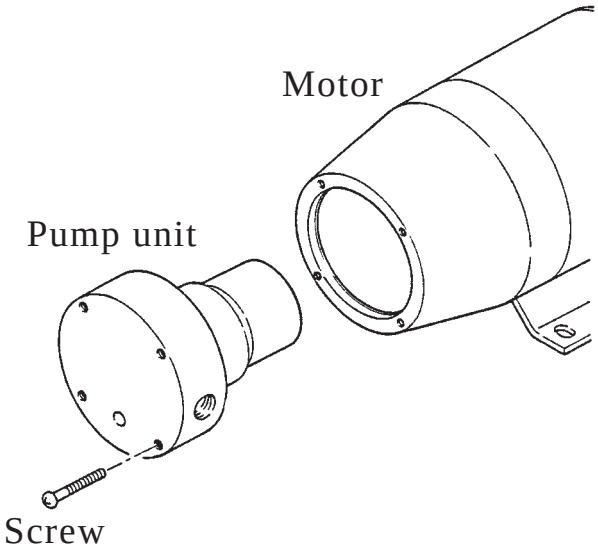
◇1 Pay attention to the operating condition, referring to ‘‘Notes on Operation During Operation’’. When any of the consumable parts reaches its replacement time or the performance is noticeably lowered, substitute the gear case unit and the driving gear shaft with new ones.

■ Consumable Parts

No.	Part		Number	Raplacement Time
47	Gear Case Unit		1 set	5,000 hours
9	Driving Gear shaft		1	
10	Gasket		1	at every maintenance

The above replacement periods have been estimated based on the length of time in which the initial flow rate of clear water at normal temperature under a pressure of 0.5MPa loweres by 20%.

⑨ Disassembling and Reassembling



■ Disassembling Procedure

◈1 Unscrew 4 screws (29) to detach the pump unit from the motor unit.

◈2 Unscrew the screws (28) and remove the mounting plate (7), rear casing (5) and magnet capsule (6) in this order.

◈3 Unscrew the screws (30) and remove the gear unit (47), gasket (10), drive gear shaft (9) and shaft spring (20) in this order.

◈4 Remove the O ring (11).

- Put the dismantled parts in a clean place. Take care that they do not get scratched. Particular care is required for the magnet capsule (6) which contains powerful magnets and easily attracts iron powder, etc. Its storage should be chosen carefully.

■ Reassembling Procedure

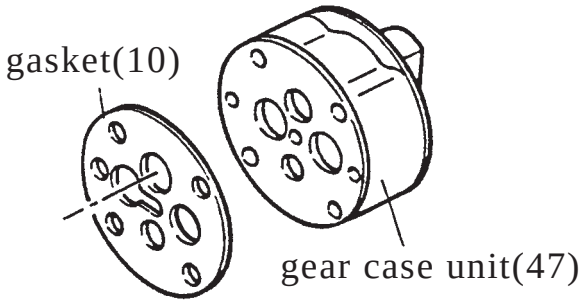
Follow the disassembling steps in reverse, while attending to the following points.

◇1 Position the gasket (19) corresponding to the gear case unit (47) as illustrated.

◇2 In attaching the gear unit (47), tighten the small screws (30) uniformly.
(Clamping torque : 1N·m)

◇3 If the O ring is flawed, replace it with a new one.

◇4 When the life of any of the consumable parts expires, replace the gear case unit (47), gasket (10) and drive gear shaft (9) simultaneously.



⑩ Causes of Trouble and Troubleshooting

Troubles / Causes	Motor cannot be started.	Motor start but rpm does not increase and excess current is generated.	Motor stops while in operation.	Liquid cannot be pumped up or pumping is insuffi-cient.	Magnet coupling comes off.	Too much noise or vibration.	Liquid leaks.	Countermeasure
Plug is out of socket.	○							Insert plug into socket.
Contact is bad or broken somewhere in wiring.			○					Examine and repair defective part.
Motor malfunctions. (Break malfunctioning of capacitor,etc.)	○							Repair or replace.
Thermal protector activated by overload.			○					Lower viscosity of liquid handled and/or discharge pressure.
Earth leakage circuit breaker activated by leak.	○		○					Inspect wiring and motor,and repair or replace.
Dry running.				○		○		Confirm pump is filled with liquid.
Air gets in through inlet port.				○				Take necessary steps to prevent air from getting in.
Inlet pipe is crushed.				○				Substitute with crush-proof pipe.
Pressure in inlet portion is lowered to saturated vapor pressure of liquid.				○				Lower either liquid temperature or piping resistance.
Viscosity of liquid handled is too high.		○						Lower viscosity.
Foreign matter sticks to gears.					○	○		Disassemble and remove foreign matter.
Gear is damaged.				○	○	○		Replace gear.
Magnet capsule hits rear casing.	○				○	○		Disassemble and repair or replace parts.
Gears are locked because liquid temperature is too high.			○		○			Increase thickness of seal.
Seal is damaged.							○	Replace seal.
Bolt is loosened.							○	Tighten bolt.
Valve is closed.		○			○			Open valve.
High resistance of piping.		○			○			Alter piping to reduce resistance.
Performance of pump lowered by decrease in liquid temperature.				○				Raise liquid temperature or change specification.

⑪ Performance and Sizes

■ Performance

Model of Pump	Diameter	Maximum Flow rate (ℓ /min)	Maximum Discharge Pressure (MPa)	Attainable Degree of Vacuum kPa (abs.)	Motor Specifications				Weight (kg)
					Rated Voltage (V)	Rated Current (A)	Rated Output (W)	Type	
MDG-M4S6B115L	1/4NPT	4/4.8	0.6	5.33	1 ϕ 115	1.5/1.7	100	2P Induction Motor Capacitor Run Type	7.9
MDG-M4S6B220					1 ϕ 220~240	0.70/0.84			
MDG-M4T6B115L		3.8/4.6		8.00	1 ϕ 115	1.5/1.7			
MDG-M4T6B220					1 ϕ 220~240	0.70/0.84			
MDG-M4T6B220H						1.4/1.5	150/180		8.2

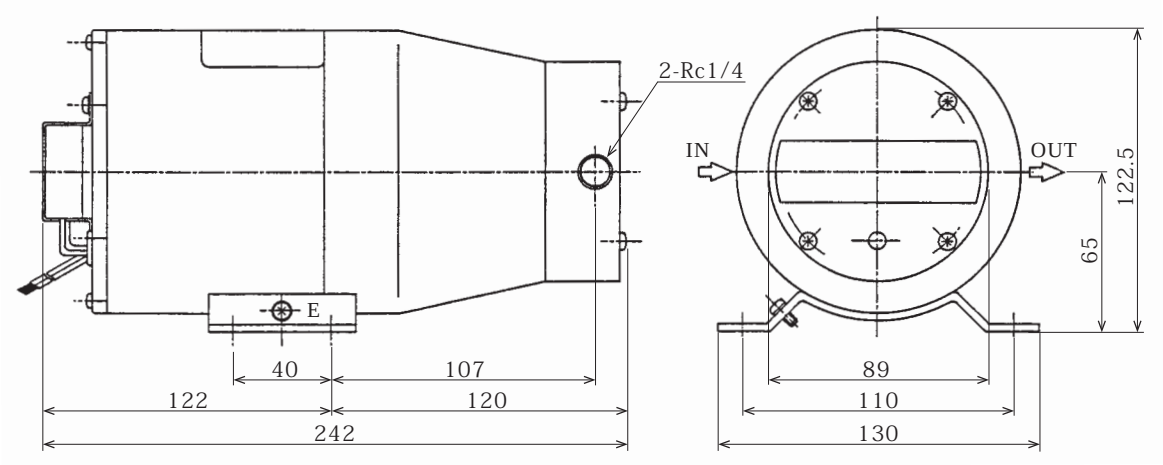
〔Note〕 1. Above is the performance on a test of clean water at 25ºC.
(The discharge changes depending on the temperature of liquid handled. Further information will be supplied on request.)

2. The pumps can be used in an ambient temperature between 0 and 40ºC.

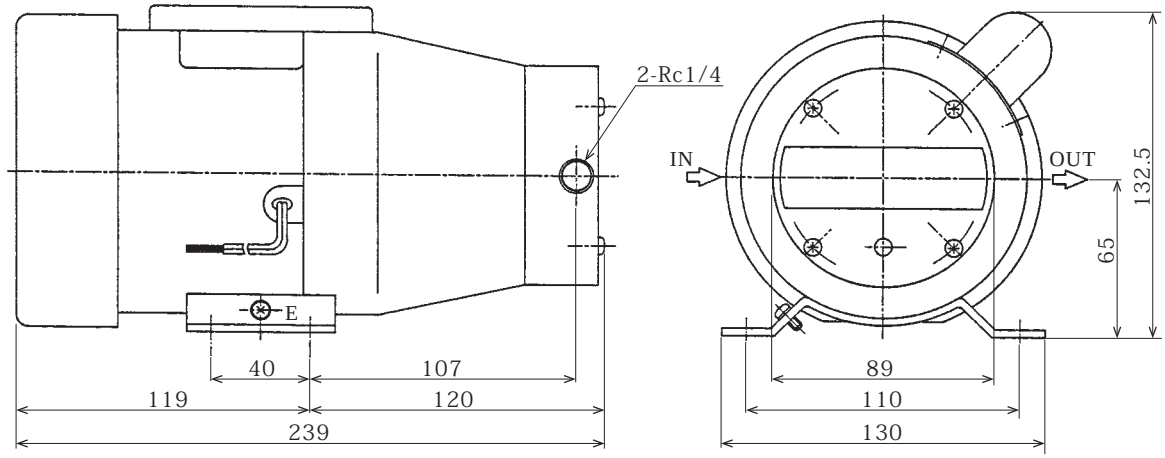
3. Maximum operating noise is 60dB or below.
(1 m away from the front of pump, A scale)

■ Outer Sizes

● Models　MDG-M4 □



● Models　MDG-M4 □ H



⑫ Repair Service

■ Repair

In case something unusual comes to your notice while you are using the pump, stop operation immediately and check whether anything is out of order. (Refer to the chapter on ‘‘Causes of Trouble and Troubleshooting’’.)

◈1 For repair work, please contact us or the dealer with whom you placed your order.

◈2 Before requesting repair, peruse this instruction manual again and recheck the product.

◈3 When you request repair, the following information is needed:

① Model code and manufacturing number.
② Period of use and conditions under which the product has been used.
③ Details of the problem.

In the event you return your pump, please ship it only after thoroughly washing the inside to prevent residual liquid from flowing out in transit, which is very dangerous.

IWAKI PUMPS

( )Country codes

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T367-3 '15/04