IWAKI PUMPS

IWAKI Magnetic Drive 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 power before service**
  Risk of electrical shock. Be sure to turn off power to stop the pump and related devices before service is performed.



- **Stop operation**
  If you notice any abnormal or dangerous conditions, suspend operation immediately and inspect/solve problems.



- **Do not use the pump in any condition other than its intended purpose**
  The use of the pump in any conditions other than those clearly specified may result in failure or injury. Use this product in specified conditions only.



- **Do not modify the pump**
  Alterations to the pump carry a high degree of risk. It is not the manufacturer's responsibility for any failure or injury resulting from alterations to the pump.



- **Wear protective clothing**
  Always wear protective clothing such as an eye protection, chemical resistant gloves, a mask and a face shield during disassembly, assembly or maintenance work.



⚠ CAUTION

- **Qualified personnel only**
  This pump should be handled or operated by qualified personnel with a full understanding of the pump. Any person not familiar with the product should not take part in the operation or maintenance of the pump.



- **Use specified power only**
  Do not apply power other than that specified on the nameplate. Otherwise, failure or fire may result. Ensure the pump is properly grounded.



- **Do not touch the pump or pipe with bare hands**
  Risk of burns. The surface temperature of the pump or piping becomes very high during and immediately after operation, depending on the liquid temperature.



- **Keep electric parts and wiring dry**
  Risk of fire or electric shock. Install the pump where it can be kept dry.



- **Ventilation**
  Fumes or vapours can be hazardous with certain solutions. Ensure proper ventilation at the operation site.



- **Spill precautions**
  Ensure protection and containment of solution in the event of plumbing or pump damage (secondary containment).



- **Do not use a damaged pump**
  Use of a damaged pump could lead to an electric shock or death.



Safety Instruction

⚠ CAUTION

- **Do not use the pump in a wet location**
  The pump is not waterproof. Use of the pump in wet or extremely humid locations could lead to electric shock or short circuit.


Prohibition

- **Do not damage the power cable**
  Do not pull, knot, or crush the power cable. Damage to the power cable could lead to a fire or electrical shock if cut or broken.


Caution

- **Do not cover the pump with a cloth**
  Covering the pump may cause heat to build up in the motor, resulting in fire or electrical/mechanical failure.


Requirement

- **Grounding**
  Risk of electrical shock! Always properly ground the pump. Conform to local electric codes.


Earthing

- **Install a GFCI (earth leakage breaker)**
  An electrical failure of the pump may adversely affect other devices on the same line. Purchase and install a GFCI (earth leakage breaker) separately.


Electrical shock

- **The power cable is not replaceable**
  Do not use a damaged power cable, as it may result in fire or electric shock. If the cable is damaged, the entire pump unit must be replaced.


Prohibition

- **Preventative maintenance**
  Follow instructions in this manual for replacement of wear parts. Do not disassemble the pump beyond the extent of the instructions.


Requirement

- **Do not install/store the pump:**
  - In a flammable/explosive/corrosive atmosphere.
  - In a dusty/humid environment.
  - Where ambient temperature can exceed 0-40ºC.
  - In direct sunlight or wind & rain.


Prohibition

- **Use of hazardous chemicals**
  Risk of personal injury or fire. Check the piping system for leaks before and during operation when handling flammable, corrosive,or hazardous liquids.


Caution

- **Do not drain liquid onto the floor**
  The liquid discharged from the pump must be drained into a special container. Never drain it directly onto the floor.


Prohibition

- **Disposal of a used pump**
  Dispose of any used or damaged pump in accordance with local rules and regulations. See page 21 to comply with the European Directive 2012/19/EU on waste electrical and electronic equipment.


Requirement

- **Static electricity**
  When low electric conductivity liquids such as ultra-pure water and fluor inactive liquid (e.g. Fluorinert™) are handled, static electricity may be generated in the pump and may cause static discharge. Take countermeasures to remove static electricity.


Requirement

① Inspection after Unpacking

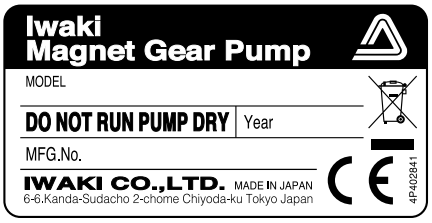
Upon unpacking, check the following points to confirm that the product is what you have ordered. If you find anything wrong, please contact the dealer you placed your order with.

◇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?



Spec label (pump unit) for the European market

*The CE marking on our product(s) is for us to market the product(s) into the European market, however, the CE marking does not ensure any safety or conformity of the product(s) outside the European market.
When the pump is incorporated into the equipment marketed in the European market, such equipment must meet all the requirements of applicable directives.
In such a case, any person who places the equipment on the market must carry a CE mark on the equipment as a manufacturer.



Spec label (pump with no motor) for the European market

◇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

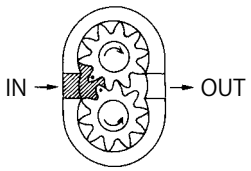


Fig.A

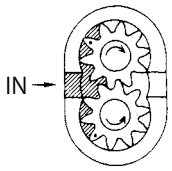


Fig.B

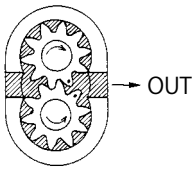


Fig.C

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 220 H

a b c d e

a. 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)

b. Represents the maximum discharge pressure.

6 : 0.6MPa

c. Connection

B : 1/4NPT

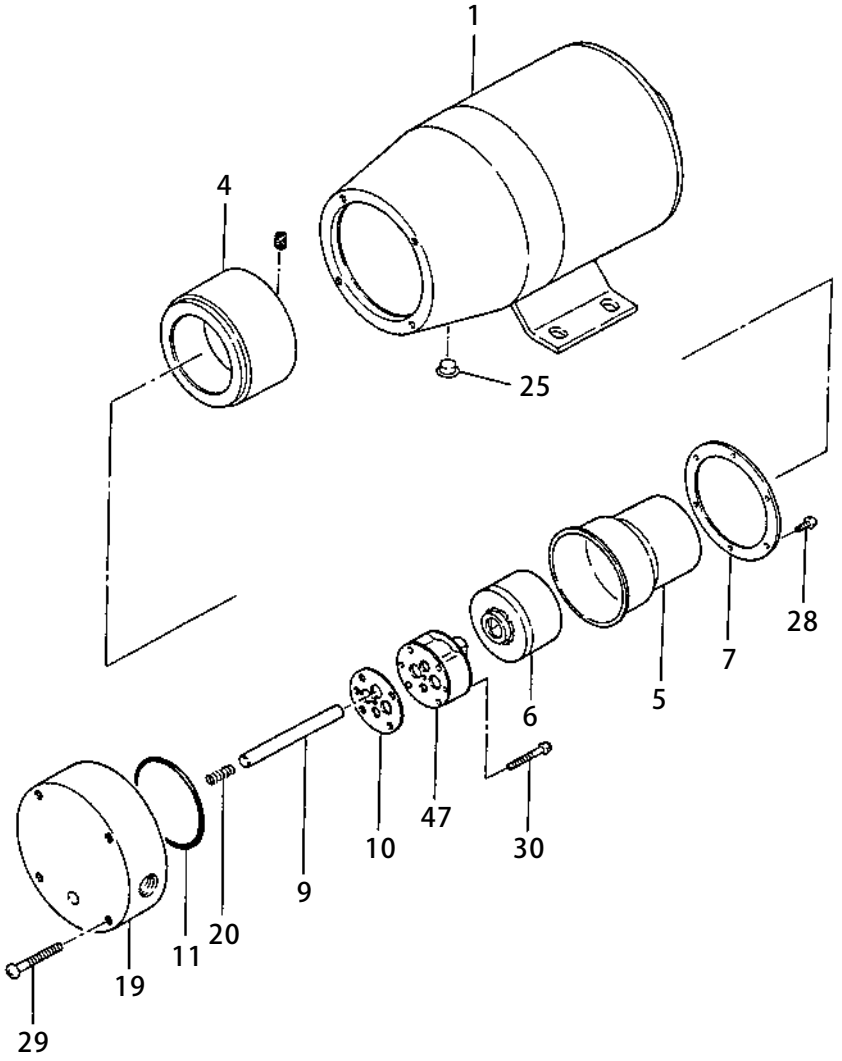
d. Line voltage

220 : AC220 ~ 240V single phase

e. Non-standard specification code

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

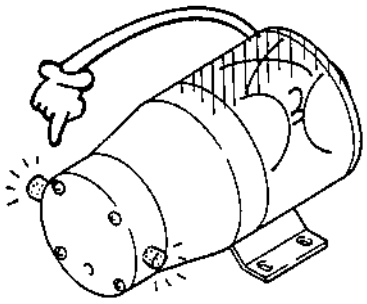
④ Names of Parts and Structure



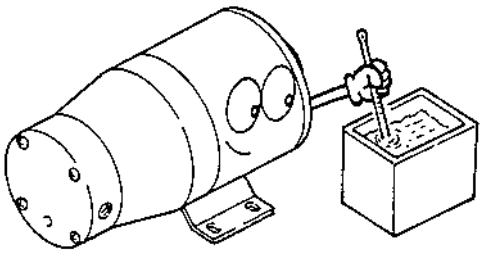
No.	Name	Number
1	Motor	1
4	Driving magnet assy	1 set
5	Rear casing	1
6	Magnet capsule	1
7	Mounting plate	1
9	Driving gear shaft	1
10	Gasket	1
11	O ring	1

No.	Name	Number
19	Pump body	1
20	Shaft spring	1
25	Cap	1
28	Screw M3×10	6
29	Screw M4×35	4
30	Screw M3×25	4
47	Gear case unit	1 set

⑤ Precautionary measures

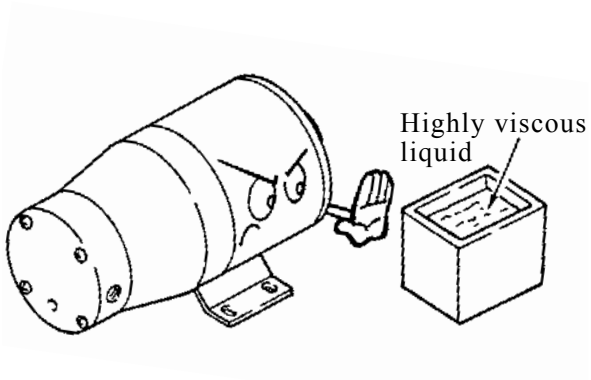


◈① Do not operate the pump dry.
The pump should not be operated dry or while the suction side is closed. This will wear out the gears and bearings.

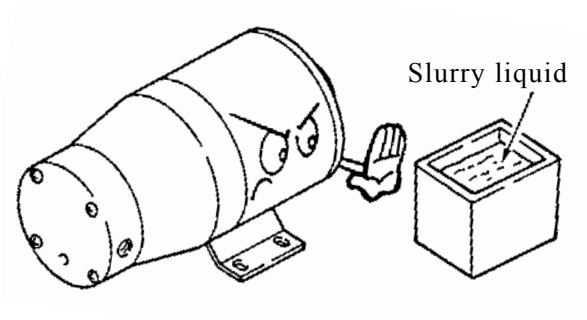


◈② Range of liquid temperatures
The pump can be used with liquids in the following temperature range. The performance will change depending on the temperature of the liquid.
- Type S : 0 ~ 50ºC
- Type T : 0 ~ 95ºC

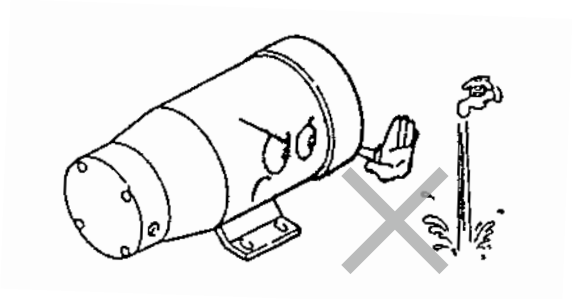
In case the liquid being handled is a solvent, the gears may swell to force the pump to stop, in the worst case. For further information, please contact us.



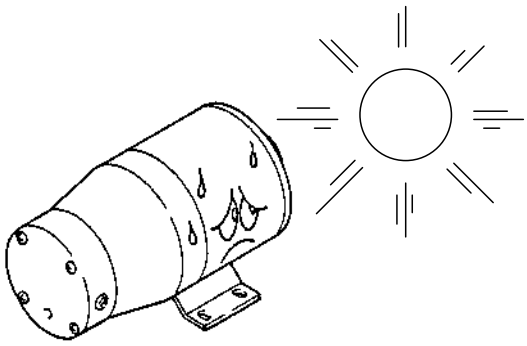
◈③ Liquid viscosity
Highly viscous liquid cannot be transferred.
- Type S : up to 30mPa·s
- Type T : 80mPa·s
  (with a 100W motor)
  200mPa·s
  (with a 150W motor)



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



◈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.

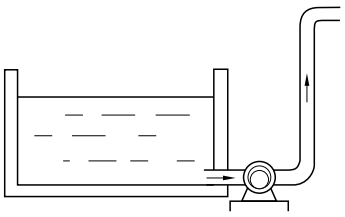
⑥ Installation, Piping and Wiring



■ 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.

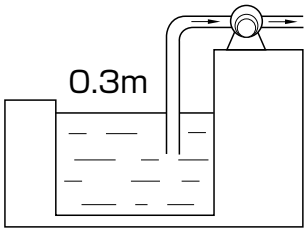
Flooded suction



◇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).

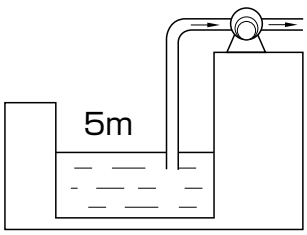
Priming method
(In case the pump chamber is wet)

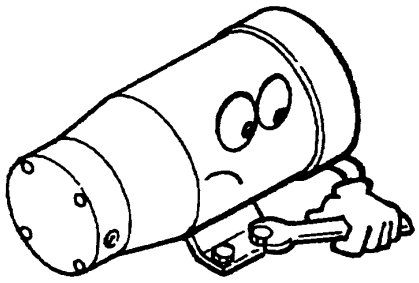
①There is no liquid in the suction piping
(This is not allowed for the T type).



◇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.

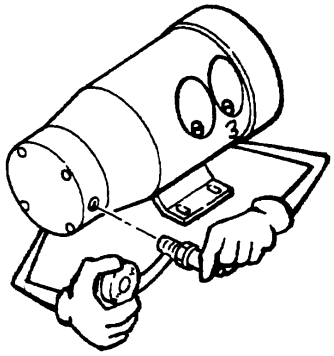




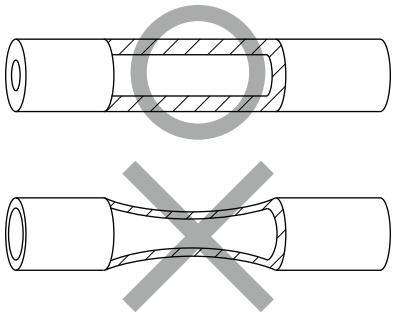
④ For fixing the pump, use M6 small screw. In the event floor on which the pump is installed is resonant and causes a loud noise, fix the pump with rubber mountings.

■ 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.

● Rated Electric Current Value 50/60Hz

Model of Pump	Rated Voltage (V)	Rated Current (A)
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.

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

◇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 17). In case the pump still cannot be restored to normal condition, please contact your supplier.

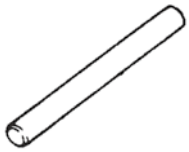
No.	Check Point	Remarks
1	Is pump transferring liquid properly?	● Whether liquid is transferred. ● Whether suction and discharge pressures are at normal levels.
2	Is there abnormal noise or vibration?	● If pump does not function normally, abnormal noise or vibration tends to be generated. ● Base on which 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

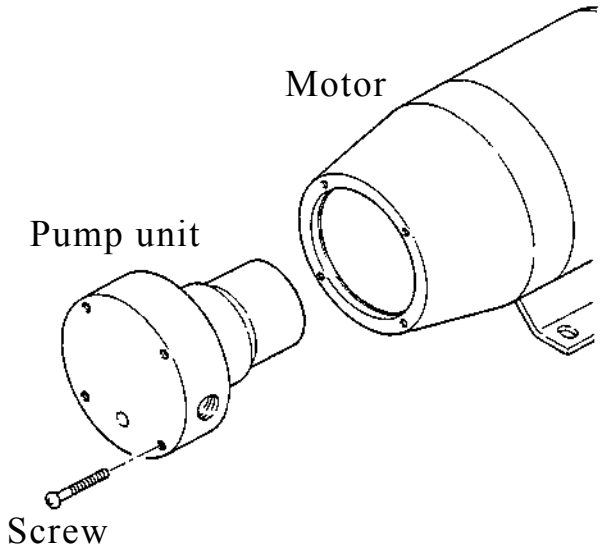
◇1 Pay attention to the operating condition, referring to ‘‘Notes on Operation During Operation’’. When any of the consumable parts reaches its replacement time or the performance is noticeably lowered, substitute the gear case unit and the driving gear shaft with new ones.

■ Consumable Parts

No.	Part		Number	Replacement 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

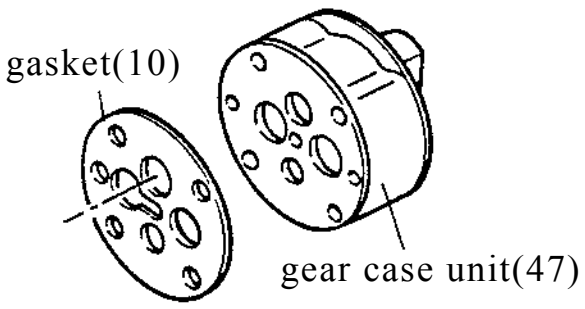
Follow the disassembling steps in reverse, while attending to the following points.

◇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.



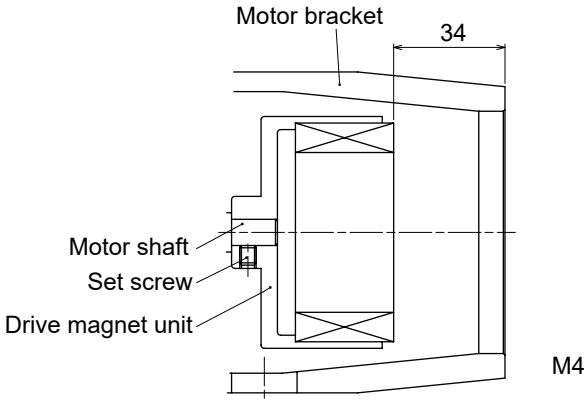
■ Assembly of the motor to the pump

If a customer mounts the pump and the motor bracket to the motor, follow the instructions below.

⚠CAUTION
• Be sure to turn off power to stop the motor and related devices before work. • Before the motor bracket is mounted to the motor, make sure that the motor size is correct. • To avoid personal injury, do not place the drive magnet unit near any metal part or tool.

1. Mount the motor bracket to the motor and tighten them up with the screws.

2. Do not allow foreign matters such as iron pieces to stick to the magnet capsule unit. Slide the drive magnet unit onto the motor shaft straight without excessive force. Check the distance between the end faces of the drive magnet and the bracket is 34mm (see the figure below) and secure them with the set screw and the Loctite #222.



3. Mount the pump to the motor bracket and secure them by 0.8N·m with the three M3×10 screws. Magnetic force of the pump is strong. Be careful not to catch the finger in parts. See the arrow mark on the pump head for the correct direction of the liquid flow.

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 cou-pling 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-M4S6B220	1/4NPT	4/4.8	0.6	5.33	1ϕ 220~240	0.70/0.84	100	2P Induction Motor Capacitor Run Type	7.9
MDG-M4T6B220		3.8/4.6		8.00					
MDG-M4T-6B220H						1.4/1.5	150/180		8.2

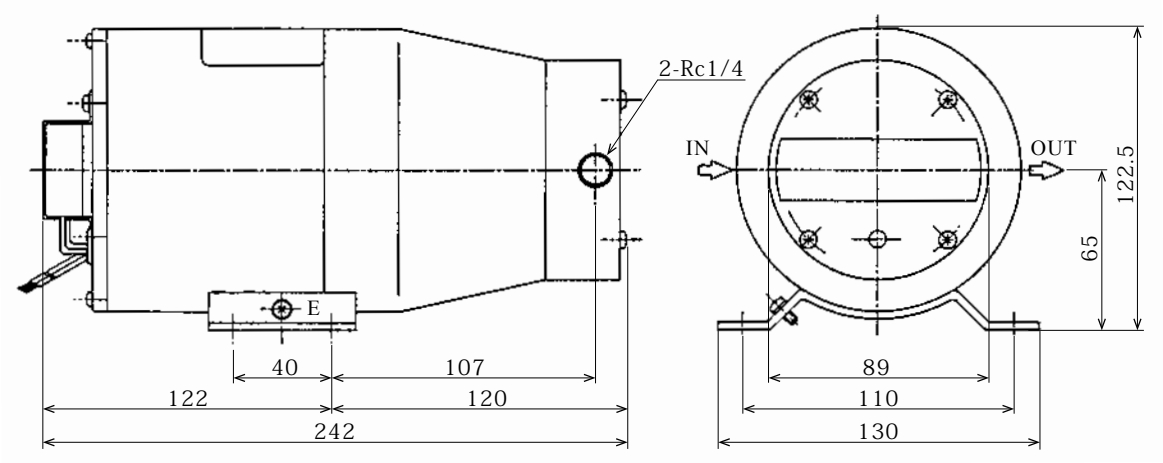
[Note] 1. Above is the performance on a test of clean water at 25ºC.
(The discharge changes depending on the temperature of liquid handled.
Further information will be supplied on request.)

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

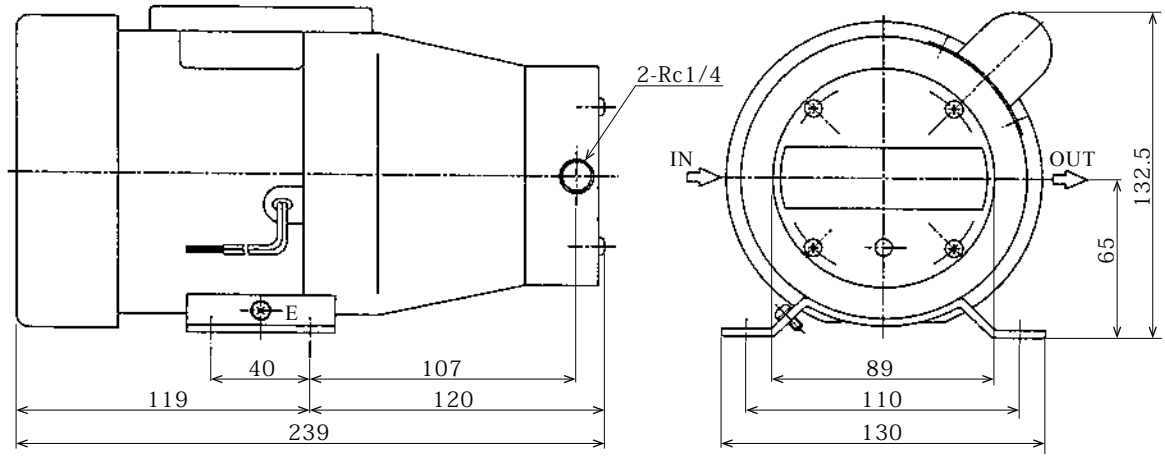
3. Maximum operating noise is 60dB or below.
(1 m away from the front of pump, A scale)

■ 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.

EC DECLARATION OF CONFORMITY

A copy of the original Declaration of Conformity

(SUPPLIER'S NAME)

WE

IWAKI CO.,LTD.

(ADDRESS)

6-6 2-CHOME KANDA-SUDACHO CHIYODA-KU TOKYO JAPAN

(PRODUCT)

DECLARE UNDER OUR SOLE RESPONSIBILITY THAT THE PRODUCTS

MAGNETIC DRIVE GEAR PUMP

(MODEL NAME)

MDG SERIES

TO WHICH THIS DECLARATION RELATES ARE IN CONFORMITY WITH THE FOLLOWING STANDARDS OR DIRECTIVES AS FAR AS APPLICABLE

(DIRECTIVES)

MACHINERY DIRECTIVE 2006/42/EC (ANNEX IIA)
RoHS DIRECTIVE 2011/65/EU

NOTE: THIS PRODUCT IS INTENDED FOR FITTING INTO ANOTHER MACHINE OR INSTALLATION. CONFORMITY WITH THE DIRECTIVE 2014/30/EU SHOULD BE ESTABLISHED BY THE END PRODUCT.

(STANDARDS)

EN ISO12100: 2010 EN809: 1998 + A1: 2009 EN IEC63000: 2018

(A PERSON WHO IS AUTHORISED TO COMPILE THE TECHNICAL FILE IN THE COMMUNITY)

IWAKI EUROPE GMBH
SIEMENSRING 115 D-47877 WILLICH GERMANY

NOTE: THIS DECLARATION BECOMES INVALID IF TECHNICAL OR OPERATIONAL MODIFICATIONS ARE INTRODUCED WITHOUT THE MANUFACTURER'S CONSENT.

T. Sawada.

TSUTOMU SAWADA
SENIOR GENERAL MANAGER,
QUALITY ASSURANCE HEAD OFFICE

Tokyo, Dec. 18, 2023

(PLACE AND DATE OF ISSUE) **(NAME AND SIGNATURE OR EQUIVALENT MARKING OF AUTHORIZED PERSON)**

DOCUMENT NO. IS-51K-527-4

CE conformity

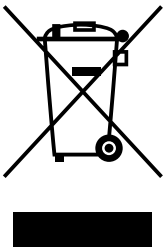
■ **Information on CE conformity of pump units when the motor is fitted by the customer (dealer/operator)**

We hereby confirm the CE conformity of our pump unit provided that the following criteria about intended use are satisfied as described in this instruction manual:

- Motor conformity in accordance with any relevant EC directives which are currently effective.
- The dimensions of a required motor flange and shaft must fit the specified pump.
- The motor must be installed to the pump according to this instruction manual.
- Guaranteed grounding
- The pump must not be repainted over our original upper coating.

Any reseller or dealer who connects the pump with a motor and markets it as a complete unit must conform to all relevant EC directives. In such cases, the reseller or dealer then becomes the manufacturer.

Waste Electrical and Electronic Equipment (WEEE)



In accordance with the European Directive 2012/19/EU on waste electrical and electronic equipment, this product features the crossed-out wheelie bin symbol. When this product is disposed of in household wastes, toxic components included in it can cause major environmental and human health problems. Use appropriate waste collection systems for recovery and recycling. Contact your local distributor or nearest Iwaki company for the detailed collection systems.

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