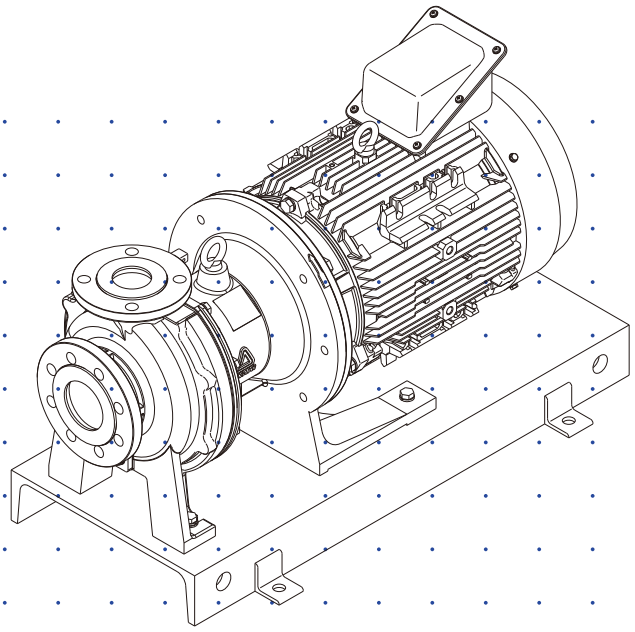
Iwaki Magnetic Drive Pump

AMP (Asia)



Instruction manual

Thank you for choosing our product.

⚠ Please read through this instruction manual before use.

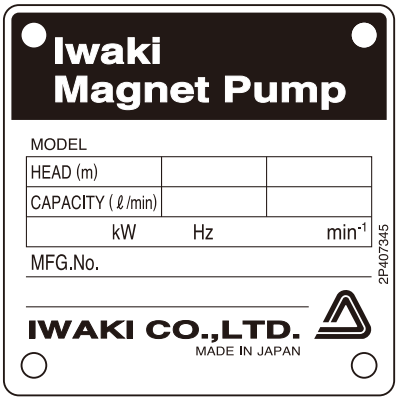
This instruction manual describes important precautions and instructions for the product. Always keep it on hand for quick reference.

Order confirmation

Open the package and check that the product conforms to your order. If any problem or inconsistency is found, immediately contact your distributor.

a. Check if the delivery is correct

Check the nameplate to see if the information such as model codes, discharge capacity, and discharge head are as ordered.



b. Check accessories are complete

Standard parts:

- Motor back pull-out bolts
  Two (2) M12×100mm hexagon bolts

Optional parts:

- Spare parts if ordered
- The DRN pump protector if ordered

c. Check if the delivery is damaged or deformed

Check for transit damage and loose bolts.

*Tighten the hex head bolts (901.4) that hold the rear casing support (161) to 85N•m. Before tightening these bolts, be sure to loosen the hex head bolts (901.7) to unfix the foot support (330) from the base (890). See page 38 as well.

Contents

Safety instructions

Read through this section before use. This section describes important information for you to prevent personal injury or property damage.

■ Symbols

In this instruction manual, the degree of risk caused by incorrect use is noted with the following symbols. Please pay attention to the information associated with the symbols.

⚠ **WARNING**	**Indicates mishandling could lead to a fatal or serious accident.**
⚠ **CAUTION**	**Indicates mishandling could lead to personal injury or property damage.**

A symbol accompanies each precaution, suggesting the use of "Caution", "Prohibited actions" and specific "Requirement".

Caution marks

Prohibition mark

Requirement mark

⚠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.

⚠WARNINGS


Prohibited

Access limitation

The magnet drive pump has a pair of strong magnets (the magnet capsule unit and drive magnet). The strong magnet field could adversely affect the persons who are assisted by electronic devices such as the pacemaker.


Electrical shock

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.


Wear protectors

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. The specific solution will dictate the degree of protection. Refer to SDS precautions from the solution supplier.


Requirement

Use an overhead crane or any other proper transporting machine

Two or more operators may be needed for ensuring safe transport depending on the pump size and weight.


Requirement

Use the eye bolt or lifting holes

Use the eye bolt when lifting the pump only. If the pump and the motor are mounted on the baseplate, use lifting holes on the baseplate.


Do not remodel

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.


Requirement

Daily inspection and maintenance

Daily inspection and maintenance are required for the prevention of chemical spray or leakage when handling:

- Explosive or flammable liquid,
- Corrosive liquid, or
- Harmful liquid.


Requirement

Ventilation

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

⚠CAUTIONS


Requirement

Qualified personnel only

The 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 management of the pump.


Requirement

Do not catch the finger

Magnetic force of the pump is powerful. When taking apart or putting together the pump, take measures not to catch the finger in the foot support. Also, keep the drive magnet and the driven magnet free from iron debris/ powder.


Prohibited

Pay attention to magnet force

The pair of strong magnets in the pump and its magnetic force may adversely affect magnetic disks/cards or wrist watches. Do not bring them close to the pump.


Requirement

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.


Prohibited

Do not run pump dry

Do not run pump dry (operation without priming water or with a suction valve closed). Internal parts are excessively worn by friction heat and fatal pump damage results.


Prohibited

Do not install/store the pump:

- In a flammable/corrosive atmosphere.
- In a dusty/humid environment.
- Where ambient temperature can exceed 0-40ºC.
- In direct sunlight or wind & rain (except an outdoor type).
- Under mechanical vibrations.


Prohibited

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.

Static electricity

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

Commissioning

Friction heat builds up and damages the internal parts. Break in the pump to expel gas from the pump and piping, especially when handling liquids that generate gas bubbles (hydrogen peroxide or sodium hypochlorite).

Spill precautions

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

Do not stand on the pump

Injury or damage may result when the pump turns over.

Do not touch the pump or pipe with bare hands

Risk of burning! The surface temperature of the pump or pipe rises high along with liquid temperature in or right after operation.

Grounding

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

Install a GFCI (earth leakage breaker)

An electrical failure of the pump may adversely affect other devices on the same line. Purchase and install an earth leakage breaker separately.

The pump itself doesn't have an ON-OFF switch

An external electromagnetic switch is needed to run or stop the pump safely.

Disposal of a used pump

Dispose of any used or damaged pump in accordance with local rules and regulations. If necessary, consult a licensed industrial waste disposal company.

Precautions for use

- Electrical work should be performed by a qualified electrician. Otherwise, personal injury or property damage may result.

- Do not install the pump:
  –In a flammable/corrosive atmosphere.
  –In a dusty/humid place.
  –In direct sunlight or wind & rain (except outdoor type).
  –Where ambient temperature can exceed 40ºC or falls below 0ºC.
  –Where ambient humidity can exceed 85%RH or falls below 35%RH.
  –Under mechanical vibrations.

- Tighten the hex head bolts (901.4) that hold the rear casing support (161) to 85N•m. Before tightening these bolts, be sure to loosen the hex head bolts (901.7) to unfix the foot support (330) from the base (890).

- Allow sufficient space around the pump for easy access and maintenance.

- Use care handling the pump. Do not drop. An impact may affect pump performance. Do not use a pump that has been damaged to avoid the risk of electrical damage or shock.

- The pump is not waterproof. Do not operate the pump while wet with solution or water. Failure or injury may result. Immediately dry off the pump if it gets wet.

- Solution may leak. Do not close/block discharge line during operation. Install a relief valve to ensure safety and prevent damaged plumbing.

- Solution in the discharge line may be under pressure. Release the pressure from the discharge line before disconnecting plumbing or disassembly of the pump to avoid solution spray.

- Wear protective clothing when handling or working with pumps. Consult solution SDS for appropriate precautions. Do not come into contact with residual solution.

- Do not clean the pump or nameplate with a solvent such as benzine and thinner. This may discolour the pump or erase printing. Use a dry or a damp cloth or a neutral detergent.

- Empty and clean the pump before it is left stopped for a long time.

Overview

Pump characteristics, features and part names are described in this section.

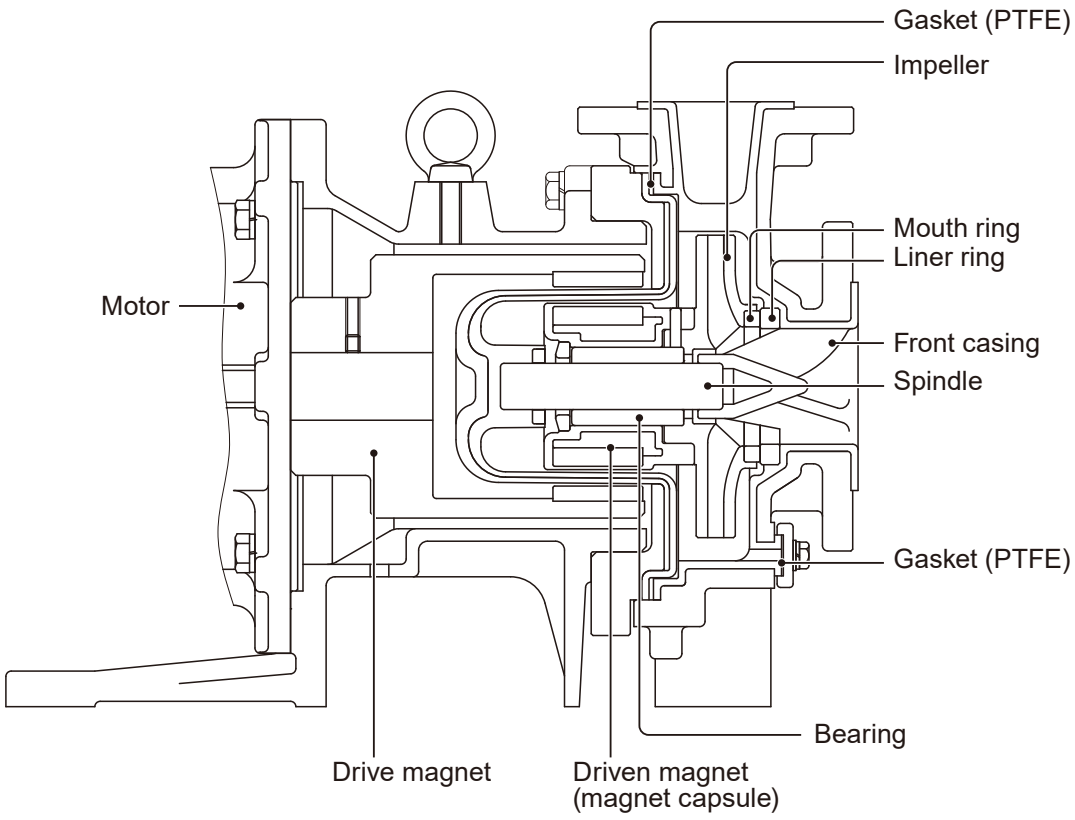
Introduction

Pump structure & Operating principle

The AMP series is an industrial magnetic drive pump which is designed for handling various chemicals including a strong acid and alkali.

Principle of operation

- The magnetic coupling between the drive magnet and the driven magnet (magnet capsule) transfers the rotation energy of the motor to the impeller in the front casing, where a liquid is transferred from the inlet to outlet.
- When the driven magnet rotates in the front casing, the mouth ring and the liner ring slide over each other as the thrust force pushes the driven magnet forward. Also, the bearing and the spindle slide over each other as the radial force accompanies the rotation of the driven magnet.
- The best combination of the sliding parts (mouth ring/liner ring, bearing/spindle) is determined by chemicals to be delivered. Gaskets are proven PTFE.



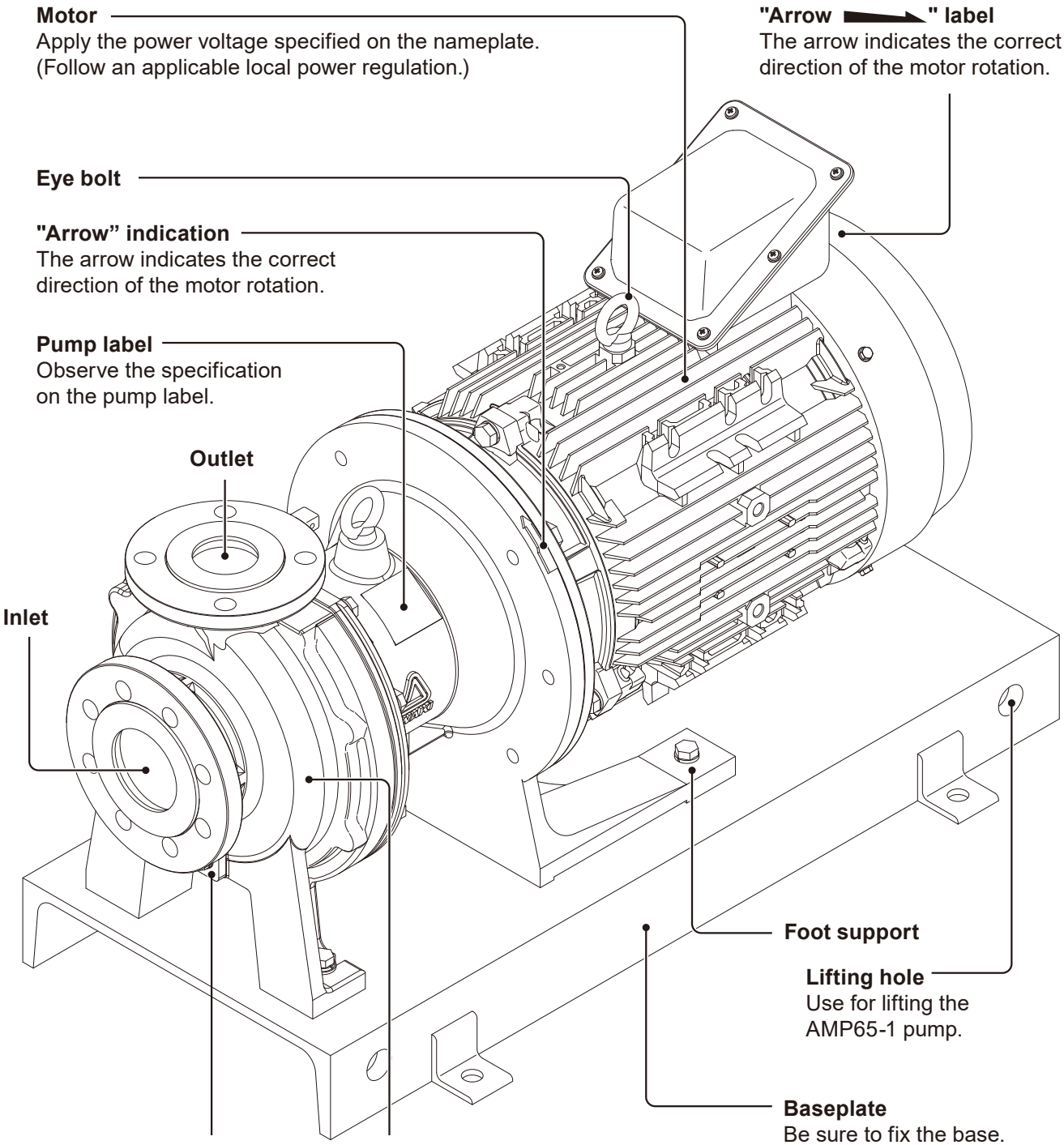
Conforming standards

Mounting dimensions: ISO 2858 (pumps with baseplate)
Flange PCD: JIS 10K/ ISO PN16/ ANSI 150LB

Part names

Pump

The illust below represents the pump on the baseplate.



*The drain port is optionally available.

*Do not clean the pump or nameplate with a solvent such as benzine and thinner. This may discolour the pump or erase printing. Use a dry or a damp cloth or a neutral detergent.

Limitations

Pressure

Observe the maximum allowable discharge pressure of 1.0MPa.

Liquid

- **Slurry**

  Generally the pump can not send slurry except the KK type (SiC bearing/SiC spindle) that can handle slurry up to 5% (concentration), 50μm (particle size) and 80Hs (hardness). When the KK type is used, you will need shorter maintenance frequency so the internal parts won't wear badly. Contact us for more information.

- **Performance change**

  Shaft power, discharge capacity, and a delivery head vary with liquid specific gravity and liquid viscosity. The pump is designed for use with limited liquid properties. Contact us if any liquid other than that originally planned is used.

- **Temperature change**

  Note that liquid viscosity, vapour pressure, and chemical aggressiveness change with liquid temperature. Monitor the liquid temperature for ensuring good operating conditions.

Allowable liquid temperature range (tap water)	0 - 80°C
Allowable ambient temperature	0 - 40°C
Allowable ambient humidity	35 - 85%RH

*The allowable liquid temperature range changes with liquid properties. Contact us for detail.

Identification codes

Each code represents the following information.

Pump

AMP 40 - 150 1 KK F 075 J - D 2
a b c d e f g h i

a. Pump inlet/outlet size

Code	Inlet	Outlet
40	50A	40A
50	65A	50A
65	80A	65A

b. Impeller O.D. (nominal)

110/ 120/ 130/ 140/ 150/ 160/ 165 mm

c. Impeller series

1: 1 series

d. Bearing/Spindle materials

KK: SiC/SiC CF: High density carbon/High purity alumina ceramic

e. Motor

F: Flanged motor

f. Motor output

037: 3.7kW 055: 5.5kW 075: 7.5kW
110: 11kW 150: 15kW 185: 18.5kW

g. Flange connection/Motor standard

J: JIS flange + JIS motor I: ISO flange + IEC motor A: ANSI flange + JIS motor

h. Drain/Special version

Code	Drain port	Baseplate	Special version
A	No	Yes	Standard
S			Customized
D	Yes		Standard
X			Customized
B	No	No	Standard
Y			Customized
E	Yes		Standard
Z			Customized

i. Motor pole

2: Two poles

Installation

This section describes the installation of the pump, piping and wiring. Read through this section before work.

Points to be observed

- Be sure to turn off power to stop the pump and related devices before service is performed.
- If you notice any abnormal or dangerous conditions, suspend operation immediately and inspect/solve problems.
- Do not place explosive or flammable material near the pump.
- Use of a damaged pump could lead to an electric shock or death.

Pump mounting

Select an installation location and mount the pump.

Installation location

1. If the pump unit is not anchored to the foundation and if the motor unit is heavier than the pump unit, the entire pump falls to the motor side. See page 53 and 54 for the weight of the pump.

2. Select a flat and firm foundation where is free from mechanical vibration.

3. Allow sufficient space around the pump for easy access and maintenance (motor back pull out).

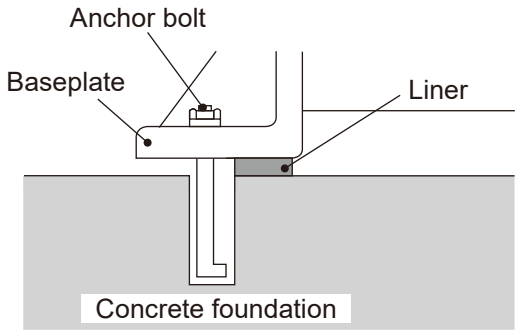
4. The concrete foundation should be larger than a pump base footprint.

Pump position

Install the pump as close to the supply tank in the flooded suction method which is recommended. If the suction lift method is used due to the limitation on plumbing latitude, see page 18.

Foundation work

1. See the diagram when mounting the baseplate onto the concrete foundation.



2. If you purchased the pump without the baseplate and mounted the pump directly on the foundation, do not anchor all the "legs". Leave the foot support legs NOT anchored, or the motor won't be pulled back.

Plumbing

Plumbing latitude is often affected by facility size and other conditions like the positional relationship between the tank location and the pump location. This section outlines the minimum requirements to ensure your plumbing system works well.

NOTE

- Before plumbing, remove the protective cap from the pump inlet and outlet.
- Do not apply too much adhesive or leave a screw or nut in the plumbing when it is assembled. Also, blow out any small debris from the plumbing so they won't be taken into the pump and cause failure.
- Use measures to keep the pump connections free from stress. Weight and thermal expansion/contraction of the piping can stress connection points.

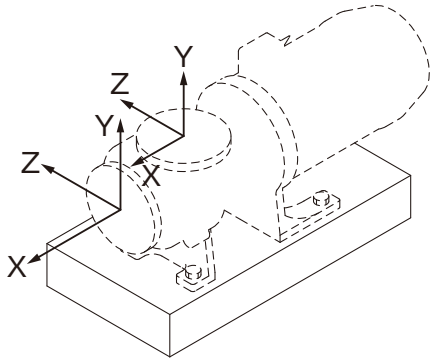
Flange connection

Integrate the pump into your plumbing. Fasten the flange tightening bolts diagonally and evenly by the following torque. No gap is allowed between flanges. Always use a gasket in between metal flanges.

Bolt size	Tightening torque
M16	78.4N•m

Piping load & Moment

Do not apply excess load to the pump inlet flange and outlet flange. See below for the max allowable force and moment.



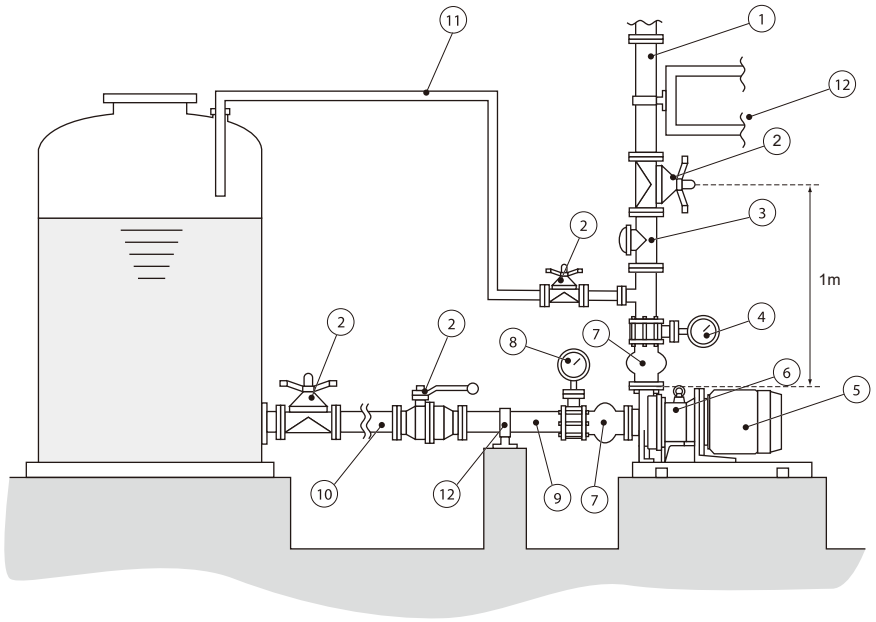
Maximum force to inlet & outlet flanges

Direction of load	Load (kN)			
	Outlet flange		Inlet flange	
	AMP40/50	AMP65	AMP40/50	AMP65
Fx	0.71	1.07	0.89	1.33
Fy (Compressive/Tensile force)	0.89/0.44	1.33/0.67	0.58	0.89
Fz	0.58	0.89	0.71	1.07

Maximum moments to inlet & outlet flanges

Direction of load	Moment (kN•m)			
	Outlet flange		Inlet flange	
	AMP40/50	AMP65	AMP40/50	AMP65
Mx	0.46	0.95	0.46	0.95
My	0.35	0.72	0.35	0.72
Mz	0.23	0.47	0.23	0.47

System overview



1. Discharge line
2. Gate valve
3. Check valve
4. Pressure gauge
5. Motor
6. Magnetic drive pump
7. Expansion joint
8. Vacuum (compound) gauge
9. Straight suction line
10. Suction line
11. Air vent line
12. Pipe support

Suction line

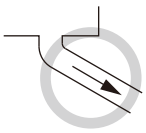
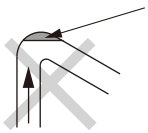
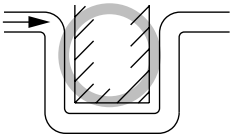
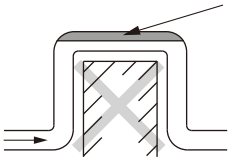
When the suction line of the system is build up, meet the following requirements:

- *Flooded suction:* Establish a flooded suction system. A suction lift system is much less efficient and so it is not recommended.
- *Line I.D.:* Ensure the suction line I.D. is equal to or larger than the pump inlet and NPSHr is satisfied.
- *Pipe resistance:* Establish the shortest line length and the minimum number of bends so the pipe resistance is minimized.
- *Straight section:* The suction line must be extended straight to the pump inlet. The minimum allowable length of the straight pipe varies with the pump inlet nominal diameter of:

  50A (2B) : 500mm

  65A (2½B) or 80A (3B) : 8 times longer than the pump inlet I.D.
- *Eccentric reducer:* If the suction line I.D. is wider than the pump inlet and they can not be connected simply due to the different pipe size, use an eccentric reducer between them. Make sure the upper part of it is level so the air won't be trapped in there.

- *No air/gas entrapment:* In general, do not allow any arched line where air may be trapped. In a flooded suction system, lay a suction line in the down-slope (from the tank outlet to the pump inlet) of 1:100 or steeper. In a suction lift system; however, lay it in the up-slope to the pump inlet. If plumbing latitude is limited in your facility and you can not avoid an arched suction line in the system, mount an air vent device.

Good examples	Bad examples
 Down-slope from tank outlet to pump inlet (in a flooded suction system)	 Trapped air in a sharp bend
	 Trapped air in an arched suction line

- *Shut-off valve:* Install the shut-off valve (gate valve) in the suction line for the preventative maintenance that involves taking apart the pump.
- *Flushing line:* Install a flushing line for cleaning the pump after handling a harmful liquid.
- *Line end:* The suction line end should always be 500mm lower than any liquid level for the prevention of entrained air.
- *Foot valve:* In a suction lift system, always install a foot valve to the suction line end or a general back pressure valve in the suction line. The distance between the foot valve and the bottom of the supply tank should be at least 1 to 1.5D from the bottom of the supply tank. (D=Diameter of suction pipe).
- *Piping support:* Use measures to keep the pump connections free from stress. Weight and thermal expansion/contraction of the piping can stress connection points.
- *Air tightness:* Joints of the suction line must be air tight, or output may be affected or the pump is worn badly by friction heat.
- *NPSH:* Always check that the NPSHr is satisfied and cavitation won't upset your system.

$$NPSHa \geq NPSHr + 0.5m \text{ (0.5m is a margin)}$$

$$NPSHa = 10^6 \times \frac{(Pa - Pv)}{\rho g} \pm hs - hfs$$

NPSHa: Net Positive Suction Head available (m)
NPSHr: Net Positive Suction Head required (m)
Pa: Absolute pressure to the tank liquid surface (MPa)
Pv: Vapour pressure of tank liquid (MPa)
hs: Suction lift (m)
hfs: Suction pipe resistance (m)
ρ: Liquid density (kg/m^3)
g: Acceleration of gravity (9.8 m/sec^2)

Discharge line

When the discharge line of the system is build up, meet the following requirements.

-*Discharge line I.D.:* If the piping is very long, its diameter should be determined by calculating the piping resistance. Otherwise, the specified performance may not be obtained due to increased piping resistance.

- *Discharge valve:* A discharge valve should be positioned around 1m away from the pump outlet. Mount an air vent line between the discharge valve and the pump outlet so entrained air can be expelled from the system successfully. If the back pressure valve is needed, install it between the discharge valve and the pump outlet as well.

- *Pressure gauge:* Install a pressure gauge on the discharge line to monitor a discharge capacity and delivery head.

- *Check valve:* A check valve should be installed if any of the following conditions exists in the piping:
  - Discharge line is longer than 15m.
  - A delivery head is higher than 15m.
  - The top end of the discharge line is located 9m or higher than the liquid level of the supply tank.
  - Several pumps are connected in parallel with the same piping.

- *Air vent line:* Provide an air vent line on the discharge line when the horizontal section of the discharge line is longer than 15m.

- *Drain valve:* Install a drain valve as necessary (to empty the plumbing).

- *Piping support:* Use measures to keep the pump connections free from stress. Weight and thermal expansion/contraction of the piping can stress connection points.

- *Priming line:* If the suction lift method is used due to the limitation on plumbing latitude, branch the discharge line and establish a priming system with a priming tank. Also, mount a foot valve at the end of the suction line in the supply tank so the liquid won't get back to the supply tank and empty the suction line when the pump is stopped. The distance between the foot valve and the bottom of the supply tank should be at least 1 to 1.5D from the bottom of the supply tank. (D=Diameter of suction pipe).

Wiring

Wiring for power voltage, earthing and external signals.

Points to be observed

- Electrical work should be performed by a qualified electrician. Always observe local electric codes.
- Do NOT perform wiring work while electric power is ON. Otherwise, an electrical shock or a short circuit may result. Be sure to turn off the power before wiring work.
- Be careful for electric power NOT to be turned on during work.

Power voltage

Electrical wiring and any work on power source must be performed by qualified persons only. It is not the manufacturer's responsibility for any injury and damage due to noncompliance with this notice. Contact us as necessary.

- *Electromagnetic switch:* Select the optimal specification according to the motor to be used (power voltage, capacity, etc.). Purchase separately.
- *Overcurrent protector:* Select the optimal specification according to the motor to be used. Purchase separately.
- *Electric device location:* Install an electromagnetic switch and other electric devices such as a stop button if any, in a control panel. If the control panel is installed out of doors, protect the electric devices from direct sunlight, wind & rain.
- *Pump/Control panel location:* They can be installed either indoors or outdoors (use an indoor use motor indoors only). However, safety measures should be taken so as not to expose the motor and power distribution unit to flooding or other natural environmental elements (rain, snow, direct sun, etc.).

Electrical motor

Check/adjust the motor before operation.

- Read through motor manufacturer's instruction manual before operation.
- Check the rotational direction of the motor before electric wiring.
- Ground the electric motor.
- Use a Star-Delta Starter, a motor soft starter, or an inverter for starting the 5.5kW or larger motor.

Starting methods

Use the star-delta starting method or an inverter to start the pump.

- If the full-voltage starting of the motor with a simple electric power circuit is taken, wiring work will be easy; however, the motor and electric devices are subject to a high striking current that will be 5 times, 6 times, or even 7 times larger than the rated current. This leads to a high starting torque and load to the motor so the use of the inverter is recommended for the safe starting.
- Even if the star-delta starting of the motor is taken, the motor is still subject to a sharp rise of acceleration torque that happens as the circuit transforms from the "Star" shape to the "Delta" shape. This sharp rise can be softened effectively if a proper Star-Delta transform time is determined and set.

Use of an inverter (full-voltage starting)

Use of an inverter allows for control of the motor frequency (revolution), the flow rate, and the delivery head as well as contributes to energy saving and long life. An inverter is used with the full-voltage starting of the motor.

Set the base frequency, the maximum frequency, and the maximum operating voltage, according to the motor specs. The minimum frequency is 25Hz in general. If it's set too low (less than 25Hz), the motor will stumble and heat up as cooling efficiency is lost.

*Consult with your inverter manufacture and your motor manufacture to determine the best combination.
*If the inverter is used for the motor control, an Iwaki DRN series pump protector can not be used.

Sensors

To protect the pump and monitor:

- A motor power current to detect, alert, and stop a significant load change.
- Pressure to detect, alert, and stop a significant pressure change.
- Flow volume to detect, alert, and stop a significant flow change.
- Liquid level to detect, alert, and stop a significant level change of the tank liquid.

*Monitor two or more items above for ensuring safe operation. An Iwaki DRN series pump protector will be a solution. Contact us for detail.

Operation

This section describes pump operation and programming. Run the pump after plumbing and wiring are completed.

Points to be observed

- To keep good cooling efficiency, clean the pump/motor surface at regular intervals.
- Do not run pump dry. If the suction valve is closed, the pump runs dry.
  *If you notice the pump runs dry, do not open a valve to deliver liquid to the pump. Or heat shock may crack the internal parts of the pump. Leave it for more than one hour to cool them down.
- Check the rotational direction of the pump. Clockwise rotation seen from the motor end is correct.
- Reverse rotation of the motor/pump leads to fatal damage.
- Stop the pump immediately when it is running under cavitation.
- Stop the pump immediately when air is entrained from the suction line.
- Decoupling of the drive magnet and the driven magnet brings about eddy current, Joule heat as the eddy current is lost, and eventually an unacceptable hot motor. Stop the pump immediately and leave it for more than one hour to cool it down. The magnets will be coupled again as the pump is turned ON (or they may not be coupled if they have been demagnetized considerably by the heat.).
- If the motor power is cycled, observe the minimum interval of 10 minutes. Or the internal parts are aged faster or worn excessively.
- Keep liquid temperature change within 80˚C (176˚F) at any time during operation or stop.
- Close the discharge valve and then start the pump to avoid water hammer (and slowly open the discharge valve to the desired level).
- Closed-discharge operation should be within one minute, or friction heat builds up and damages the internal parts of the pump.
- If power is interrupted while the pump is running, turn off the external switch of the pump immediately and close a discharge valve.
- Do not exceed the maximum operating pressure of the pump.
- The surface temperature of the pump or pipe rises high along with liquid temperature in or right after operation. Take preventive measures.

Liquid temperature	Surface temperature (at ambient 40°C=104°F)
80°C (176°F)	80°C (176°F)

- In case the operating noise interrupts communication between operators to secure a safety or adversely affects human health, provide a noise reduction cover.

Model	Noise level
AMP40-1/50-1	90dB
AMP65-1	95dB

Before operation

Check plumbing and wiring are correct. Prime the pump and remove air.

Points to be checked

Before operation, check if:

- Connection bolts are tight. Tighten connection bolts at regular intervals as they may become loose over time.
  *To properly hold the rear casing support (161) with the hex head bolts (901.4), unfix the foot support (330) from the base (890) by loosening the hex head bolts (901.7) in advance.
- Liquid level in a supply tank is enough so air won't be entrained into the system.

Priming

In a flooded suction system, take the steps below. In a suction lift system, the suction line and the pump need filled with liquid somehow.

Points to be observed

Be sure to turn off power to stop the pump and related devices before service is performed.

1 Open the suction line.

2 Open the air vent line.
Or open the discharge line instead.

Motor rotation check

Check electric wiring is correct and the motor rotates in the correct direction.

1 Close the discharge valve.
The suction line and the pump must be filled with liquid.

2 Turn ON the pump.

3 Run the pump for a very short time (0.5 sec.).
If the inverter is used, slowly raise the frequency to 10-15Hz and then reduce to 0Hz.

4 Check the motor rotates in the direction of the arrow mark.
The correct direction is the CW direction seen from the motor end.

5 Check the motor fan stops smoothly.
If necessary, check the rotating parts of the pump.

Degassing

The air/gas in the pump and plumbing is the obstacle to liquid delivery and needs to be expelled before the pump is started.

1 Open the suction line.

2 Open the air vent line.

If the air vent line is not provided or if its piping resistance is too high, open the discharge valve instead.

NOTE

Do not open the discharge valve too much. Or liquid starts to be pumped up before air is completely expelled.

3 Run the pump for a very short time (0.5 sec.).

If the inverter is used, slowly raise the frequency to 10-15Hz and then reduce to 0Hz.

NOTE

Do not run the pump for a long time. If the pump runs with air or gas, friction heat will build up and damage rotating/sliding parts of the pump.

4 Check the motor fan stops smoothly.

Check the rotating parts of the pump if necessary.

5 Repeat the step 3 and the step 4 until air/gas is expelled completely.

When liquids that generate gas bubbles are delivered or when the suction line is too long, it's going to be hard to remove air/gas. Repeat this momentary run 10 times or more.

6 Close the air vent line.

Commissioning

Read this section before operation.

Points to be observed

- Check for a loose bolt on the pump and plumbing.
- Tighten the hex head bolts (901.4) that hold the rear casing support (161) to 85N•m. Before tightening these bolts, be sure to loosen the hex head bolts (901.7) to unfix the foot support (330) from the base (890). See the Wear part list section on page 38 and the next page and identify the parts.
- Do not run the motor in reverse. Or the pump may be damaged.
- Closed-discharge operation should be within one minute, or friction heat builds up and the damages the internal parts of the pump.
- Observe the minimum flow rate, or the self-radiation mechanism does not work effectively to cool down the sliding parts (bearing/spindle) and rotating parts (mouth ring/liner ring).

Models	2P
AMP40/50/65	50L/min

Starting process

Take the steps below to start up.

1 Open the suction line.

Adjust the discharge valve to the minimum flow rate.

NOTE

Closed-discharge operation or closed-suction damages the pump. Do not keep a valve closed in operation.

2 Run the pump and check for abnormal noise or vibration.

If necessary, stop the pump and determine/remove the root cause of abnormal noise/vibration.

3 Further open the discharge valve to the desired flow rate and pressure.

Turn the valve slowly so water hammer won't happen.

4 Check for flow, pressure, noise and vibration.

If necessary, stop the pump and determine/remove the root cause of abnormality.

NOTE

If you notice any abnormal or dangerous conditions, suspend operation immediately and inspect/solve problems. See the troubleshooting section as well.

Shut-down process

Take the steps below to shut it down.

Points to be observed

- If pump operation is stopped in cold weather, liquid inside the pump cavity may freeze and damage the pump. Be sure to drain liquid completely. If the liquid is harmful, empty and then flush it out. In case of a short term shut down, which does not allow removal of liquids, use a band heater to prevent liquid from freezing.
- In the event of service power failure, turn the power switch off and close the discharge valve.

1 Close the discharge valve slowly to the minimum flow rate.
Risk of water hammer. Do not close the discharge valve sharply.

2 Turn off the pump.

3 Check the motor fan stops smoothly.
Check the rotating parts of the pump if necessary.

Suspension & Restart

When the system is rebooted, special care needs to be taken depending on system conditions.

Points to be observed

- Do not turn on the pump before it stops rotating completely, or the drive magnet and the driven magnet will be decoupled.
- If the system is empty, return to the priming section in this manual and take the full steps to reboot the pump and the system.

- When handling liquids that generate gas bubbles (e.g. sodium hypochlorite), repeat the degassing process until gas is completely expelled from the pump and plumbing.
- When handling liquids that crystallizes (e.g. salt water), the pump bearing and the spindle may be caught in crystallization. Before the system is rebooted, manually turn the motor fan to see if it rotates free. If not, take apart the pump and clean the inside of the pump.
- At a freezing temperature, the pump bearing and the spindle may be caught in a frozen liquid. Before the system is rebooted, manually turn the motor fan to see if it rotates free. If not, take measures to melt the frozen liquid.
- Empty and clean the pump when it is left unused for a long time. Before the system is rebooted, tighten connection bolts to make sure liquid won't leak.

Maintenance

This section describes troubleshooting, maintenance, wear part replacement, exploded view and specifications.

Points to be observed

- Follow instructions in this manual for replacement of wear parts. Do not disassemble the pump beyond the extent of the instructions.
- Always wear protective clothing such as an eye protection, chemical resistant gloves, a mask and a face shield during disassembly, assembly or maintenance work. The specific solution will dictate the degree of protection. Refer to SDS precautions from the solution supplier.
- Risk of electrical shock. Be sure to turn off power to stop the pump and related devices before service is performed.
- Magnetic force of the pump is powerful. When taking apart or putting together the pump, take measures not to catch the finger in the metal parts.
- The magnet drive pump has a pair of strong magnets (the magnet capsule unit and the drive magnet). The strong magnet field could adversely affect the persons who are assisted by electronic devices such as the pacemaker.

NOTE

- It's not the manufacturer's responsibility for any failure due to corrosion or erosion occurred in your operating condition.
- When repair is needed to our pumps, contact us or the manufacturer of the machine in which our product is built.
- Be sure to drain chemicals and flush the inside of the pump before return. Or harmful chemicals may spill out in transit.

Troubleshooting

First check the following points. If the following measures do not help remove problems, contact your nearest distributor.

Sign	Possible status	Possible causes	Corrective actions	Possible damage
Unusual vibration/ noise	Pump runs dry.	Pump is not primed.	Prime the pump and the suction line.	• Scratched/cracked sliding/rotating parts • Fused plastic parts • A damaged casing
		An empty tank		
		Closed suction line		
	Pump runs with entrained air.	Air was not fully expelled in the degassing process.	Make sure air is expelled before operation.	• Scratched/cracked sliding/rotating parts • Fused plastic parts • A cracked impeller • A damaged casing
		An air pocket in the suction line	Remove an arched suction line.	
		A low liquid level in the tank	Monitor/observe the minimum liquid level.	
		A broken water-/ air-tightness	Tighten connection bolts.	

Sign	Possible status	Possible causes	Corrective actions	Possible damage
Unusual vibration/ noise	Cavitation	Pipe resistance of the suction line is too high.	Use a wider/shorter/ straighter pipe.	• Scratched/cracked sliding/rotating parts • Fused plastic parts • A cracked impeller • A damaged casing
		Foreign matter in the suction line	Install a screen baffle in the supply tank.	
		A clogged strainer	Clean it at intervals.	
	Clogged with foreign matter or slurry particles	Foreign matter or slurry particles from the supply tank.	Install a screen baffle in the supply tank.	• Scratched/cracked sliding/rotating parts • Fused plastic parts • A clogged self-radiation path • A cracked impeller • Foreign matter in the impeller • Damaged magnet capsule and rear casing • A damaged casing
	A closed suction line	A closed valve in the suction line	Observe the correct starting process.	• Scratched/cracked sliding/rotating parts • Fused plastic parts • A damaged casing
		A clogged strainer	Clean it at intervals. Monitor the suction line pressure.	
	Too much pump output	The discharge valve is opened too much.	Adjust valve opening. Monitor the motor current as well.	–
		A flow into a branched line.	Use the main line.	
	Loose connection bolts	Rated torque was not observed.	Tighten by the rated torque.	–
		Bolts are loosened in operation.	Tighten bolts at intervals.	
	Pump is not mounted properly.	Pump-baseplate fixing bolts are loose.	Tighten to a higher torque.	–
		No plumbing support	Install plumbing supports.	
		Pump is stumbling.	Select a level and rigid foundation.	
Low discharge pressure	Pump runs dry.	Pump is not primed.	Prime the pump and the suction line.	• Scratched/cracked sliding/rotating parts • Fused plastic parts • A damaged casing
		An empty tank		
		Closed suction line		
	Pump runs with entrained air.	Air was not fully expelled in the degassing process.	Make sure air is expelled before operation.	• Scratched/cracked sliding/rotating parts • Fused plastic parts • A cracked impeller • A damaged casing
		An air pocket in the suction line	Remove an arched suction line.	
		A low liquid level in the tank	Monitor/observe the minimum liquid level.	
		A broken water-/ air-tightness	Tighten connection bolts.	

Sign	Possible status	Possible causes	Corrective actions	Possible damage
Low discharge pressure	Cavitation	Pipe resistance of the suction line is too high.	Use a wider/shorter/straighter pipe.	• Scratched/cracked sliding/rotating parts • Fused plastic parts • A cracked impeller • A damaged casing
		Foreign matter in the suction line	Install a screen baffle in the supply tank.	
		A clogged strainer	Clean it at intervals.	
	Clogged with foreign matter or slurry particles	Foreign matter or slurry particles from the supply tank.	Install a screen baffle in the supply tank.	• Scratched/cracked sliding/rotating parts • Fused plastic parts • A clogged self-radiation path • A cracked impeller • Foreign matter in the impeller • Damaged magnet capsule and rear casing • A damaged casing
	A closed suction line	A closed valve in the suction line	Observe the correct starting process.	• Scratched/cracked sliding/rotating parts • Fused plastic parts • A damaged casing
		A clogged strainer	Clean it at intervals. Monitor the suction line pressure.	
	Too much pump output	The discharge valve is opened too much.	Adjust valve opening. Monitor the motor current as well.	–
		A flow into a branched line	Use the main line.	
	Motor runs in reverse.	Wrong electric wiring	Correct wiring.	–
	The drive/driven magnets are decoupled.	Overload operation	Observe the rated motor current.	–
		Water hummer at start up	Remove air from the pump and the discharge line.	
High discharge pressure	The min flow rate is not satisfied.	A closed discharge valve	Adjust the valve to meet the min flow rate.	• Scratched/cracked sliding/rotating parts • Fused plastic parts • A damaged casing
		Pipe resistance of the discharge line is too high.	Adjust the discharge valve, remove air, and clean the strainer.	
Unstable discharge pressure	Entrained air	Air is not expelled completely.	Remove air completely.	• Scratched/cracked sliding/rotating parts • Fused plastic parts • A cracked impeller • A damaged casing
		An air pocket in the suction line	Remove an arched suction line.	
		A low liquid level in the tank	Monitor/observe the minimum liquid level.	
		A broken water-/air-tightness	Tighten connection bolts.	

Sign	Possible status	Possible causes	Corrective actions	Possible damage
Unstable discharge pressure	Cavitation	Pipe resistance of the suction line is too high.	Use a wider/shorter/ straighter pipe.	• Scratched/cracked sliding/rotating parts • Fused plastic parts • A cracked impeller • A damaged casing
		Foreign matter in the suction line	Install a screen baffle in the supply tank.	
		A clogged strainer	Clean it at intervals.	
	Clogged with foreign matter or slurry particles	Foreign matter or slurry particles from the supply tank.	Install a screen baffle in the supply tank.	• Scratched/cracked sliding/rotating parts • Fused plastic parts • A clogged self-radiation path • A cracked impeller • Foreign matter in the impeller • Damaged magnet capsule and rear casing • A damaged casing
Low suction pressure	Cavitation	Pipe resistance of the suction line is too high.	Use a wider/shorter/ straighter pipe.	• Scratched/cracked sliding/rotating parts • Fused plastic parts • A cracked impeller • A damaged casing
		Foreign matter in the suction line	Install a screen baffle in the supply tank.	
		A clogged strainer	Clean it at intervals.	
	A closed suction line	A closed valve in the suction line	Observe the correct starting process.	• Scratched/cracked sliding/rotating parts • Fused plastic parts • A damaged casing
		A clogged strainer	Clean it at intervals. Monitor the suction line pressure.	
Low pump output	Entrained air	Air is not expelled completely.	Remove air completely.	• Scratched/cracked sliding/rotating parts • Fused plastic parts • A cracked impeller • A damaged casing
		An air pocket in the suction line	Remove an arched suction line.	
		A low liquid level in the tank	Monitor/observe the minimum liquid level.	
		A broken water-/ air-tightness (suction line)	Tighten connection bolts.	
	Cavitation	Pipe resistance of the suction line is too high.	Use a wider/shorter/ straighter pipe.	• Scratched/cracked sliding/rotating parts • Fused plastic parts • A cracked impeller • A damaged casing
		Foreign matter in the suction line	Install a screen baffle in the supply tank.	
		A clogged strainer	Clean it at intervals.	
	Clogged with foreign matter or slurry particles	Foreign matter or slurry particles from the supply tank.	Install a screen baffle in the supply tank.	• Scratched/cracked sliding/rotating parts • Fused plastic parts • A clogged self radiation path • A cracked impeller • Foreign matter in the impeller • Damaged magnet capsule and rear casing • A damaged casing

Sign	Possible status	Possible causes	Corrective actions	Possible damage
Low pump output	A closed suction line	A closed valve in the suction line	Observe the correct starting process.	• Scratched/cracked sliding/rotating parts • Fused plastic parts • A damaged casing
		A clogged strainer	Clean it at intervals. Monitor the suction line pressure.	
	Motor runs in reverse.	Wrong electric wiring	Correct wiring.	–
	The drive/driven magnets are decoupled.	Overload operation	Observe the rated motor current.	–
		Water hummer at start up	Remove air from the pump and the discharge line.	
No pump output	Pump runs dry.	Pump is not primed.	Prime the pump and the suction line.	• Scratched/cracked sliding/rotating parts • Fused plastic parts • A damaged casing
		An empty tank		
		Closed suction line		
	Pump runs with entrained air.	Air was not fully expelled in the degassing process.	Make sure air is expelled before operation.	• Scratched/cracked sliding/rotating parts • Fused plastic parts • A cracked impeller • A damaged casing
		An air pocket in the suction line	Remove an arched suction line.	
		A low liquid level in the tank	Monitor/observe the minimum liquid level.	
		A broken water-/air-tightness	Tighten connection bolts.	
	The min flow rate is not satisfied.	A closed discharge valve	Adjust the valve to meet the min flow rate.	• Scratched/cracked sliding/rotating parts • Fused plastic parts • A damaged casing
		Pipe resistance of the discharge line is too high.	Adjust the discharge valve, remove air, and clean the strainer.	
	Clogged with foreign matter or slurry particles	Foreign matter or slurry particles from the supply tank.	Install a screen baffle in the supply tank.	• Scratched/cracked sliding/rotating parts • Fused plastic parts • A clogged self-radiation path • A cracked impeller • Foreign matter in the impeller • Damaged magnet capsule and rear casing • A damaged casing
	A closed suction line	A closed valve in the suction line	Observe the correct starting process.	• Scratched/cracked sliding/rotating parts • Fused plastic parts • A damaged casing
		A clogged strainer	Clean it at intervals. Monitor the suction line pressure.	
	The drive/driven magnets are decoupled.	Overload operation	Observe the rated motor current.	–
		Water hummer at start up	Remove air from the pump and the discharge line.	

Sign	Possible status	Possible causes	Corrective actions	Possible damage
High motor power current	Clogged with foreign matter or slurry particles	Foreign matter or slurry particles from the supply tank.	Install a screen baffle in the supply tank.	• Scratched/cracked sliding/rotating parts • Fused plastic parts • A clogged self-radiation path • A cracked impeller • Foreign matter in the impeller • Damaged magnet capsule and rear casing • A damaged casing
	Too much pump output	The discharge valve is opened too much.	Adjust valve opening. Monitor the motor current as well.	–
		A flow into a branched line.	Use the main line.	
Low motor power current	Pump runs dry.	Pump is not primed.	Prime the pump and the suction line.	• Scratched/cracked sliding/rotating parts • Fused plastic parts • A damaged casing
		An empty tank		
		Closed suction line		
	Pump runs with entrained air.	Air was not fully expelled in the degassing process.	Make sure air is expelled before operation.	• Scratched/cracked sliding/rotating parts • A cracked impeller • Fused plastic parts • A damaged casing
		An air pocket in the suction line	Remove an arched suction line.	
		A low liquid level in the tank	Monitor/observe the minimum liquid level.	
		A broken water-/air-tightness	Tighten connection bolts.	
	Cavitation	Pipe resistance of the suction line is too high.	Use a wider/shorter/straighter pipe.	• Scratched/cracked sliding/rotating parts • Fused plastic parts • A cracked impeller • A damaged casing
		Foreign matter in the suction line	Install a screen baffle in the supply tank.	
		A clogged strainer	Clean it at intervals.	
	The min flow rate is not satisfied.	A closed discharge valve	Adjust the valve to meet the min flow rate.	• Scratched/cracked sliding/rotating parts • Fused plastic parts • A damaged casing
		Pipe resistance of the discharge line is too high.	Adjust the discharge valve, remove air, and clean the strainer.	
	Clogged with foreign matter or slurry particles	Foreign matter or slurry particles from the supply tank.	Install a screen baffle in the supply tank.	• Scratched/cracked sliding/rotating parts • Fused plastic parts • A clogged self-radiation path • A cracked impeller • Foreign matter in the impeller • Damaged magnet capsule and rear casing • A damaged casing
	A closed suction line	A closed valve in the suction line	Observe the correct starting process.	• Scratched/cracked sliding/rotating parts • Fused plastic parts • A damaged casing
		A clogged strainer	Clean it at intervals. Monitor the suction line pressure.	

Sign	Possible status	Possible causes	Corrective actions	Possible damage
Low motor power current	Motor runs in reverse.	Wrong electric wiring	Correct wiring.	–
	The drive/driven magnets are decoupled.	Overload operation	Observe the rated motor current.	–
		Water hummer at start up	Remove air from the pump and the discharge line.	
Unstable motor power current	Entrained air	Air is not expelled completely.	Remove air completely.	• Scratched/cracked sliding/rotating parts • Fused plastic parts • A cracked impeller • A damaged casing
		An air pocket in the suction line	Remove an arched suction line.	
		A low liquid level in the tank	Monitor/observe the minimum liquid level.	
		A broken water-/ air-tightness	Tighten connection bolts.	
	Cavitation	Pipe resistance of the suction line is too high.	Use a wider/shorter/ straighter pipe.	• Scratched/cracked sliding/rotating parts • Fused plastic parts • A cracked impeller • A damaged casing
		Foreign matter in the suction line	Install a screen baffle in the supply tank.	
		A clogged strainer	Clean it at intervals.	
Hot pump surface	The min flow rate is not satisfied.	A closed discharge valve	Adjust the valve to meet the min flow rate.	• Scratched/cracked sliding/rotating parts • Fused plastic parts • A damaged casing
		Pipe resistance of the discharge line is too high.	Adjust the discharge valve, remove air, and clean the strainer.	
Hot motor surface	Too much pump output	The discharge valve is opened too much.	Adjust valve opening. Monitor the motor current as well.	–
		A flow into a branched line.	Use the main line.	
A leak from a connection point	Loose connection bolts	Rated torque was not observed.	Tighten by the rated torque.	Gaskets becomes inelastic if liquid temperature is too high.
		Bolts are loosened in operation.	Tighten bolts at intervals.	
A leak from the foot support	Pump runs dry.	Pump is not primed.	Prime the pump and the suction line.	–
		An empty tank		
		Closed suction line		
	Entrained air	Air is not expelled completely.	Remove air completely.	• Scratched/cracked sliding/rotating parts • Fused plastic parts • A cracked impeller • A damaged casing • The rear casing hits against the drive magnet.
		An air pocket in the suction line	Remove an arched suction line.	
		A low liquid level in the tank	Monitor/observe the minimum liquid level.	
		A broken water-/ air-tightness	Tighten connection bolts.	

Sign	Possible status	Possible causes	Corrective actions	Possible damage
A leak from the foot support	Cavitation	Pipe resistance of the suction line is too high.	Use a wider/shorter/straighter pipe.	• Scratched/cracked sliding/rotating parts • Fused plastic parts • A cracked impeller • A damaged casing • The rear casing hits against the drive magnet.
		Foreign matter in the suction line	Install a screen baffle in the supply tank.	
		A clogged strainer	Clean it at intervals.	
	The min flow rate is not satisfied.	A closed discharge valve	Adjust the valve to meet the min flow rate.	• Scratched/cracked sliding/rotating parts • Fused plastic parts • A damaged casing • The rear casing hits against the drive magnet.
		Pipe resistance of the discharge line is too high.	Adjust the discharge valve, remove air, and clean the strainer.	
	Clogged with foreign matter or slurry particles	Foreign matter or slurry particles from the supply tank.	Install a screen baffle in the supply tank.	• Scratched/cracked sliding/rotating parts • Fused plastic parts • A clogged self-radiation path • A cracked impeller • Foreign matter in the impeller • Damaged magnet capsule and rear casing • A damaged casing • The rear casing hits against the drive magnet.
	A closed suction line	A closed valve in the suction line	Observe the correct starting process.	• Scratched/cracked sliding/rotating parts • Fused plastic parts • A damaged casing • The rear casing hits against the drive magnet.
		A clogged strainer	Clean it at intervals. Monitor the suction line pressure.	
	Water hummer	Sharp valve operation (discharge line)	Slowly operate the valve.	• A damaged casing • The rear casing hits against the drive magnet.
		An air pocket in the suction line	Remove an arched suction line.	

Inspection

Perform daily and periodic inspection to keep the best pump performance and safety.

Daily inspection

Check the following points. If you notice any abnormal or dangerous conditions, suspend operation immediately and inspect/solve problems. See the troubleshooting section as necessary.
When wear parts come to the life limit, replace them with new ones. Contact your distributor for detail.

No.	States	Points to be checked
1	Evidence of a leak	• A leak point. Do not go without solving problems.
2	Pumping	• If liquid is pumped. Use the flow meter.
		• If the suction pressure and the discharge pressure are at the rated level.
		• If the liquid level in the tank is not too low.
		• If liquid has deteriorated, crystallized or settled.
3	Noise and vibration	• If abnormal noise or vibration occurs. They are signs of abnormal operation.
4	Air ingress from the pump head joints and the suction line	• If a leak occurs. • If pumped liquid includes air bubbles, check lines for leakage and retighten as necessary.
5	Motor power current	• If the motor power current is too high. That's the sign of overpressure. See the motor spec for the rated current.
6	Parameters	• If pressure, a flow rate, or the motor power current is greatly changed. They are signs of abnormal operation. See the troubleshooting section and take effective measures.
7	Spare pump	• If a spare pump is stored, run it from time to time to keep it ready for operation at any time when needed.

Periodic inspection

To ensure efficient and smooth operation, take apart the pump and check the internal conditions at regular intervals (6 months). Be careful not to have a big impact on internal sliding parts and plastic parts. Since the magnets used in the pump are powerful, be careful not to catch your fingers or hand between them during disassembly or assembly. Also, keep the magnet unit away from any electronic device that could be affected by a strong magnetic field.

Part names	Points to be checked	Measures
Drive magnet	Wear tracks	Contact us.
	If the drive magnet is correctly mounted with hex. socket set screws and they are not loose.	Remount the drive magnet to the motor shaft and tighten the screws.
	Decentering of magnet and motor shaft (Max.1/10mm)	Retighten the hex. socket set screws or check the motor. Contact us as necessary.
Rear casing	Wear tracks	Contact us.
	Cracked wet ends	
	Worn-out rear thrust ring	
	Worn-out spindle	
	Dirty parts	Clean parts.
Magnet capsule (driven magnet)	Wear tracks	Contact us.
	Cracks	
	Worn-out bearing. See next page.	
	Loose impeller	
Impeller	Worn-out mouth ring. See later page 37.	Contact us.
	Cracks	
	Clogged impeller	Clean the impeller.
	Deformation	Contact us.
Front casing	Dirty wet ends	Clean parts.
	Cracks	Contact us.
	Cracked/Worn-out liner ring	
	Cracked gasket	
	Wear tracks	
	Clogged drain port	Clean the port. If necessary, contact us.
Spindle	Cracks	Contact us.
	Worn-out spindle. See next page.	

Wear limits of bearing and spindle

Check wear degree of the bearing and spindle.

Model	Bearing I.D.		Spindle O.D.	
	Before use	**Wear limit**	**Before use**	**Wear limit**
AMP40-1/50-1	26mm	27mm	26mm	25mm
AMP65-1	30mm	31mm	30mm	29mm

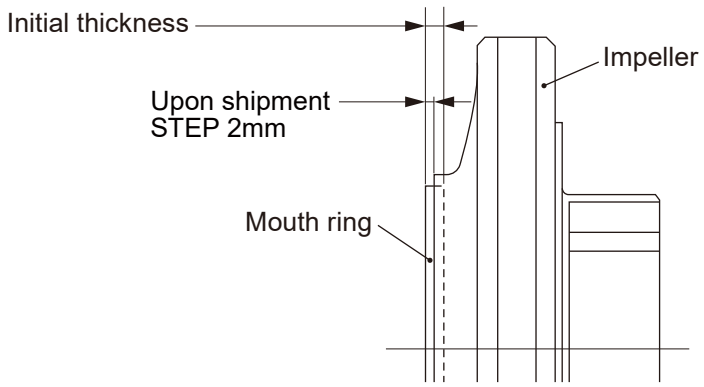
- For the pumps with the carbon bearing and the alumina ceramic spindle (CF type), if the clearance between the bearing and the spindle exceeds 1mm, either of them, whichever has greater wear, should be replaced no matter whether the wear limit is exceeded or not.
- For pumps with the SiC bearing and SiC spindle (KK type), if the clearance between the bearing and spindle exceeds 1mm, replace both the bearing and spindle together, regardless of whether the wear limit is exceeded.
- Initial wear may appear in the sliding part during the early stages of operation. This should not be mistaken for an abnormal condition.

Wear limits of mouth ring

Check wear degree of the mouth ring.

Model	Mouth ring thickness	
	Initial thickness	Wear limit
AMP40-1	8mm	6mm
AMP50-1/65-1	9mm	7mm

The step between the surfaces of the mouth ring and the impeller upon shipment is 2mm. Replacing the mouth ring is recommended before this step is reduced to zero.



Wear part replacement

Appropriate spare parts are necessary to ensure continued pump operation. Expendable parts shown below should always be kept on hand. When placing orders, supply the following information.

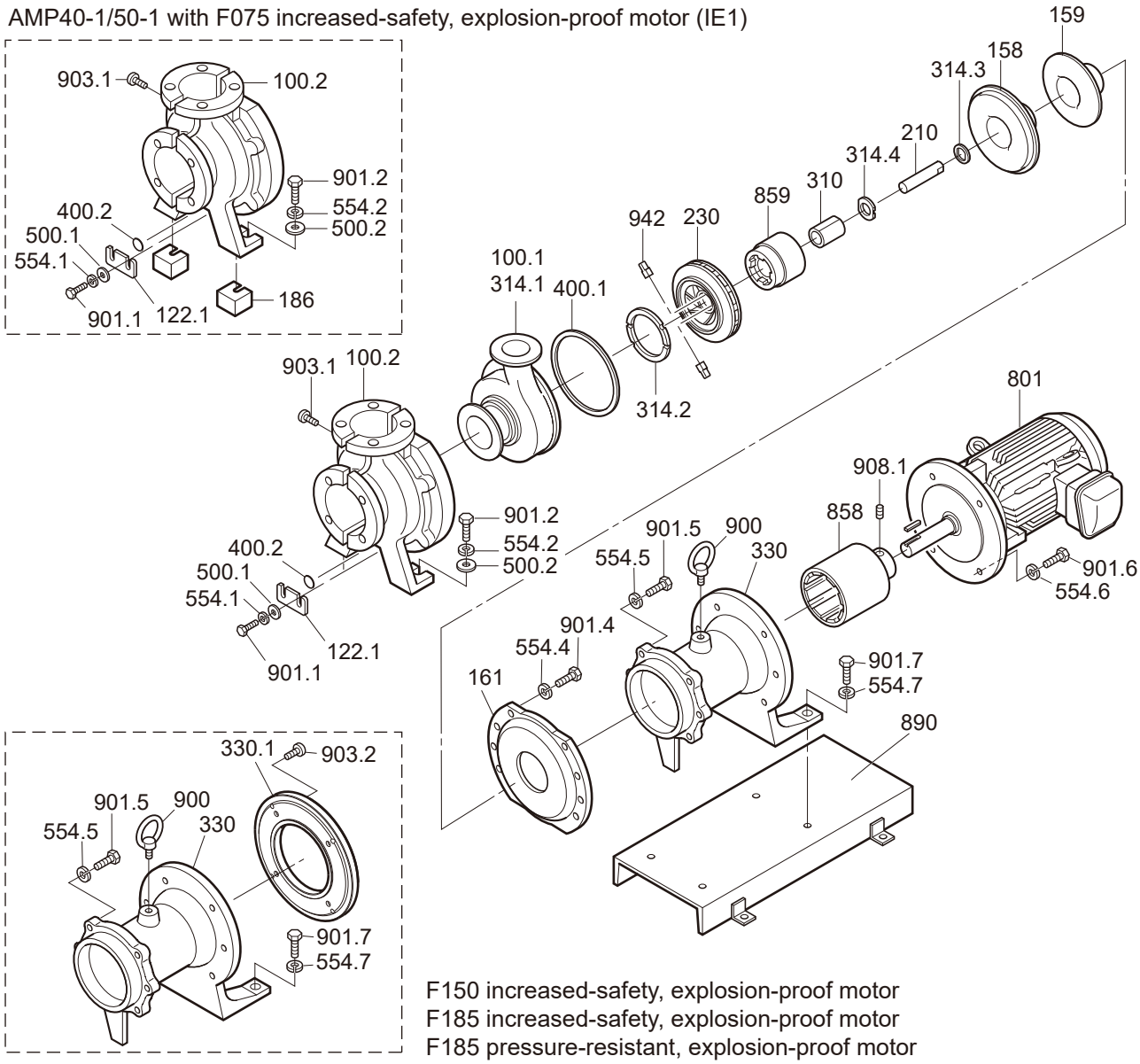
1. Part names and part number (see the diagram below.)
2. Pump model identification code and manufacturing number (see the pump nameplate.)
3. Drawing number (if you have received a certified drawing)

! Precautions

- Solution in the discharge line may be under pressure. Release the pressure from the discharge line before disconnecting plumbing or disassembly of the pump to avoid solution spray.
- Rinse and clean wet ends thoroughly with tap water.

Wear part list

AMP40-1/50-1 with F075 increased-safety, explosion-proof motor (IE1)



F150 increased-safety, explosion-proof motor
F185 increased-safety, explosion-proof motor
F185 pressure-resistant, explosion-proof motor

No.	PARTS NAME	WET ENDS/MOTOR OUTPUT	Q'ty			NOTES
			AMP40-1	AMP50-1	AMP65-1	
100.1 + 314.1	Front casing	KK/CF	1	1	1	
100.2 + 903.1	Cover unit	KK/CF	1	1	1	
122.1	Drain plate		1	1	1	
158	Rear casing	KK/CF	1	1	1	
159	Rear casing cover	KK/CF	1	1	1	
161	Rear casing support	KK/CF	1	1	1	
186	Spacer	F075 increased-safety, explosion-proof (IE1)	2	2		
210	Spindle	KK/CF	1	1	1	
230	Impeller		1	1	1	
230 + 314.2	Impeller assembly		1	1	1	
230 + 310 + 314.2 + 314.4 + 859 + 942	Impeller-Magnet capsule assembly		1	1	1	
310	Bearing	KK/CF	1	1	1	
314.2	Mouth ring	KK/CF	1	1	1	
314.3	Rear thrust ring	KK/CF	1	1	1	
314.4	Rear ring	KK/CF	1	1	1	
330 + 900	Foot support	F037	1	1		
		F055/F075	1	1	1	
		F075 increased-safety, explosion-proof (IE1)	1	1	1	
		F110/F150/F185			1	
330.1	Motor adapter	F150 increased-safety, explosion-proof F185 increased-safety, explosion-proof F185 pressure-resistant, explosion-proof			1	
400.1	Gasket	PTFE	1	1	1	
400.2	Drain gasket	PTFE	1	1	1	
500.1	Plain washer		2	2	2	
500.2	Plain washer		2	2	2	
554.1	Spring washer		2	2	2	
554.2	Spring washer		2	2	2	
554.4	Spring washer		8	8	8	
554.5	Spring washer		4	4	4	
554.6	Spring washer		4	4	4	
554.7	Spring washer		2	2	2	
801	Motor					
858 + 908.1	Drive magnet unit		1	1	1	
859	Magnet capsule unit		1	1	1	
890	Base plate		1	1	1	
900	Eye bolt		1	1	1	
901.1	Hex. head bolt		2	2	2	
901.2	Hex. head bolt		2	2	2	
901.4	Hex. head bolt		8	8	8	
901.5	Hex. head bolt		4	4	4	
901.6	Hex. head bolt		4	4	4	
901.7	Hex. head bolt		2	2	2	
903.1	Hex. socket head cap screw		5	5	5	
903.2	Hex. socket head cap screw	F150 increased-safety, explosion-proof F185 increased-safety, explosion-proof F185 pressure-resistant, explosion-proof			4	
908.1	Hex. socket set screw		2	2	2	
942	Pin		2	2	2	

*The F075 increased-safety, explosion-proof motor (IE3) consists of the same parts as our standard TOSHIBA TEFC motor.

Disassembly/Assembly

Points to be observed

- Follow instructions in this manual for replacement of wear parts. Do not disassemble the pump beyond the extent of the instructions.
- Always wear protective clothing such as an eye protection, chemical resistant gloves, a mask and a face shield during disassembly, assembly or maintenance work. The specific solution will dictate the degree of protection. Refer to SDS precautions from the solution supplier.
- Risk of electrical shock. Be sure to turn off power to stop the pump and related devices before service is performed.
- Magnetic force of the pump is powerful. When taking apart or putting together the pump, take measures not to catch the finger in the metal parts.
- The magnet drive pump has a pair of strong magnets (the magnet capsule unit and drive magnet). The strong magnet field could adversely affect the persons who are assisted by electronic devices such as the pacemaker.

Before disassembly

1 Turn off the power and stop the pump.

2 Close the suction line and the discharge line.

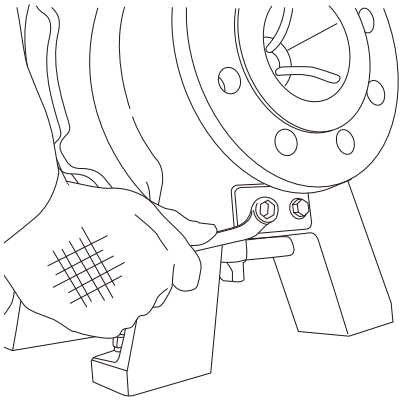
3 Tag motor wires with U(R), V(S), and W(T) codes.
Make sure the motor turns in the correct direction after maintenance is finished.

■ Necessary tools

No.	Tools	NOTES	Q'ty
1	Spanner	13mm/19mm/24mm	1 each
2	Hex wrench	4mm/5mm	1 each
3	Bearing press (plastic round bar)	ø34×100L	1 each
4	Plastic welder or industrial dryer	–	1
5	Handpress	–	1
6	A flathead screwdriver	–	1
7	Longnose pliers	–	1
8	Plastic hammer	–	1
9	Bar	–	2
10	Belt wrench	–	1
11	Metal file	–	1

Pump disassembly

1 For the pump with the drain port, remove the hex head bolts (901.1) and the drain plate (122.1) to drain liquid out of the pump. Flush out remains with clean water. For the pump without the drain port, chemically neutralize the liquid in the pump and plumbing, and open a drain valve in the suction line to empty the pump. Flush out remains with clean water.

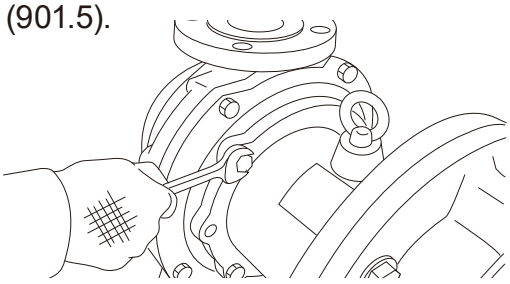


NOTE

- Solution in the discharge line may be under pressure. Release the pressure from the pump and discharge line before disconnecting plumbing or disassembly of the pump to avoid solution spray.
- Try to slowly loosen the hex head bolts just in case the pressure remains in the pump.

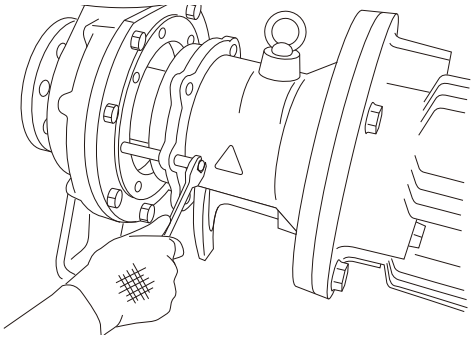
2 Remove the mounting bolts (901.7) of the foot support (330).

3 Remove the foot support-pump head mounting bolts (901.5).



4 Use the attached back pull-out bolts to separate the motor from the pump.

- Thread two bolts through the foot support, one on each side of casing. Alternate from side to side to jack the front casing off the foot support evenly to the distance of 80mm (3.14").

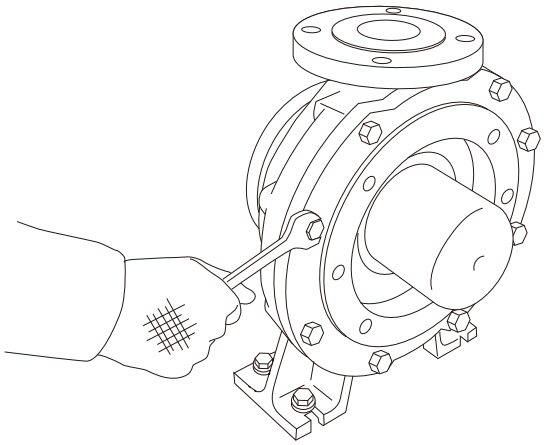


5 Use an overhead crane or any other proper transporting machine to catch/hold the motor (and the foot support) horizontally and pull it back.

- While the motor is lifted up, make sure the drive magnet (858) does not hit the rear casing (158).
- Always keep the motor level.

6 Remove the hex head bolts (901.4) and remove the rear casing supports (161).

If the rear casing support sticks to the cover (100.2), leverage a bar. Be careful not to bite the plastic parts and gaskets with the bar.

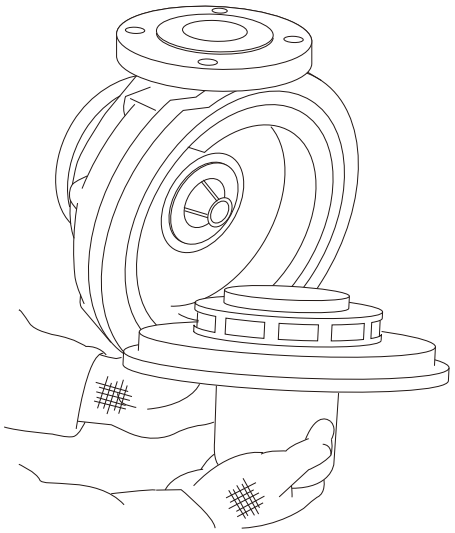


7 Pull out the rear casing cover (159) from the rear casing (158).

If the rear casing cover is difficult to remove, rotate slightly as you pull it from the front casing. If necessary, use a belt wrench and softly turn the rear casing cover.

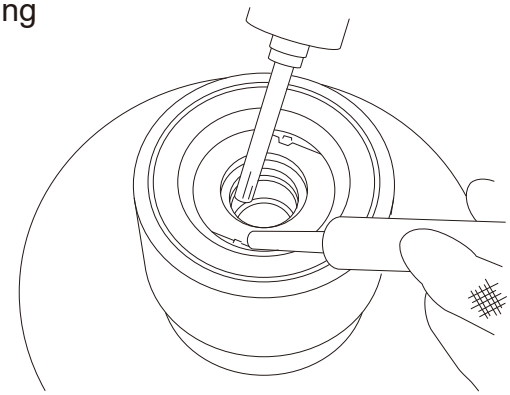
*Do not damage the plastic rear casing.

*The impeller (230) and the magnet capsule unit (859) come out together with the rear casing. Do not drop.



Impeller/Bearing removal

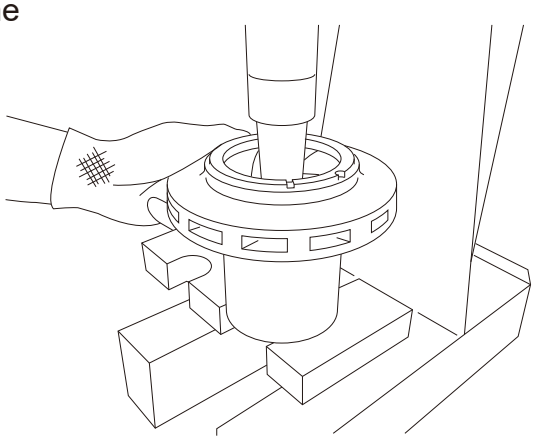
1 Stand up two weld tabs on the rear ring (314.4) using a plastic welder or an industrial dryer.



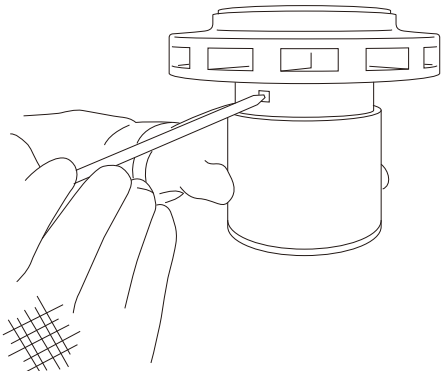
2 Use a hand press and plastic round bar to push the bearing (310) out of the magnet capsule unit.

Use the following bar.

O.D.	Length
34mm (1.33")	100mm (3.93")

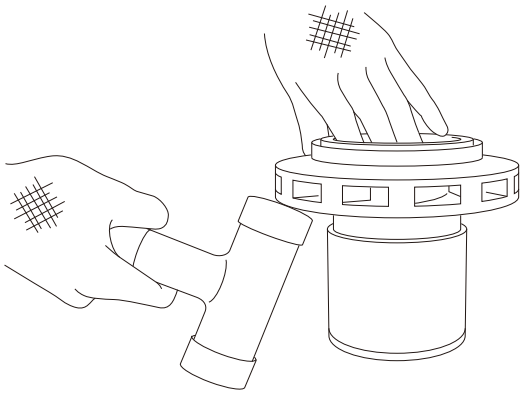


3 Push off the impeller pins (942).



4 Detach the impeller from the magnet capsule unit.

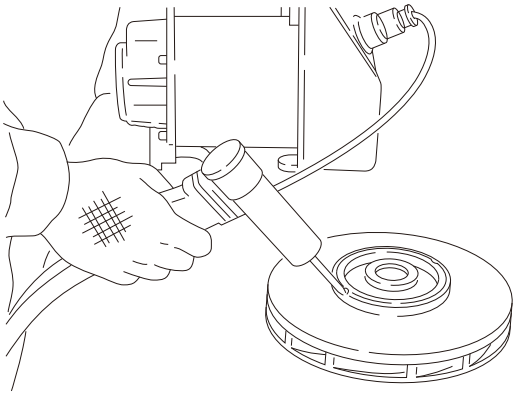
Use a plastic hummer if necessary.



Mouth ring replacement

1 Heat the tabs on the mouth ring (314.2) with a plastic welder or an industrial dryer and open them up.

Remove the worn mouth ring. If necessary, immerse the impeller into a hot water (90°C/194°F) for easier removal.



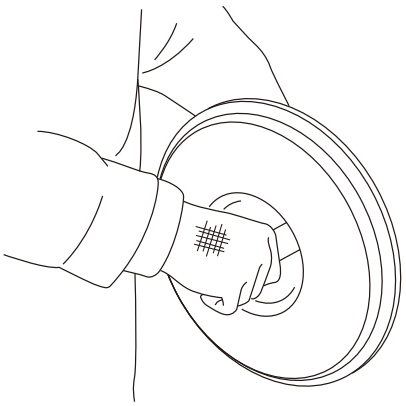
2 Replace the new mouth ring and use a plastic welder or an industrial dryer to hold it with tabs.

If necessary, immerse the impeller into a hot water (90°C/194°F) for easier mounting.

Spindle replacement

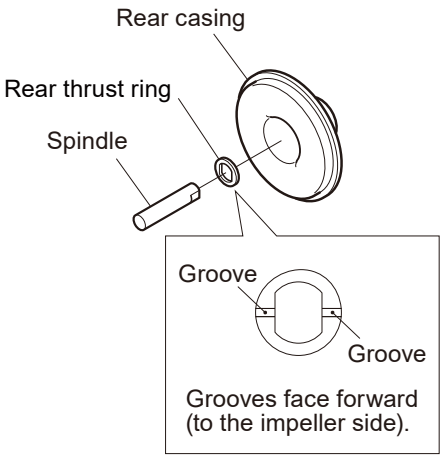
1 Simply remove the spindle (210) from the rear casing.

- The spindle is slightly pressed into the rear casing. If necessary, immerse the rear casing into a hot water (90°C/194°F) for easier removable.
- Holding the worn spindle in one hand and rear casing in the other, rock the spindle slightly as you pull them apart.



2 Align and insert the rear thrust ring (314.3) and spindle into the rear casing by hand.

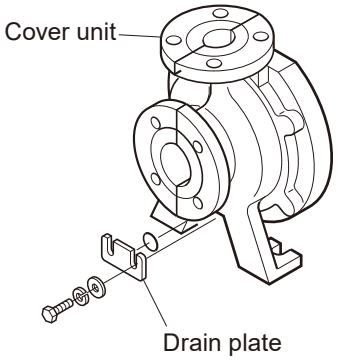
- Clean any foreign matter or build-up on the rear casing.
- Make sure that rear thrust ring grooves are facing forwards (to the impeller side).
- Use a hand press if the spindle is difficult to insert into the rear casing.



Front casing/Cover unit replacement

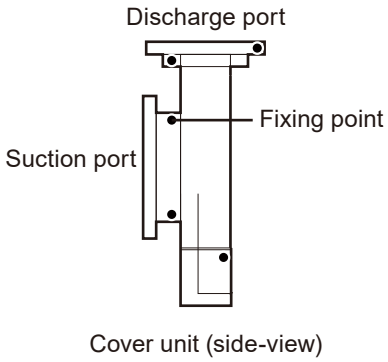
See the wear parts replacement section on page 38 for the models that can replace the cover unit (100.2) and the front casing (100.1).

1 Remove the drain plate (122.1) from the cover unit (100.2).



2 Remove all the hex. socket head cap screws (903.1).

The cover unit is fixed at the fixing points as shown in the right figure (The fixing points changes depending on the pump model.).



Cover unit (side-view)

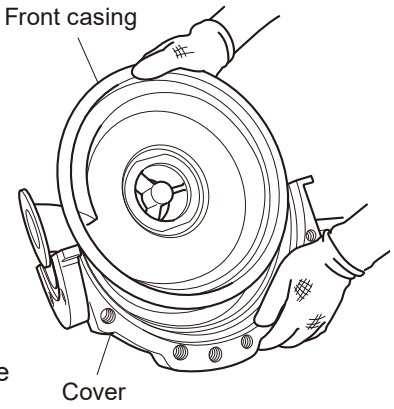
3 Detach the cover halves from the front casing.

4 Align and install the new front casing into the covers.

- Clean any foreign matter or build-up on the contacting surfaces of the covers before putting them together.
- Should the front casing be hard to be mounted in the covers, heat the front casing in warm water to 90°C (194°F) to help this step.

NOTE

Be careful not to get scalded with hot water.



- If the new cover unit is used:

The cover halves have sharp edges on their contacting surfaces. Remove them with a metal file so that the front casing will not be damaged.

NOTE

This pump uses a pair of strong magnets (the drive/driven magnets). Confirm that there are no metal pieces or other matter adhering to these magnets. If necessary, use an air blow gun and a dry cloth to remove them.

5 Secure all hex. socket head cap screws tightly to fix the covers.

6 Tighten the drain and air vent cover hex. bolts.

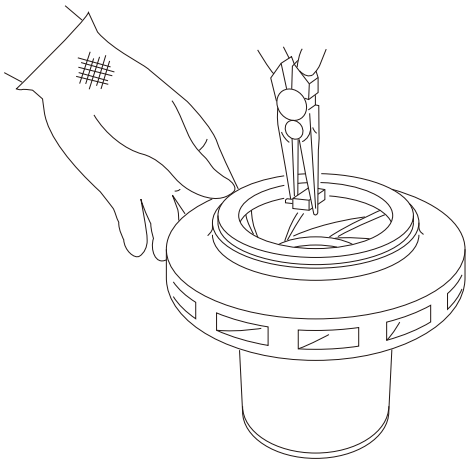
Impeller/Bearing mounting

1 Align and attach the impeller onto the magnet capsule unit.

- Ensure that the impeller has bottomed within the magnet capsule unit and the impeller securing ports are aligned.
- If the impeller does not go in easily, warm the magnet capsule unit in hot water about 90°C/194°F.

2 Insert impeller pins.

- Use needle nose pliers to correctly position pins in impeller and magnet capsule unit.
- If the impeller pins do not go in easily, warm the impeller and magnet capsule unit in hot water about 90°C/194°F before putting in the pins.

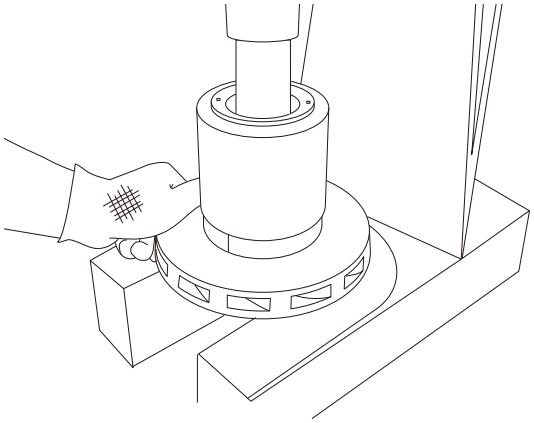


3 Use a hand press and a plastic round bar to press the bearing (310) into the magnet capsule unit.

Use the following bar.

O.D.	Length
34mm (1.33")	100mm (3.93")

*Do not use excessive force that may break the plastic/ceramic mouth ring.



4 Use a hand press to press the new rear ring (314.4) into the magnet capsule unit.

5 Use a plastic welder or an industrial dryer to hold the rear ring with tabs.

Pump reassembly

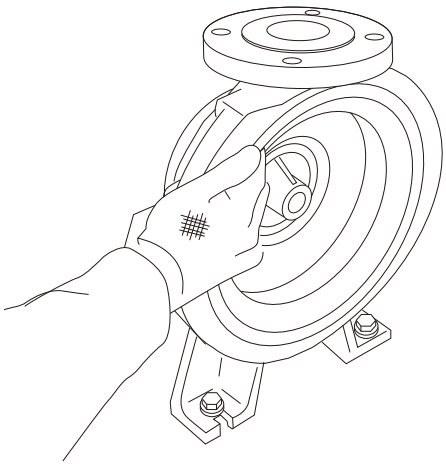
Take the following steps and put together the disassembled pump.

NOTE

- Do not reuse gaskets. Always replace them with new ones, or sealing performance reduces. Clean sealing areas and fit gaskets in place.
- A good seal from the new gasket (400.1) is established in between the front casing (100.1) and the rear casing (158) when the hex head bolts (901.4) are tightened at the rated torque; however, the gasket and the plastic casings start creeping if they are pressed over time. To keep the good seal, wait 4 hours after the hex head bolts (901.4) are tightened first so the plastic parts will creep enough, and then tighten the hex head bolts by the rated torque again.
- Tighten bolts diagonally and evenly by the rated torque before initial operation and at regular intervals.
- The magnetic force of the pump is powerful. Take care not to catch the finger in the foot support. Do not allow iron pieces/powder to adhere to the magnet capsule unit.

1 For the pump with the drain port, attach the drain gasket (400.2) and the drain plate (122.1) to the front casing (or the cover unit), and then fasten the hex head bolts (901.1).
Tighten the bolts diagonally and evenly by 8N•m.

2 Fit the new gasket onto the front casing (100.1).



3 Place the magnet capsule unit (plus the impeller) onto the spindle in the rear casing.
Slowly rotate and fit the rear casing to the front casing.

4 Mount the rear casing cover on the rear casing and place the rear casing support.
Secure rear casing support by tightening hex head bolts (901.4) diagonally and evenly to 85N•m.

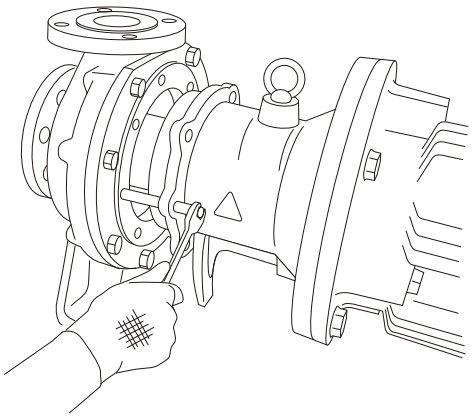
5 Clean the drive magnet (858) if iron objects stick to the surface.

6 Use the attached back pull-out bolts threaded about half-way through the foot support (330) to ease two assemblies together.

7 Use an overhead crane or any other proper transporting machine to catch/hold the motor (and the foot support) horizontally and shift it to the pump.

- Insert the drive magnet (858) into the foot support (330) taking care to align it such that drive magnet does not contact the rear casing.
- Always keep the motor level.

8 Once the back pull-out bolts come in contact with the rear casing support of the pump, start loosening the bolts gradually and alternately until the motor "lands" on the pump.



9 Tighten the foot support-rear casing fixing bolts.

NOTE

Magnetic force of the pump is powerful. When taking apart or putting together the pump, take measures not to catch the finger in the metal parts.

Drive magnet demounting

Make sure the motor is electrically-disconnected in advance.

NOTE

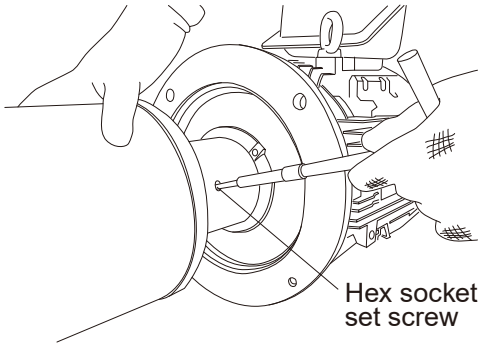
If the motor were to run in this process, personal injury would result.

1 Remove the motor (and foot support) from the pump head.

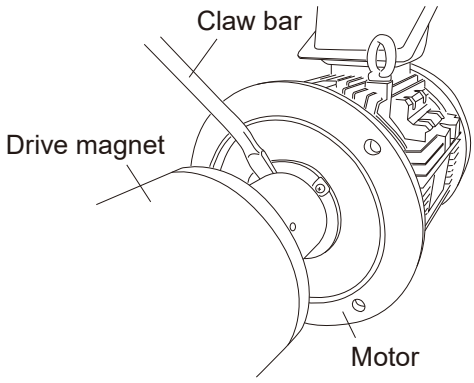
See the Pump disassembly section on page 41.

2 Remove the hex head bolts (901.6) and the foot support from the motor.

3 Loosen the hex socket set screws (908.1) and demount the drive magnet (858) from the motor shaft.



If necessary, leverage a claw bar as shown below. Do not use excessive force that may damage the motor shaft.



Drive magnet mounting

Make sure the motor is electrically-disconnected in advance.

NOTE

If the motor were to run in this process, personal injury would result.

1 Clean the motor shaft surface and the shaft hole of the drive magnet.

Use a sand paper or sand blaster to remove burrs if necessary.

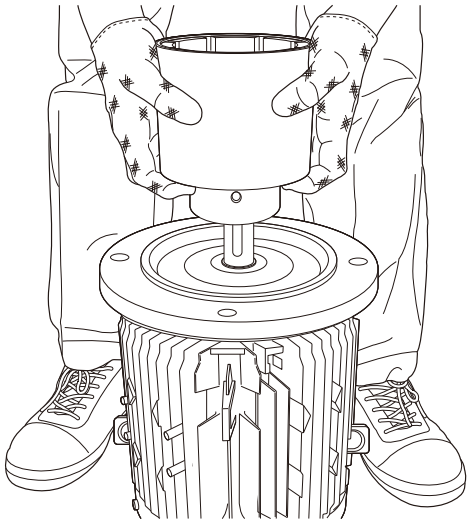
*Be careful not to drop the drive magnet, or it may break.

2 Adjust the depth of the hex socket set screws (908.1) in the drive magnet so they won't hinder the insertion of the drive magnet to the motor shaft.

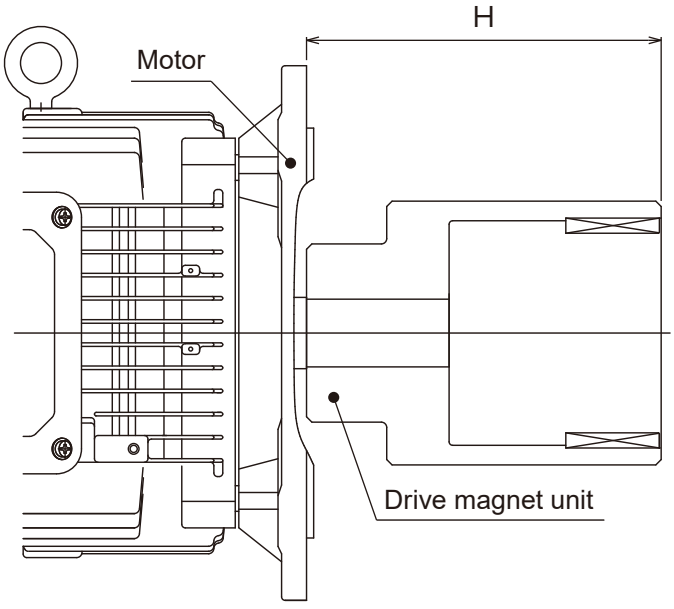
3 Mount the key to the motor shaft in place beforehand.

4 Slide the drive magnet down to the motor shaft until it bottoms out.

Remove burrs or debris or any other obstacles if any. Adjust the key position if necessary.



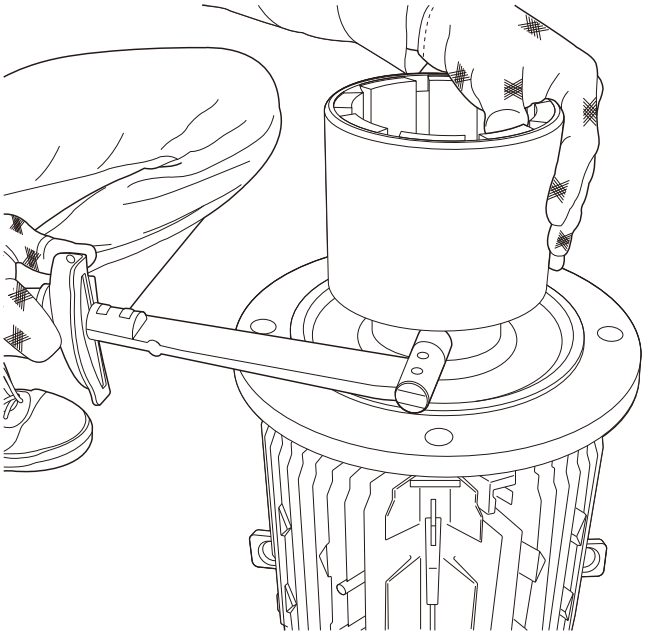
5 Adjust the depth of the drive magnet so the dimension “H” will come to the proper length at each motor size.



Motor output [kW]	Poles	H [mm]
3.7	2	173
5.5		199
7.5		
11		230
15		
18.5		

6 Tighten the hex. socket set screws by the rated torque shown below to fix the drive magnet to the motor shaft.

When a 5.5kW or larger motor is used, apply the LOCTITE #243 onto the screw threads.



Motor output	Tightening torque	Adhesive application	Adhesive agent
3.7kW or below	15N•m	NR	–
5.5kW or above		Required	LOCTITE #243

7 Check the drive magnet is fixed tight and won't loose in operation.

8 Remount the foot support to the motor.

NOTE

Always fit the "single" foot support part to the motor first, and then the pump head (driven magnet) to the foot support, on the step by step basis!

Do not fit the combination of the foot support and the pump head (driven magnet) to the motor. There is a very strong magnetic force between the drive magnet and the driven magnet, and there is always the risk of personal injury which could happen when they strongly pull each other.

To take apart the foot support and the pump head in a correct way, see page 41.

Specifications/Outer dimensions

Specifications

Information in this section is subject to change without notice.

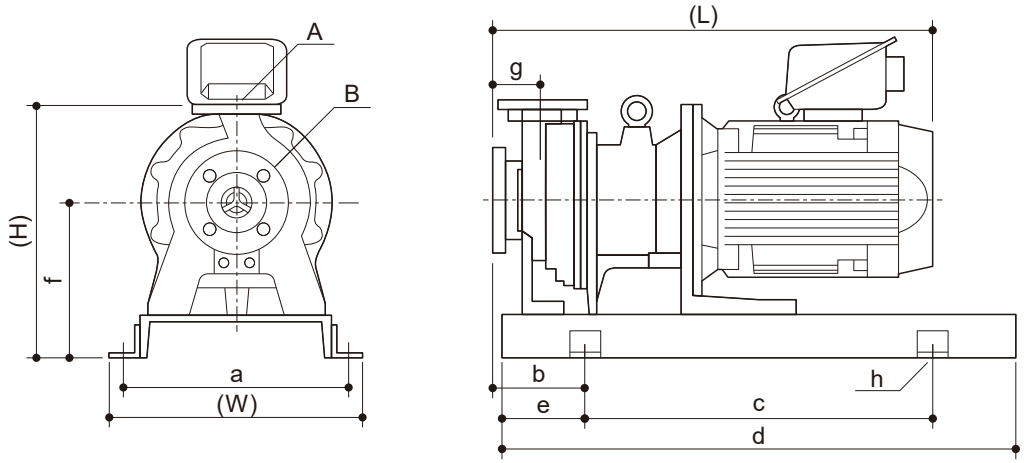
■ Pump

50Hz/60Hz

		AMP40-1	AMP50-1	AMP65-1
Inlet I.D. (mm)		50	65	80
Outlet I.D. (mm)		40	50	65
Top lift (m)		36.2/47.9	36.0/49.4	45.4/62.6
Max flow (L/min)		500	1000	1400
Min flow (L/min)		50		
Motor output (kW)		3.7/5.5/7.5		5.5/7.5/11 /15/18.5 for 60Hz
Noise level (dB)		85		95
Liquid temp (°C)		See page 12.		
Max pressure (MPa)		1.0		
Max viscosity (mPa·s)		Contact us.		
Slurry capability		Pumps with SiC bearing and SiC spindle can handle the slurry with limitations of: - Max concentration of 5% - Max particle size of 50μm - Max hardness of 80Hs Contact us for more information.		
Ambient		0-40°C (32-104°F), 35-85%RH		
Wet ends	**Front casing (100.1)**	CFRPP		
	Impeller (230)	CFRPP		
	Rear casing (158)	CFRPP		
	Magnet capsule (859)	CFRETFE		
	Bearing (310)	SiC/High density carbon		
	Spindle (210)	SiC/ Highly purity alumina ceramic		
	Liner ring (314.1)	SiC/ Highly purity alumina ceramic		
	Mouth ring (314.2)	SiC/Filled PTFE		
	Rear thrust ring (314.3)	PTFE/Filled PTFE		
	Gasket (400.1)	PTFE		

Outer dimensions

■ Pumps with a baseplate

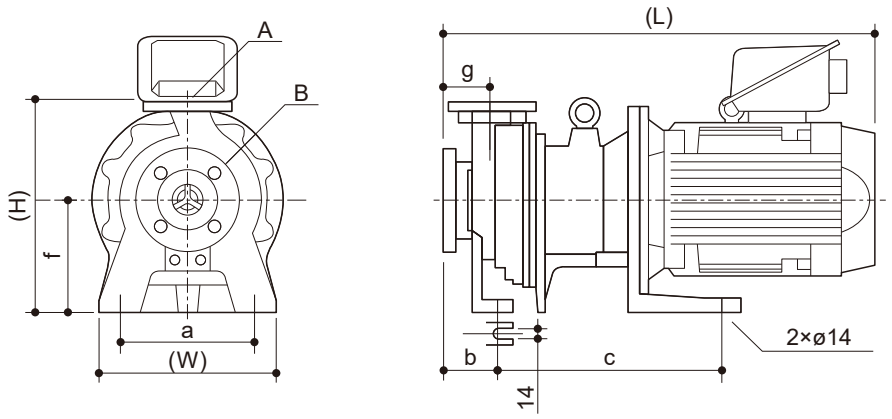


Pump model	Motor output kW	(W)	(H)	(L)	a	b	c	d	e	f	g	h	A	B	Weight kg	
															w/ motor	w/o motor
AMP40-1	3.7	400	410	(625)	350	150	540	(800)	(130)	250	80	4×φ19	40A	50A	125	84
	5.5			(689)											145	87
	7.5														150	
AMP50-1	3.7	400	410	(625)	350	150	540	(800)	(130)	250	80	4×φ19	50A	65A	125	85
	5.5			(689)											145	88
	7.5														150	
AMP65-1	5.5	400	430	(709)	350	170	540	(800)	(130)	250	100	4×φ19	65A	80A	155	96
	7.5														160	
	11	480	500	(872)	430	190	600	(900)	(150)	320					235	129
	15														250	
	18.5														270	

*For the weight with/without the motor, information is based on our standard motor of the Toshiba 2-pole TEFC (Totally-Enclosed Fan-Cooled) motor. If any other motor is used, contact us.

*Outer dimensions are subject to change. Contact us for the up-to-date revision.

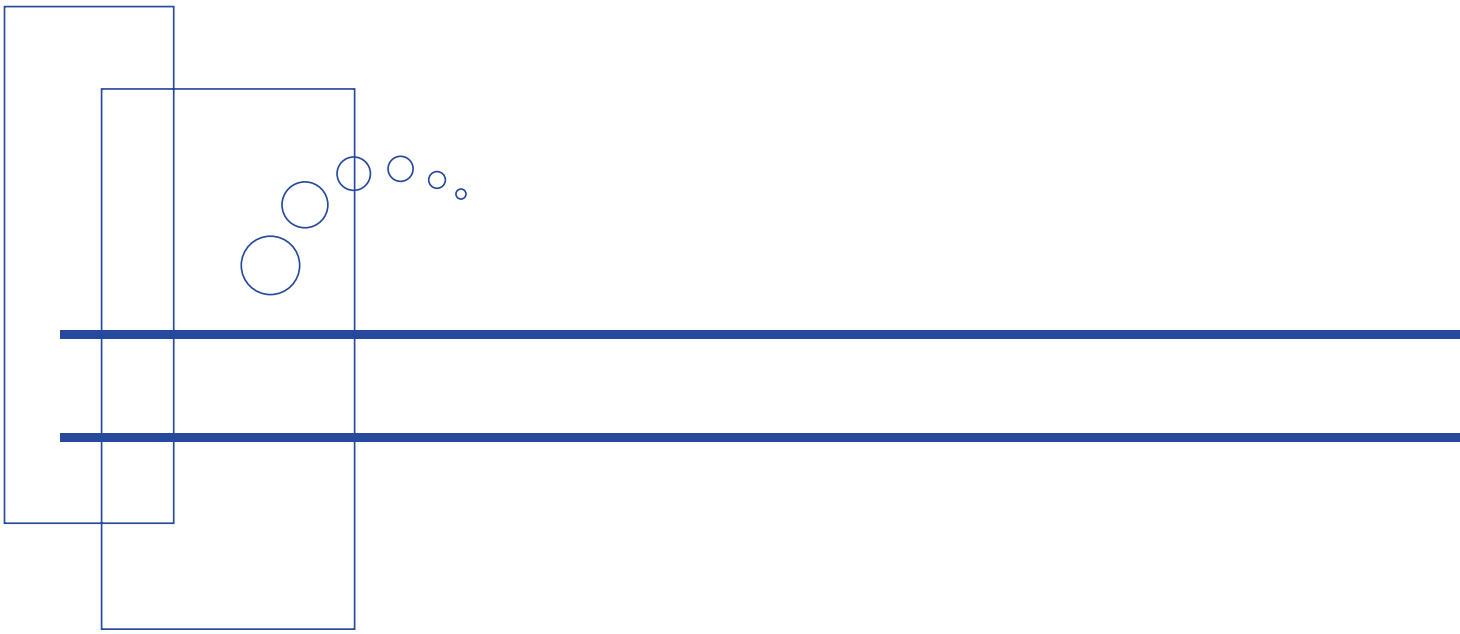
■ Pumps without a baseplate



Pump model	Motor output kW	(W)	(H)	(L)	a	b	c	f	g	A	B	Weight kg	
												w/ motor	w/o motor
AMP40-1	3.7	280	340	(625)	220	90	285	180	80	40A	50A	95	57
	5.5			(689)			365					120	60
	7.5											125	
AMP50-1	3.7	280	340	(625)	220	90	285	180	80	50A	65A	100	58
	5.5			(689)			365					120	61
	7.5											125	
AMP65-1	5.5	280	360	(709)	220	110	365	180	100	65A	80A	130	69
	7.5											135	
	11		410	(872)			450	230				190	82
	15											205	
	18.5											225	

*For the weight with/without the motor, information is based on our standard motor of the Toshiba 2-pole TEFC (Totally-Enclosed Fan-Cooled) motor. If any other motor is used, contact us.

*Outer dimensions are subject to change. Contact us for the up-to-date revision.



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