IWAKI PUMPS

IWAKI Magnetic Drive Pump

MXM (Asia version: English)

Instruction Manual

⚠ Read this manual before use of product

Thank you for selecting IWAKI's Magnetic Drive Pump MXM series. This instruction manual deals with "*Important Instructions*", "*Product outline*", "*Installation*", "*Operation*" and *Maintenance*" for the MXM series pump.
Please read through this manual carefully to ensure the optimum performance, safety and service of your pump.

Contents

Contact us or your nearest dealer if you should require any further information.

Important instruction

For the Safe and Correct Handling of the pump

- "Safety Instruction" section deals with important details about handling of the product. Before the use of the pump, read this section carefully for the prevention of personnel injury or loss.
- Observe the instructions accompanied with "WARNING" or "CAUTION" in this manual. These instructions are very important for protecting pump users from dangerous situations.
- The symbols on this instruction manual have the following meanings:

WARNING	**Nonobservance or misapplication of the contents of "Warning" section could lead to a serious accident which may result in death.**
CAUTION	**Nonobservance or misapplication of the contents of "Caution" section could lead to a personal injury or damage to the product.**

Types of Symbols

Indicates that "Warning" or "Caution" must be exercised. Inside this triangle, a concrete and practical image provided as a warning or caution message is depicted.

Indicates a prohibited action or procedure. Inside or near this circle, a concrete and practical image of the activity to be avoided is depicted.

Indicates an important action or procedure which must be performed or carried out without fail. Failure to follow the instructions herein can lead to malfunction or damage to the pump.

Safety instruction

⚠WARNING

- **Pay attention to the magnet field**

  The magnet drive pump has a pair of strong magnets. The strong magnet field could adversely affect the persons who are assisted by electronic devices such as the pacemaker, etc.


Prohibited

- Be sure to turn off power prior to any inspection/maintenance and installation works. Be careful power is not turned on unintentionally while working on the pump. In a noisy or dark place, display a sign of "Men Working" near the power supply switch.


Turning off power

- **Wear protective clothing**

  When arranging piping or dismantling the pump, wear protective clothing such as safety goggles, protective gloves etc.


Wear protective gear

- **Lifting pump**

  When lifting the pump, apply a chain or belts to the eye bolts to keep the pump horizontal.

- **Do not remodel pump**

  Do not remodel the pump. We are not responsible for any personal injury or damage to the pump due to modifications.


No Remodeling

- **Handling of dangerous liquid**

  For the transfer of the dangerous liquids mentioned as below, be sure to conduct daily inspection and maintenance for the prevention of liquid leakage or other failure. Liquid leakage may result in a personal injury, explosion or fire.

  1. Explosive or flammable liquids
  2. Corrosive or stimulus toxic liquids
  3. Harmful liquids to human health

- **Preventative measure against harmful gas**

  When handling harmful chemical gas, provide a preventative measure such as installation of an air fan.

Safety instruction

⚠CAUTION

- **Attention to magnetic force**
  Strong magnets are used in this pump. Personal injury may be caused from the strong magnetic force. Follow the procedure on "13. Dismantlement and Assembly" when conducting maintenance work.

- **Do not run pump dry**
  Do not run pump dry (without liquid). Friction heat generates under dry running and causes the pump damage. If the pump is operated with a suction side valve closed, the pump runs dry.

- **Restriction on pump operator**
  The pump must be handled or operated by a qualified person with a full understanding of the pump.

- **For specified application only**
  The use of the pump in any application other than those clearly specified may result in the failure or damage to the pump.

- **Countermeasure against static electricity**
  When low electric conductivity liquid such as the ultra-pure water and the fluor inactive liquid (e.g. Fluorinert™) are handled, static electricity may generate in the pump, which may cause a static discharge and the pump breakage. Take a countermeasure for removing static electricity.

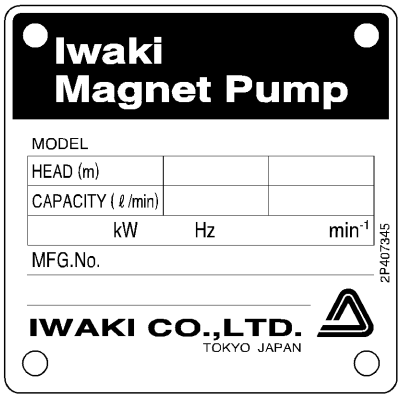
- **Air elimination prior to pumping operation**
  Eliminate the air in the pump chamber before the full operation of pump. Eliminate the air at every time before pumping the liquid which easily generates bubbles (hydrogen peroxide, sodium hypochlorite, etc.). An operation with the air remaining in the pump chamber may cause friction heat and result in the damage to the pump.

- **Countermeasure against efflux**
  Take a protective measure against the accidental efflux caused by the pump or piping breakage. Also, take an appropriate measure for preventing a liquid flowed out from directly soaking into the ground.

- **Pump disposal**
  A used or damaged pump must be disposed of in accordance with local laws and regulations. (Consult a licensed industrial waste products disposing company.)

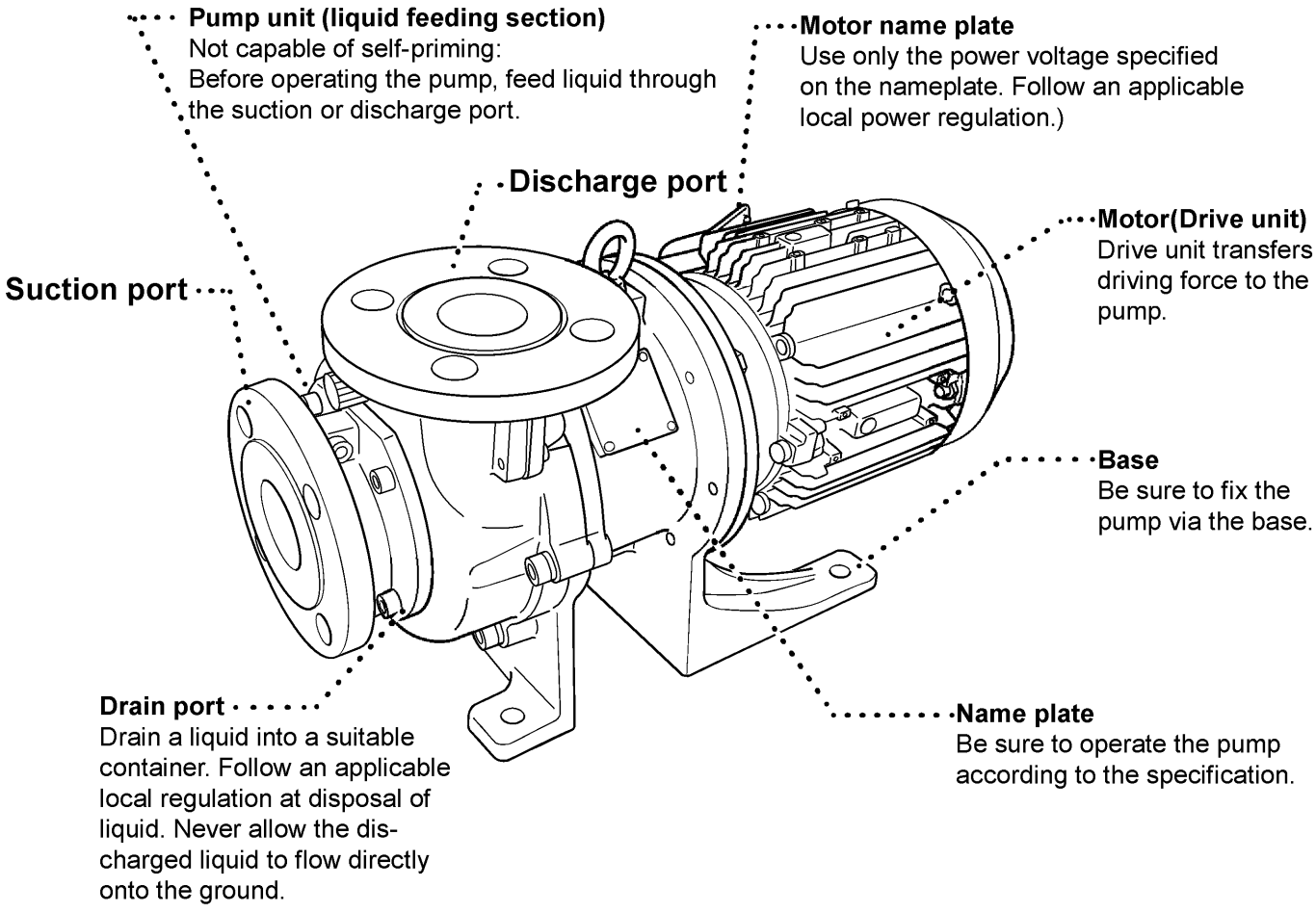
Product outline

1.Unpacking and inspection



After unpacking, confirm that-

- The delivered product and accessories are exactly what you ordered.
  Do the specification on the nameplate such as the model, discharge capacity, discharge pressure and rated voltage conform to your order?
- The product delivered is not damaged.
  Are the bolts and nuts not loosened?
  Are the product damaged in transit?



⚠ CAUTION

When cleaning the pump, do not wipe labels or the pump body with a solvent.

2.Model codes

MXM 54 3 - 150 3 E CF V J - H
① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

①Pump bore

Suction port × Discharge port

54: 50A × 40A

②Motor output

2: 1.5kW 3: 2.2kW 5: 3.7kW

③Impeller diameter

110-150mm

④Nominal Impeller diameter

1, 2, 3, 4

⑤Wet end material

E: CFRETFE

⑥Bearing/spindle material

CF: High density carbon/High purity alumina ceramic

FF: High purity alumina ceramic/High purity alumina ceramic

KK: SiC/SiC

⑦O ring material

V: FKM E: EPDM A: AFLAS® P: DAI-EL PERFLUOR®

⑧Flange connection/Motor standard

J : JIS flange + JIS motor

I : ISO flange + IEC motor

A : ANSI flange + JIS motor

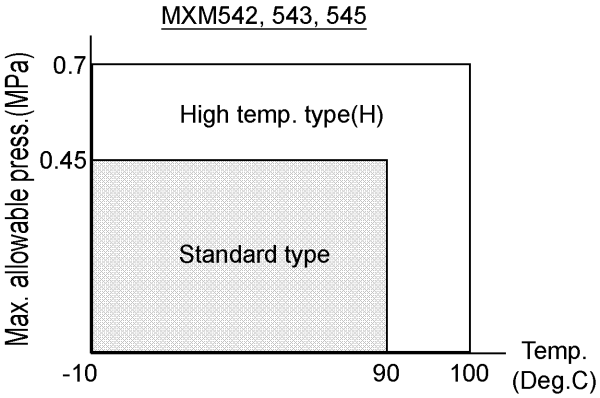
⑨Special specification

No code: Standard B: With base H: High temperature type S: Special specification

3. Operating condition

3-1.Allowable pressure

The graph below shows the maximum pressure resistance of the pump. Discharge pressure should not exceed the maximum allowable pressure.



Ambient temperature: 0-40℃

Ambient humidity: 35-85%RH

NOTE: Allowable liquid temperature range is 10-100deg.C for AFLAS® O ring.

3-2. Slurry

Slurry can not be pumped as a general rule, however; the pump with SiC bearing (KK type) can handle slurry on the condition of the concentration up to 5%, the particle size up to 50μ and the hardness up to 80Hs. Consult us in advance of handling slurry.

3-3. Pump performance varies with specific gravity and viscosity.

Shaft power, discharge capacity and head are influenced by the specific gravity and viscosity of the pumped liquid. The pump is manufactured based on your specification for operating conditions at order stage. Contact us if your specification is changed.

3-4. Temperature influence

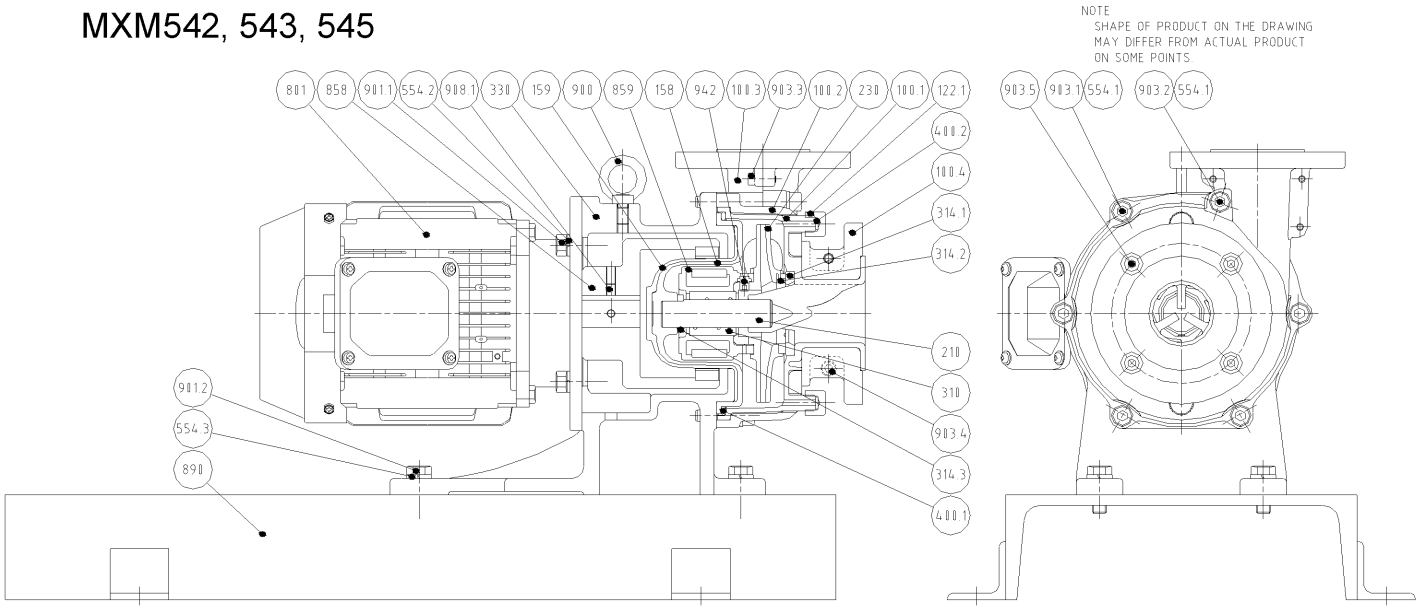
The pump itself is not influenced by liquid temperature change, however; the pumped liquid varies in viscosity, vapour pressure, chemical corrosion characteristics with the liquid temperature change. Pay attention to the temperature change of the pumped liquid.

3-5. Allowable liquid viscosity for FF type

Liquid viscosity should be 1 mPa•S(cP) or more.

4.Construction and parts name

MXM542, 543, 545

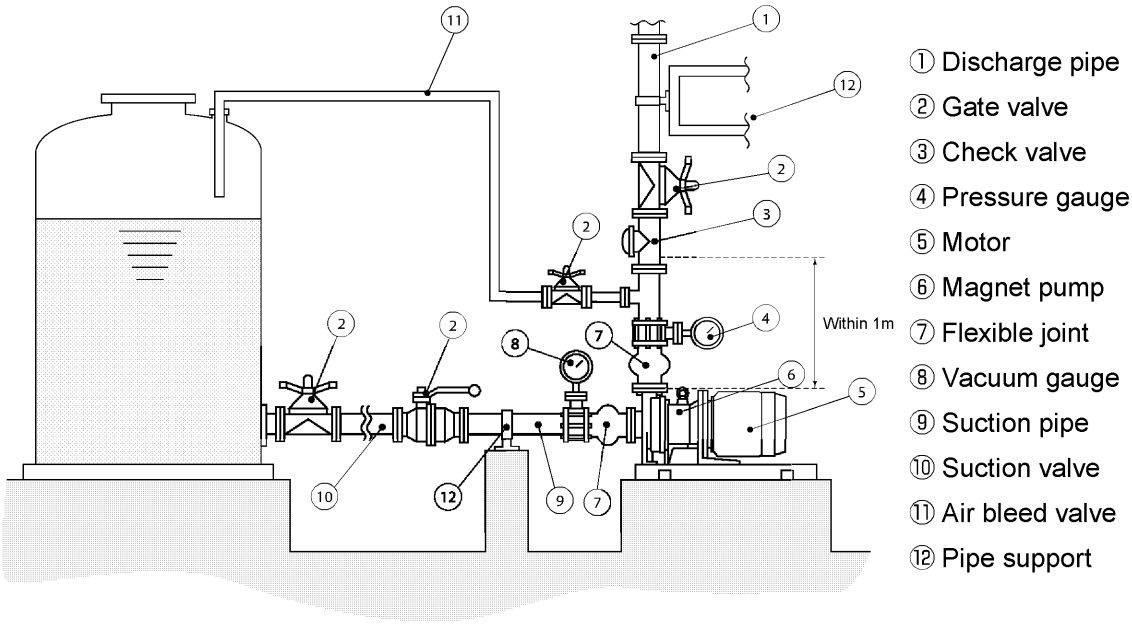


No.	PARTS NAME	QTY	MATERIAL	REMARKS
100.1	Front casing	1	CFRETFE	
100.2	Cover A	1	Ductile iron	
100.3	Cover B	1		
100.4	Cover C	2		
122.1	Drain cap	2	ETFE	
158	Rear casing	1	CFRETFE	
159	Rear casing cover	1	FRP	High temperature type only
230	Impeller	1	CFRETFE	
330	Frame	1	Ductile iron	
400.1	O ring	1	V: FKM E: EPDM A: AFLAS® P: DAI-EL PERFLUOR®	JIS B 2401 G165
400.2	Seat	2		
554.1	Spring washer	6	Stainless steel	M10
554.2	Spring washer	4	Stainless steel	1.5/2.2kW:M10 3.7kW:M12
554.3	Spring washer	4	Stainless steel	M12
801	Motor	1		1.5/2.2/3.7kW
858	Drive magnet unit	1	Rare earth magnet + Ductile iron	
859	Magnet capsule	1	Rare earth magnet + CFRETFE	
890	Base	1	Steel	
900	Eye bolt	1	Steel	M10
901.1	Hex. head bolt	4	Stainless steel	1.5/2.2kW:M10×30 3.7kW:M12×35
901.2	Hex. head bolt	4		M12×30
903.1	Hex. socket head bolt	5		M10×40
903.2	Hex. socket head bolt	1		M10×80
903.3	Hex. socket head bolt	3	Steel	M6×18
903.4	Hex. socket head bolt	2		M8×20
903.5	Hex. socket head bolt	4	Stainless steel	M8×15
908.1	Hex. socket set screw	2	Steel	M8×10
942	Lock pin	2	CFRETFE	

No.	PARTS NAME	QTY	MATERIAL		REMARKS
			CF/FF	KK	
210	Spindle	1	High purity alumina ceramic	SiC	
310	Bearing	1	High density carbon/High purity alumina ceramic	SiC	
314.1	Liner ring	1	High purity alumina ceramic	SiC	
314.2	Mouth ring	1	PTFE(With filler)	SiC	
314.3	Rear thrust	1	CFRPFA		

Installation

5.Before installation



Example of recommended piping

5-1. Installed position

· Install the pump on the foundation free from vibration.

· Keep room for back pull-out of the motor and working space around the pump for assembly/dismantlement.

· Foundation area should be larger than the pump base plate.

5-2. Location

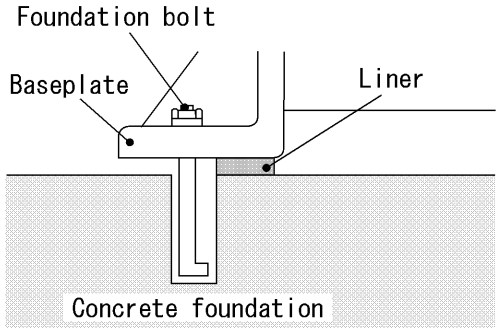
· Install the pump as close to the tank as possible under a flooded suction system.

· If the pump is located over the liquid level in the tank (suction lift style), arrange priming piping and install a foot valve at the end of suction pipe.

5-3. Foundation work

· Refer to the illustration below for the installation on a foundation.

· Do not mount the frame of the pump without base plate. The pump can not be dismantled.



6. Piping

6-1. Connection between the pipes and pump

The table below shows the bolt size and tightening torque for the connection between the pipe and pump flanges. Tighten each bolt evenly.

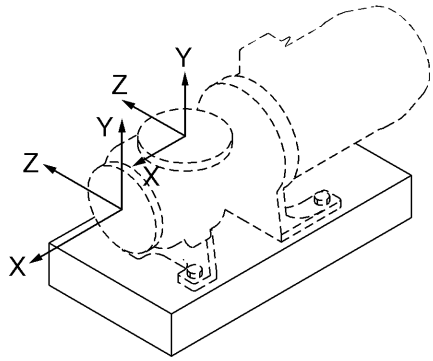
Pump model	Bolt size	Tightening torque
MXM54	M16	79 N•m

Note 1: The values on the table is based on the use of metallic flanges and rubber gaskets.

Note 2: Use the suitable M16 bolts in length. Do not allow them to come in contact with Cover A (See page 8, No100.2)

6-2. Pipe load and moment

Pipe loads and moment applied to the pump should not exceed the value in the following table..



Allowable pipe loads on the pump flange

Direction of load	Load kN	
	Discharge flange	Suction flange
Fx	0.71	0.89
Fy(Pression/Tension)	0.89/0.44	0.58
Fz	0.58	0.71

Allowable moments on the pump flange

Direction of load	Moment kN•m	
	Discharge flange	Suction flange
Mx	0.35	0.46
My	0.46	0.35
Mz	0.23	0.23

6-3. Suction piping

(1) Flooded suction

Flooded suction is recommended. Avoid suction lift style.

(2) Suction piping bore

Bores of suction piping should be equal to or larger than the pump inlet bore.

(3) Shortest piping

Have the piping short as much as possible with the minimum number of bends.

(4) Straight section on piping

Make sure at least 500 mm of a straight pipe is connected to the pump inlet port. The straight pipe should have a removable section of 300mm for easy dismantlement and maintenance.

(5) Air pocket in piping

Do not allow any projections on piping where air may be trapped. Suction pipe should have an ascending gradient of 1/100 toward the pump.

(6) Different pipe bores

If the diameter of suction piping is different from that of the pump suction port, use the eccentric reducer pipe. Connect the eccentric reducer pipe so that the upper side is level. Residual air may not go out if it is mounted in reverse.

(7) Gate valve in suction side

In a flooded suction system, install a gate valve on suction piping. The gate valve is necessary to dismantle and inspect the pump.

(8) Piping for flushing

Install the flushing piping for cleaning the pump when handling a dangerous liquid.

(9) End of suction piping

The end of the suction piping should always be at least 500 mm lower than a liquid level.

(10) In suction lift system

· The distance between the end of suction piping and the bottom of a suction tank should be 1 to 1.5 times larger than the suction pipe bore.

· Be sure to install a foot valve or a check valve on the suction piping.

(11) Piping support

Support piping by pipe supports so that the piping weight does not totally weigh the pump, and thermal stress does not affect the pump.

(12) Connections

Each connection must be secured so that the air can not be sucked in. Imperfect sealing can cause air sucking and it results in the insufficient suction and the seizure of bearing.

6-4. Discharge piping

(1) Discharge piping bore

When the discharge piping is long and the piping bore is equal to the pump bore, specified performance may not be obtained when pipe resistance unexpectedly becomes high. Calculate pipe resistance in advance to decide a pipe bore.

(2) Discharge valve installation

Install a discharge valve on the piping about 1m away from the pump. The air bleed piping should be provided near the discharge valve in order to prevent the air from remaining.

(3) Gate valve installation

Install a gate valve on the discharge piping to adjust flow rate and to protect the motor from overload. If a check valve is installed, The recommended installation order is : Pump → Check valve → Gate valve.

(4) Pressure gauge

A pressure gauge is required on the discharge piping to check operating conditions such as discharge capacity and head.

(5) Check valve

A check valve is required in the following cases.

· Discharge pipe length is between 15 or more.

· Actual head is higher than 15 meters.

· Distance between the liquid level in the tank and the top end of discharge pipe is 9 meters or more.

· 2 pumps run in parallel.

(6) Air vent

Install an air vent on piping when the horizontal piping is 15 meters or more.

(7) Drain

Install a drain valve when draining liquid is required (to protect the pump from freezing, etc.),.

(8) Piping support

Support piping by pipe supports so that the piping weight does not totally weigh the pump.

(9) Priming piping

The piping for priming is required on the discharge piping in suction lift system.

7. Electrical wiring

Electrical works or wiring must be carried out by a qualified person according to local law or regulations.

· Use the electromagnetic switch which conforms to the motor specifications such as voltage and capacity etc.

· When installing the pump out of doors, take a measure to prevent rain water from getting into the switch when wiring.

· Securely install the electromagnetic or push-button switch apart from the pump.

OPERATION

8. Operational precautions

⚠ CAUTION

- Never run the pump dry or run it with a suction side valve (Gate valve) close. This may damage the pump. Especially for FF type, the bearing and spindle are damaged in one minute.

- Check the direction of the impeller rotation. Clockwise rotation seen from the motor fan is a correct direction. A long period of the operation in negative rotation can lead to a failure.

- Stop the pump within one minute when it is running under cavitation. Do not run the pump when it is sucking the air through the suction port. Especially for FF type, the bearing and spindle are damaged in one minute.

- Stop the pump within one minute when the magnet coupling is disconnected. The magnet force reduces if the pump keeps on running in this condition.

- Keep liquid temperature change within 80 deg.C through stopping and operation. Retight the drain cap when the surrounding or liquid temperature changed. The maximum number of ON/OFF operation should be within 6 times an hour. Frequent ON-OFF operation can reduce the durability of the pump.

- (In flooded suction piping system,) Start the pump with a discharge valve fully close in order to avoid water hammer.

- If the pump is operated with a discharge valve closed for a long time, the liquid temperature inside the pump rises and damages the pump. Closed-discharge operation should be within 1 minute.

- If power is interrupted while the pump is running, switch off the pump immediately and close discharge valves.

- Take extra care so that the discharge pressure dose not exceed the pump allowable pressure. Refer to page 7 for allowable pressure limit.

- When high temperature liquid is transferred, the pump surface becomes very hot. Take a protective measure against burn. See the table below for the surface temperature when transferring a liquid of 80 deg.C.

Model	Liquid temperature(deg.C)	Max. pump surface temperature (Ambient temp. is 40 deg.C.)
MXM542, 543, 545	90	80
	100	95

- Noise level is shown on the table below.
  In case the pump noise affects human health or communication to secure a safety, provide a noise reduction cover. Be careful not to reduce cooling effect by a motor fan.

Model	Noise level
MXM542/543/545	80 dB

A scale 1m

9. Start-up

1. Fully close a discharge valve and fully open a suction valve.

2. Prime the pump
   · If the pump is in flooded suction system, Fully open both discharge and suction valves.
   · If the pump is in suction lift system, prime the suction piping as well as the pump.

3. Check rotating direction of the motor.
   · Close a discharge valve. Power the motor for a quick moment (within a second) in order to check the rotation direction. A correct direction is shown with "arrow" mark on the pump (Clockwise seen from motor fan side).
   · Check if the motor fan smoothly stops when it is powered off.

Note: If the motor does not stop smoothly, check rotating parts.

4. Air elimination
   · Before the pump operation, eliminate the air in the pump.
   · Fully open the valve on the air bleed piping and run the pump for 1 second instantaneously 3-5 times for air elimination.
   · After the air elimination, fully close the discharge valve.

Note: In case an air bleed piping is not equipped, repeat the momentary run several times with a discharge valve open.

5. Starting operation
   · Start the pump with a discharge valve fully closed.

Note: Stop the closed-discharge operation within one minute.
   · Confirm that discharge pressure rises to shut-down pressure.
   · Gradually open discharge valve to obtain the specified pressure (capacity).

Note: Pay attention to the over-load caused by an excessively opened valve.

Precautions on operation

1. When the pump keeps running in negative rotation, the pump breaks.
2. **Closed-discharge operation should be within 1 minutes.**
3. Make sure that a flow rate is always equal to or more than the minimum one. The operation below the minimum flow rate can reduce the lubricant and cooling functions on the sliding parts. This could lead to failure.

Minimum discharge flow rate

Impeller size	Min. discharge flow rate
1, 2, 3	20 ℓ /min
4	50 ℓ /min

Refer to page 6 item2 model code.

10. Pump stopping

1. Slowly close a discharge valve

   Quick closing by a solenoid valve may cause water hammer and result in the damage to the pump. Be sure to slowly close any discharge valve.

2. Switch off and stop the pump

   Check that the pump stops smoothly. If the pump stops roughly, inspect it.

Note: When the pump is stored for a long period,

1. A countermeasure against freezing must be taken when the pump and liquid can freeze.
2. In case a blackout interrupts the pump operation, switch off the pump and close discharge valves.

Maintenance

11. Troubleshooting

In case the cause of trouble is unidentifiable, suspend the pump operation and contact us.

Troubles	Symptom on the pump		Cause	Check & Countermeasures
	When disch. valves are closed	When disch. valves are opened		
Liquid can not be discharged.		Pressure gauge & vacuum gauge indicate zero.	• The pump is not primed enough. • Dry running	• Stop the pump. Prime the pump and re-start operation.
	The pump can not be primed.		• Foot valve is clogged with foreign matters.	• Clean the foot valve.
	After starting, pressure drops as a discharge valve is opened.	Readings of pressure gauge & vacuum gauge vibrate and drops to zero.	• The air is sucked through the suction pipe end or gasket.	• Check if connected flanges are completely sealed. • Check if liquid level of the tank is not excessively lowered.
			• A disconnection of the magnet coupling	• Check if the motor is not overloaded through amperage. • Check if foreign matters do not lock the impeller or magnet capsule • Check if voltage is normal.
	Pressure gauge keeps showing low pressure.		• Low pump speed • The pump rotates in reverse.	• Check wiring or motor. • Correct wiring.
Discharge capacity is small.	Pressure & vacuum are normal.	Vacuum is high.	• Strainer is clogged with foreign matters.	• Remove foreign matters.
		Vacuum is very high.	• Air pocket in suction piping	• Check and remedy suction piping.
			• Foreign matters are clogged at impeller inlet.	• Remove foreign matters.
		Readings of pressure gauge & vacuum gauge vi-brate.	• Air is sucked in from suction pipe or gasket.	• Check connections on piping and retighten as necessary.
			• Foreign matters clog at discharge side.	• Remove foreign matters. • Remove foreign matters or scales in piping.
		Vacuum gauge indicates high but pressure is normal.	• There are resistance such as air pocket etc. in suction piping.	• Check if there is no protruded section in suction piping.

Troubles	Symptom on pump		Cause	Check & countermeasures
	When disch. valves are closed	When disch. valves are opened		
Discharge capacity is not enough.	Pressure & vacuum are normal.	Pressure is high but vacuum is normal.	• Actual head is too high or pipe resistance is too large.	• Check actual head of discharge piping and loss of pipe resistance.
	Pressure is low and vacuum is very low.	Both pressure & vacuum is low.	• The motor rotates in reverse.	• Correct wiring.
The motor overheats.			• Lowered power voltage.	• Check voltage or frequency.
			• Overload	• Check density and viscosity of liquid
			• Ambient temperature is too high.	• Ventilation
Discharge capacity is rapidly reduced.		Vacuum is high.	• Foreign matters clog suction piping.	• Remove foreign matters.
The pump vibrates.			• Foundation is not perfect.	• Re-install the pump.
			• Loosened mounting bolts.	• Re-tighten the bolts.
			• Cavitation occurs.	• Resolve the cause of cavitation.
			• The bearing is worn or melted	• Replace it as necessary.
			• The magnet capsule or spindle is broken.	• Replace it as necessary.
			• Dynamic balance of the drive magnet is not proper.	• Adjust dynamic balance or replace the drive magnet unit.
			• The motor bearing is worn.	• Replace the bearing or motor.

12. Maintenance and inspection

⚠ WARNING

- **Do not have the medical electronics close to magnet.**
  Any person who is equipped with the medical electronic such as a pacemaker should not be close to the magnet of pump.
- **Pay attention to magnet force**
  The magnet force is powerful. Take care not to catch the finger in a metal parts.
- **Wear protective clothing**
  Coming in contact with or getting wet with a harmful chemical may cause eye or skin trouble. Wear protective clothing such as a protective mask, goggles, gloves during the work.
- **Turn off power during the maintenance work.**
  Risk of electrical shock. Do not work on the pump with power on. Make sure the power source is turned off and the pump & other devices are stopped prior to the work.

Daily inspection

(1) Confirm that there is no leakage before operating the pump. If leakage is detected, never try to operate the pump. Check the drain cap is not loose. Tighten it by the hand if it is loose.

(2) Check the pump operates without generating any abnormal noises or vibration.

(3) Check the liquid level in the suction tank and the suction pressure.

(4) Check the discharge pressure & the electric current in operation corresponds with the specifications on the motor nameplate in order to confirm that the load to the pump is normal.

Note: The reading on the pressure gauge varies in proportion to the specific gravity of the handled liquid. The pressure gauge or vacuum gauge cocks should be opened only for measurement. Be sure to close the cocks upon the completion of measurement. If the cocks remains open during operation, the meter mechanism may be affected by an abnormal pressure such as water hammer.

(5) If you have a spare pump, activate it from time to time to keep it ready for use any time.

(6) Confirm that the discharge pressure & capacity and the motor power supply voltage do not fluctuate in operation. If the respective values considerably fluctuate, refer to "11. Troubleshooting" for correct measures.

Maintenance

■ Periodical inspection(Every six months)

Conduct periodic inspections based on the table below for using the pump in good condition. Handle the sliding parts and the plastic parts with care when overhauling the pump. The magnet force of the drive magnet and the driven magnet is powerful. **Be careful not to catch the finger in the bracket. Do not have the electronics which is vulnerable to the strong magnet field close to the magnet.**

Interval	Parts name	Inspection items	Measures
Every 6 months (Maintain an Inspection record)	Drive magnet unit	● If there is a friction trace. ● If the drive magnet housing is correctly mounted or if the hex. socket set screws are not loosened. ● Decentering of the magnet and motor shaft.(Max.1/10mm)	○ If abnormality is found, contact us. ○ Remount the drive magnet to motor shaft or retighten the screws. ○ Re-tighten the hex. socket set screws or replace the drive magnet. (Consult us before replacement.)
	Rear casing	● If there is a friction trace in inner surface. ● If there is a crack on wet-end material. ● If the rear thrust is worn. ● If the top end of spindle is worn. ● If the inside is dirty.	○ If abnormality is found, consult us. ○ If a crack is found, replace it. ○ If it is worn, contact us. ○ Replace it if excessively worn. ○ Clean the inside.
	Magnet capsule	● If there is a friction trace on surface. ● If there is a crack on surface. ● Measure the bearing inner bore to check wear. ● If the impeller is secured to the magnet capsule.	○ If abnormality is found, contact us. ○ If abnormality is found, contact us. ○ Replace it if it is worn beyond the wear limit. ○ If it is loosened, replace or contact us.
	Impeller	● Measure the mouth ring thickness. ● If there is cracks. ● If there is cavitation traces. (Abnormality related ot the mouth ring such as wear and seizure.) ● If the impeller is not clogged. ● If the impeller is deformed.	○ Replace it. ○ Replace it. ○ Eliminate cavitation. ○ Remove clogs. ○ Replace the impeller.
	Front casing	● Wet-end part is dirty. ● If there is a crack. ● If there is abnormal wear, cracks, friction traces on thrust ring. ● If drain is clogged. ● If there is swelling or cracks on O ring. ● If there is a friction trace.	○ Clean them. ○ Replace if abnormality is found ○ Contact us if abnormality is found. ○ Clean the drain. ○ Replace O ring if abnormality is found. ○ Contact us if there is a friction.
	Spindle	● If there is no cracks. ● If the bearing is worn.	○ Replace it if there is a crack. ○ Replace it if bearing is worn.
	Drain cap	● Looseness of drain cap.	○ Retight the cap by the hand.

■ Wear limits of bearing and spindle

* If the difference between the inner diameter of the bearing and the outer diameter of the spindle exceeds 1 mm, either the bearing or the spindle whichever has the greater wear, should be replaced regardless of the values in the table below. Regarding the ceramic bearing type (FF type), the spindle and the bearing should be replaced with new ones at once.

* Initial wear may appear in the sliding parts in the first stages of operation but this is not abnormal.

Part \ Model	MXM542, 543, 545	
	When shipped	Time to be replaced
Inner diameter of bearing	24 mm	25 mm
Outer diameter of spindle	24 mm	23 mm

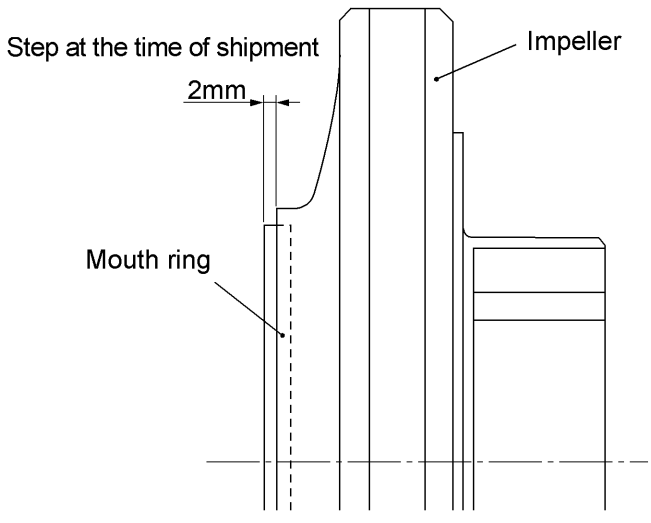
See item 5 in 13.1 Dismantlement for removing the bearing.

See item 4 in 13.1 Dismantlement for removing the spindle.

■ Wear limit of mouth ring

* The step between the surfaces of the mouth ring and the impeller is 2 mm at the time of shipment. When this step is reduced to 0 mm, it comes to the wear limit of the mouth ring. Replace the mouth ring with new one.

Model	MXM542, 543, 545
Thickness when shipped	7.5
Thickness to be replaced	5.5



Mouth ring replacement

1. Detachment

Warm the click on the mouth ring by a plastic welder or industrial drier. Then raise a plastic click to remove the mouth ring.

2. Attachment

Insert a new mouth ring into the impeller. Then use a plastic welder or industrial drier to warm the click on the mouth ring until it gets soft. If the click becomes soft enough, crush it with a bar to fix the mouth ring.

■ Consumable parts

Replace each parts based on the table below.

Parts No.	Parts name	Time to be replaced
310	Bearing	10,000 hours
210	Spindle	10,000 hours
314.2	Mouth ring	10,000 hours
400.1	O ring	At the time of periodical inspection
400.2	Gasket	At the time of periodical inspection

Note 1. The time to be replaced mentioned above is based on pumping clear water at ambient temperature. The time to be replaced varies with the characteristics, temperature and other condition of the pumped liquid.

2. Bearing, spindle and mouth ring must be replaced at the wear limit regardless of the time to be replaced shown on the above table.

3. Gasket must be replaced each time pump is disassembled regardless of the time of periodical inspection.

4. Refer to item 14 "Consumable parts" for the parts No. on the above table.

13. Dismantlement & assembly

⚠ WARNING

- **Do not have the medical electronics close to the magnet.**
  Any person who is equipped with the medical electronics such as a pacemaker should not be close by the magnet of the pump.

- **Pay attention to magnet force**
  The magnet force is powerful. Take care not to catch the finger in the bracket.

- **Wear protective clothing**
  Coming in contact with or getting wet with the harmful chemical may cause eye or skin trouble. Wear protective clothing such as a protective mask, goggles, gloves during the work.

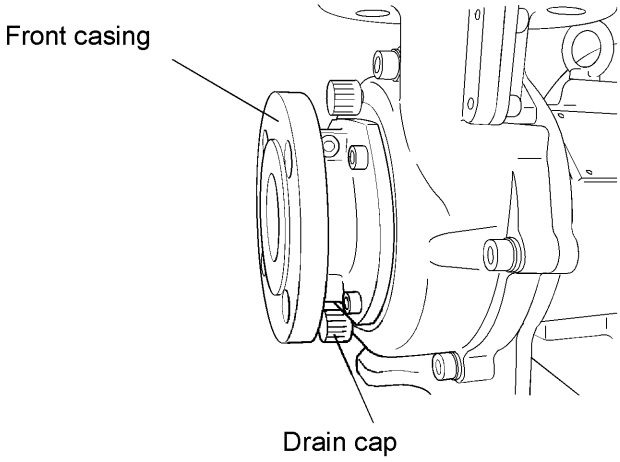
- **Turn off power during the maintenance work.**
  Risk of electrical shock. Do not work on the pump with power on. Make sure power is turned off and the pump & the related devices are stopped prior to the work.

⚠ CAUTION

- **Pay attention to magnet force**
  The magnet force is powerful. Take care so that iron pieces and iron powder do not stick to the magnet of pump.

- **The powerful magnet force can break the data of the magnetic card, disc or so. Do not have the magnetic product close to the magnet of pump.**

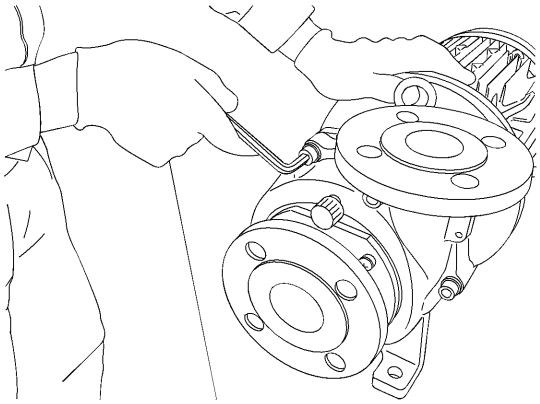
13.1 Dismantlement



1. Wash out the liquid in the pump by the use of the flushing piping. Then remove the drain cap to drain the liquid from the pump. Clean the inside of the pump.

⚠ WARNING

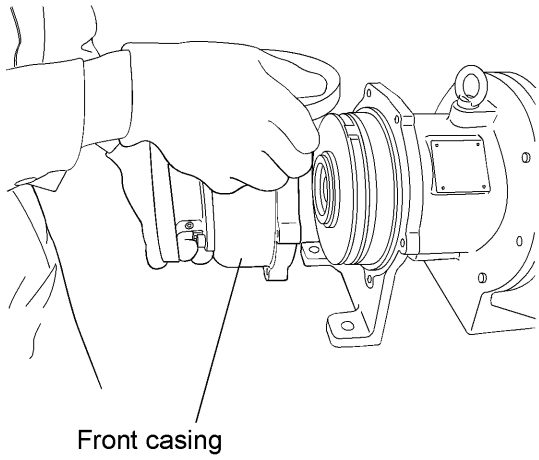
Be sure to wear protective clothing such as goggles, rubber gloves, etc. during maintenance. Certain liquids are harmful to eyes and skin.

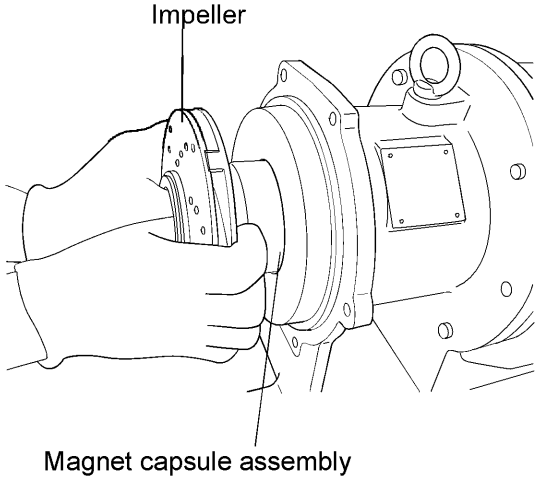


2. Remove the front casing from the frame.
   Remove the hex. socket bolts and pull out the front casing from the frame. Be careful not to damage the spindle when pulling the front casing out.
   The spindle may come off together with the front casing. In this case take care not to loose the rear thrust.

⚠ CAUTION

Strong impacts may crack the spindle or casing. Do not hit the front casing with a tool.

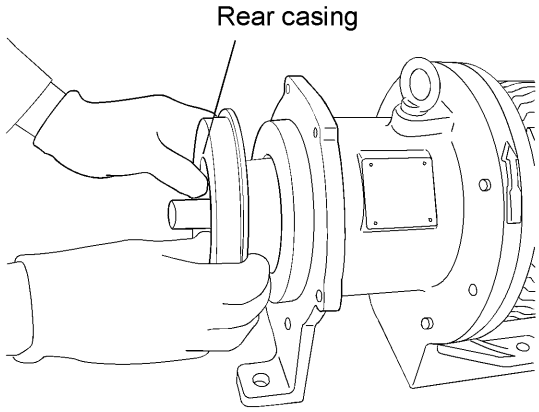




3. Pull out the impeller + the magnet capsule assy. Be careful not to scratch each part. Since the magnet capsule is strongly magnetized, store it in a place free of metal pieces or metal powder. Take extra care so as not to scratch any sliding or sealing surface of the front casing, magnet capsule, and impeller.

⚠CAUTION

The magnet force of the magnet capsule is powerful. Be careful not to catch the finger in the impeller and magnet capsule.

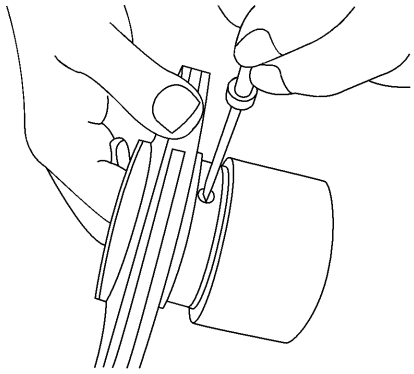


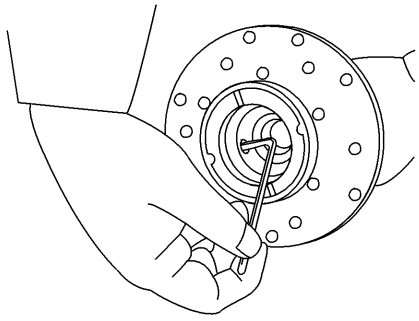
4. Insert a flat-head screwdriver between the rear casing and the motor bracket. And then pull the rear casing forward while lifting it slightly up.
   If the spindle stays on the front casing, remove it from the front casing. Fit the spindle to the rear casing with the rear thrust mated at the end. Always check the rear thrust is mated to the spindle before fitting spindle.
   If the spindle can not be removed, warm a spindle connection with hot water (about 90 deg.C) for 5 minutes and try again. Be careful not to be scalded.

⚠CAUTION

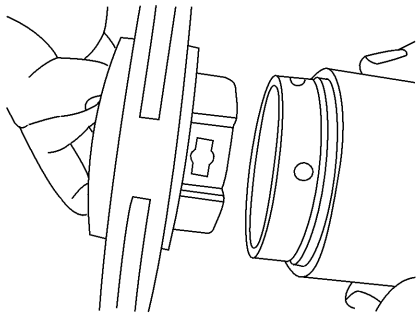
Be careful not to damage the sealing surface between the front casing and rear casing where crushes the O ring.

5. Turn the lock pins anticlockwise by 90 degree, using a flathead screw driver and then push it inward to take it out. If it is hard to push the lock pins inward, slightly tap the end of driver handle. The lock pins can also be turned by using the 4mm hex. wrench from the inside of magnet capsule. In this case pay attention to turn the wrench clockwise. The lock pins will be damaged if it is turned in reverse direction. After unscrewing the pins, push it out from the outside using a bar.





After the lock pins are removed, detach the impeller from the magnet capsule by slightly tapping the back side of the impeller with a plastic hammer. If the impeller is hardly removed, warm it in the hot water (approx. 90 deg. C) for five minutes and tap it slightly, again. Be careful not to scald in the hot water. Impeller can not be separated from the magnet capsule unless the lock pins are removed. Do not try to remove the impeller by force.

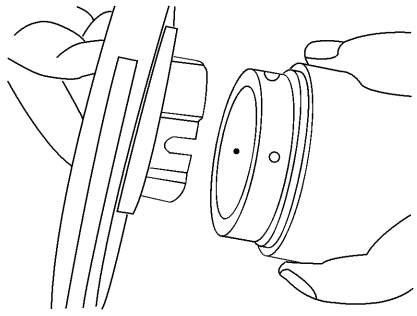


To remove the bearing from the magnet capsule, first separate the impeller from the magnet capsule. Then use a hand press with plastic extruding bar to extrude the bearing toward impeller connection side.

To insert the bearing into the magnet capsule, reverse this procedure. If the bearing can not be removed, warm the magnet capsule with hot water (about 90 deg.C) for 5 minutes and try again. Be careful not to be scalded.

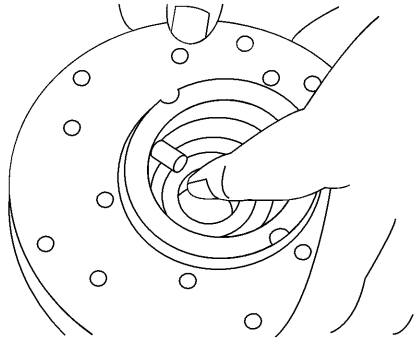
13.2 Assembly

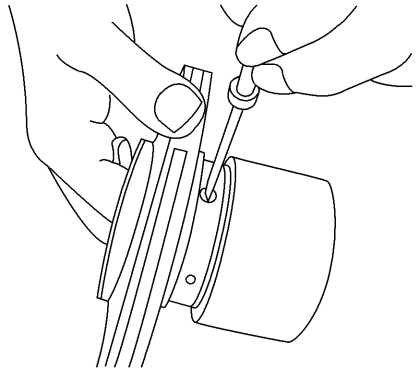
1. Attach the impeller to the magnet capsule.
   The mating surface with the impeller on the magnet capsule has two holes. The large hole(Stepped holes with 6mm at outer dia. & 12mm at inner dia) is for the lock pins and the small hole(3mm dia.) is for cooling. Press the impeller into the magnet capsule with U-shape hole on the smaller hole(3 mm dia.). If it is difficult to insert them, warm the magnet capsule in the hot water(approx. 90 deg,C) for 5 minutes. Be careful not to scald at this time.



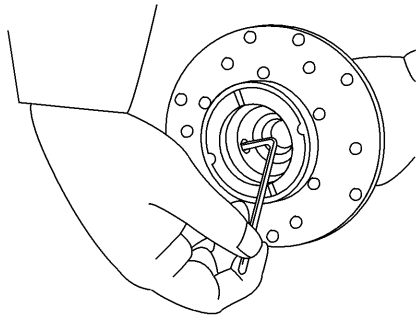
Note: Make sure that the shaft is secured in the rear casing before fitting the impeller into the magnet capsule. Check that the rear thrust is in place as well.

After the impeller is inserted, insert the lock pin totally into the holes from the inside. Then lock the impeller by turning the pin clockwise by 90 degrees from the outside with a flat-head screwdriver while holding the pin by the finger from the inside. Feeling a snap sound, the impeller is secured. Mount another lock pin at the symmetric position.



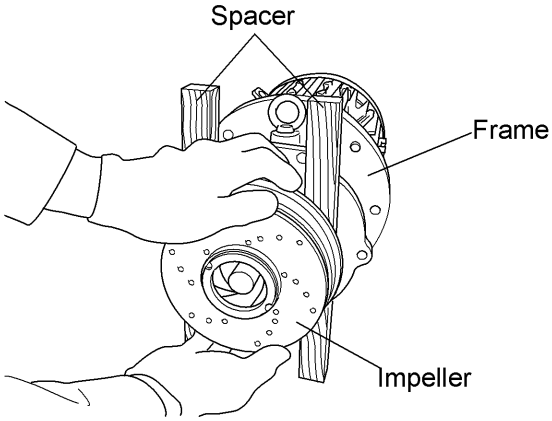


If the screw groove is deformed and can not be used, the pin can be fixed from the inside with a 4mm hex. wrench. In this case pay attention to turn the wrench anticlockwise. The lock pin may be broken if it is turned in reverse.



2. Insert the magnet capsule + the impeller into the rear casing slowly.
   Do not allow iron pieces or other foreign matters to adhere to the magnet capsule.

3. Mount the magnet capsule with the rear casing to the frame.



⚠ CAUTION

Magnet force is very powerful. Apply the plastics or wooden spacers between the rear casing and the frame not to pinch the fingers.

4. Fit O ring to the front casing. Check that O ring and seal surfaces are free of dust or scratches. Make sure that O ring is in place and will not be out of the groove.

⚠ CAUTION

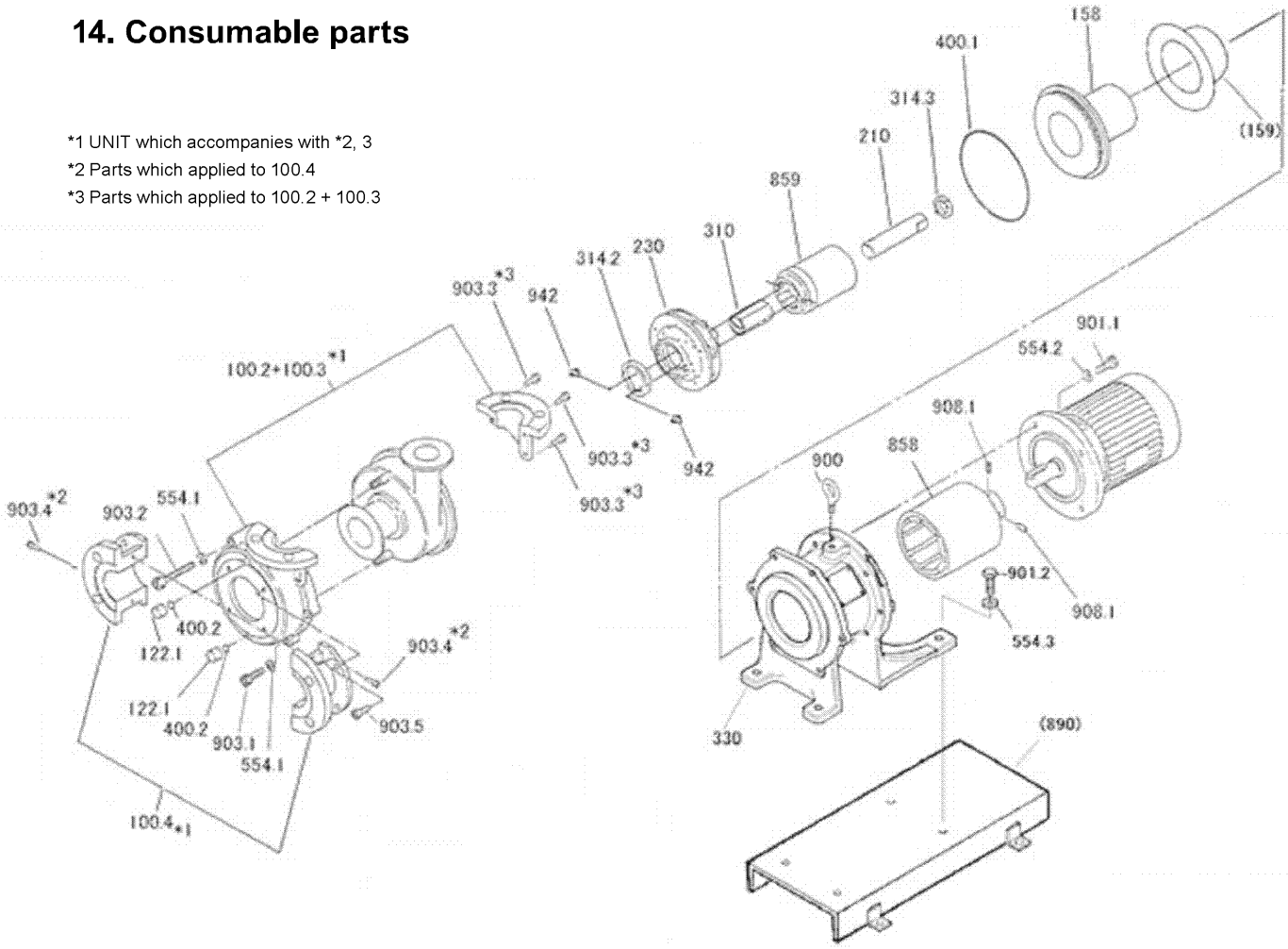
Replace O ring and gasket with new ones at each time of replacement. Reusing old O ring and gasket could reduce seal performance and result in leakage.

5. Mount the front casing to the motor bracket.
   Tighten the hex. socket bolts diagonally and equally. Tightening torque is shown below.

Model	Tightening torque	Bolt size
MXM542, 543, 545	24.5N•m	M10

14. Consumable parts

*1 UNIT which accompanies with *2, 3
*2 Parts which applied to 100.4
*3 Parts which applied to 100.2 + 100.3



Consumable parts are necessary for continuous operation for a long period. Putting an order of the consumable parts, advice us of the following.

1 Parts name and parts number(See page 8)
2 Pump model and MFG.No.(See the nameplate on the pump).
3 The approved drawing number(If you have).

				MXM542/543	MXM545
No.	Parts name		Material	Reference code	Reference code
210	Spindle	CF/FF	High purity alumina ceramics	MXM0001	←
		KK	SiC	MXM0002	←
310	Bearing	CF	High density carbon	MXM0016	←
		FF	High purity alumina ceramics	MXM0118	←
		KK	SiC	MXM0017	←
314.2	Mouth ring	CF/FF	PTFE(With filler)	MXM0063	←
		KK	SiC	MXM0064	←
314.3	Rear thrust		CFRPFA	MXM0003	←
859 + 310	Magnet capsule assembly	CF	CFRETFE + High density carbon	MXM0004	MXM0012
		FF	CFRETFE + High purity alumina ceramics	MXM0119	MXM0120
		KK	CFRETFE + SiC	MXM0005	MXM0013
400.1	O ring		FKM	MXM0006	←
			EPDM	MXM0007	←
			AFLAS®	MXM0008	←
			DAI-EL PERFLUOR®	MXM0014	←
400.2	Gasket		FKM	MXM0009	←
			EPDM	MXM0010	←
			AFLAS®	MXM0011	←
			DAI-EL PERFLUOR®	MXM0015	←

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Finland	: IWAKI Suomi Oy	TEL : (358)9 2742714	FAX : 9 2742715
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France	: IWAKI France S.A.	TEL : (33)1 69 63 33 70	FAX : 1 64 49 92 73
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