IWAKI PUMPS

IWAKI Magnetic Drive Pump
MD-F type (built-in type)
Instruction Manual

⚠ Read this manual before use of product

Thank you for selecting an Iwaki MD-F type Magnetic Drive Pump. This instruction manual deals with "*Safety Instructions*", "*Outline*", "*Installation*", "*Operation*" and "*Maintenance*" sections.

Please read through this instruction manual to ensure the optimum performance, safety and service of your pump.

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Safety Instructions ····· **1**

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This instruction manual should be kept on hand by the end user for quick reference.

Contact us or your nearest dealer if you have any questions.

Important Instruction

For the Safe and Correct Handling of the Pump

- "Safety Instruction" section deals with important details about handling of the product. Before use, read this section carefully for the prevention of personal injury or property damage.
- 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 personal injury or property damage.**

Types of Symbols

⊘	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.

⚠ Export Restrictions

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

Safety Instructions

⚠ WARNING

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


Power off

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



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


Prohibited

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


Do not rework or alter

- **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.


Wear protectors

⚠ CAUTION

- **Qualified personnel only**
  The pump should be handled or operated by a qualified personnel with a full understanding of the pump.


Prohibited

- **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

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


Prohibited

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


Caution

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


Caution

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


Prohibited

⚠ CAUTION

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


Prohibited

- **Do not run pump dry.**
  If the pump runs with no liquid, friction heat builds up and damages the internal parts of pump.


Prohibited

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


Caution

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


Earthing

- **Do not pressurize the pump**
  If the pump is pressurized over the maximum discharge pressure, O ring seal may be impaired and leakage may result.


Prohibited

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


Electrical shock

⚠ CAUTION

- **Damaged power cable**
  Do not use any damaged power cable for the prevention of a fire or electrical shock. The cable is not replaceable, so that the whole pump unit needs to be replaced when the cable is damaged.


Prohibited

- **Do not install or store the pump:**
  - Where ambient temperature falls below 0°C or exceeds 40°C.
  - In a flammable/corrosive atmosphere.
  - In direct sunlight or wind & rain.


Prohibited

- **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.



- **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.



- **Fasten the front casing tight**
  Liquid may leak if front casing fixing screws are loose. Tighten the screws diagonally and evenly by the rated torques (see page 19) before initial operation or at intervals.

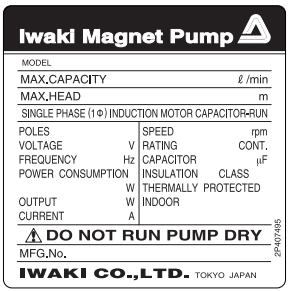

Caution

Before use, check the specification, limitation and hazardous nature of the pump.

1. Unpacking & Inspection

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

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

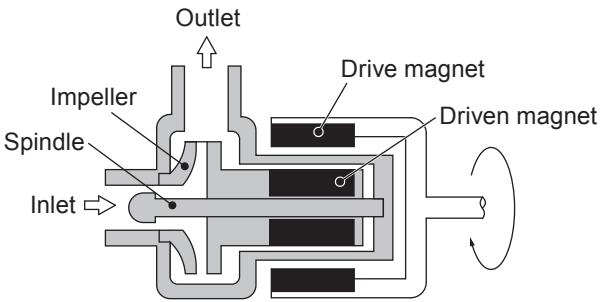


2. Check for transit damage, deformation, and loose bolts.

2. Operating principle

The MD-F is a compact magnetic drive centrifugal pump with fluoroplastic and fine ceramic wet ends and is capable of handling a strong acid and alkali.

The magnetic force between drive and driven magnets rotates the impeller in the pump chamber, where a liquid is transferred from the inlet to outlet.



3. Identification code

Identification code

MD - 15F X - 220 N 01
a b c d e

a. Series model	MD-15F/ -30F/ -55F/ -100F	
b. Impeller type	X, Y, Z	
c. Power voltage	220:	220/240V (50Hz)
d. Motor type	N:	New type motor
e. Special version	No code:	Standard
	01-99:	Custom design

MD - 55F X - 01
a b c

a. Series model	MD-55F/ -100F	
b. Impeller type	X, Y, Z	
c. Special version	No code:	Standard
	01-99:	Custom design

NOTE: Custom design is different from standard in power cable length, outlet direction, plug shape or terminal treatment.

4. Specification

50/60Hz

Model	Impeller type	Connection	Max flow (L/min)	Max head (m)	Norm flow (m-L/min)	Max SG	Motor		Mass (kg)	Max operating pressure (MPa)
							Power (V)	Rated output (W)		
MD-15FX-220N	X	NPT 1/2	10/-	4.1/-	3-5/-	1.2/-	220/240 (1ph)	10	1.8	0.06
MD-15FY-220N	Y		9/10	3/4	2-5/3-7	1.9/1.3				
MD-15FZ-220N	Z		-/10	-/3.1	-/2.5-6	-/1.9				
MD-30FX-220N	X	NPT 1/2	13/15	8/11	5.5-8/ 8.5-9.5	1.5/1.3		45	4.0	0.17
MD-30FY-220N	Y		10/12	6/8	4.5-6.5/ 6-8	1.9/1.5				
MD-30FZ-220N	Z		-/11	-/7	-/5.5-7	-/1.9				
MD-55FX	X	R1	65/-	7.8/-	6.4-30/-	1.3/-		90	5.4	0.12
MD-55FY	Y		60/65	5.4/7.8	3.8-30/ 6.4-32	2.0/1.3				
MD-55FZ	Z		-/55	-/6.0	-/4.5-25	-/2.0				
MD-100FX	X	R1	125/-	10.5/-	7.5-65/-	1.2/-	220/240 (1ph)	260/-	8.5	0.17
MD-100FY	Y		115/135	8.5/11.5	6-60/ 8-70	2.0/1.3	220/380 (3ph)	260/265		
MD-100FZ	Z		-/115	-/8.5	-/6.5-55	-/1.9	400/440 (3ph)	-/265		

NOTE:

a. The data above is based on pumping of clean water at ambient temperature.

b. The maximum flow is obtained at zero discharge head, and the maximum head is obtained at the maximum pressure.

c. The maximum viscosity is up to 30mPa•s (at SG 1.0).

d. Allowable liquid temperature is 0-80°C.
*Note that the liquid temperature is based on pumping clean water and it changes with liquid property and operating conditions.

e. Non freezing

f. The maximum specific gravity is obtained at or near the maximum flow. Note that the limitation varies with a duty point, ambient temperature or liquid viscosity.

g. Motor type

MD-15F/-30F/-55F: Single-phase capacitor-run induction motor
MD-100F : Single-phase capacitor-run induction motor or 3-phase induction motor

*The built-in thermal circuit which is provided to the both motor types will stop the pump when the motor temperature reaches a thermal operating temperature. The pump resumes operation after temperature falls to a return temperature.

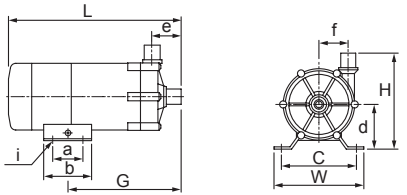
*For the IEC motor, consult your nearest distributor.

⚠CAUTION

- **If the built-in thermal circuit often interrupts the pump operation, it is possible that the damage to the impeller or debris has caught the impeller in the pump casing and caused the abnormal temperature rise in the motor. In this case, stop operation and contact us.**
- **Do not dismantle the motor. Contact us for inspection.**

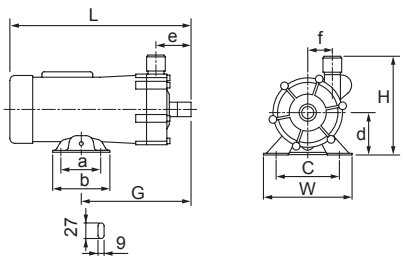
5. Outer dimensions

MD-15F-N/ -30F-N



Model	W	H	L	a	b	c	d	e	f	G
MD-15F-N	95	120	186	–	50	68	55	34	28.5	123.5
MD-30F-N	120	130	231	40	64	100	60	39	38.5	152

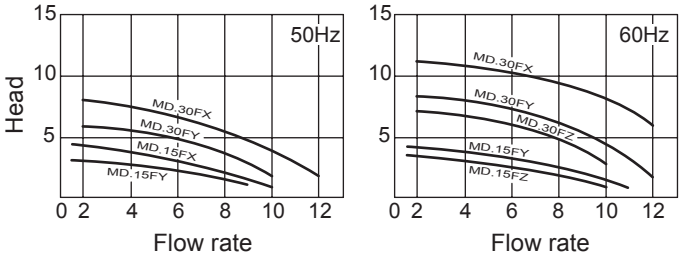
MD-55F/ -100F



Model	W	H	L	a	b	c	d	e	f	G
MD-55F	120	155	270	40	64	100	65	58.3	39.5	198.5
MD-100F	156	174.3	320	70	100	110	75	63	43	195

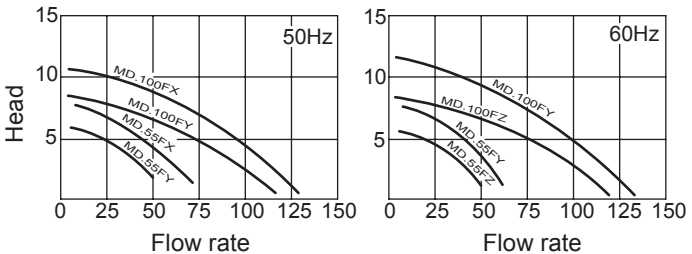
6. Performance curves

● MD-15F-N/ -30F-N



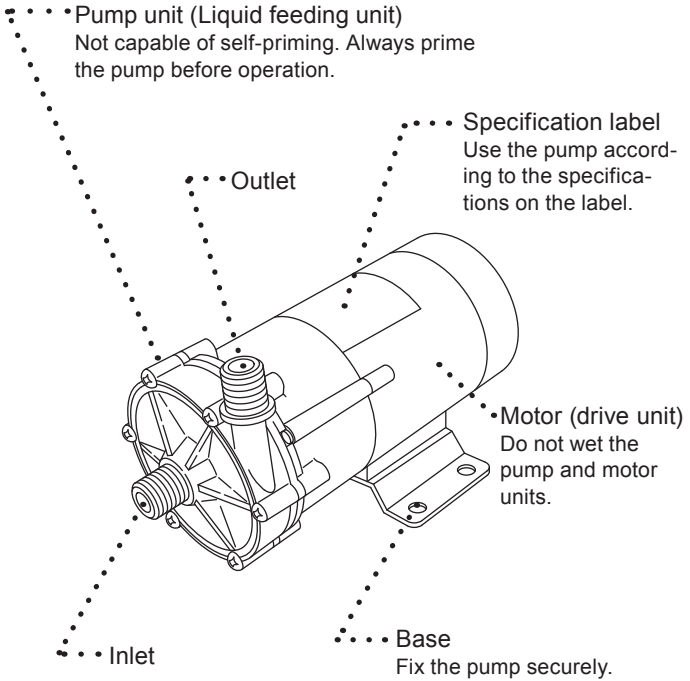
*The data above is based on pumping of clean water at ambient temperature.

● MD-55F/ -100F

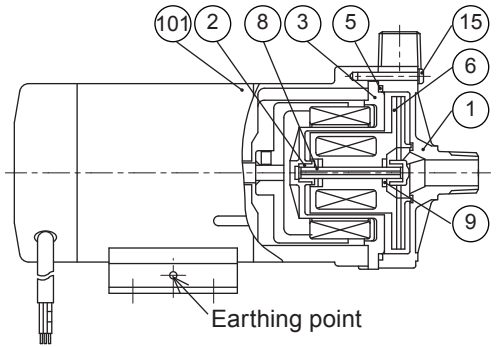


*The data above is based on pumping of clean water at ambient temperature.

7. Overview & Label



8. Part names & Structure



No.	Part names	Q'ty	Materials	Remarks
1	Front casing	1	CFRETFE	
2	Bearing	2	SiC	
3	Rear casing	1	CFRETFE	
5	O ring	1	FKM-A	
6	Impeller	1	CFRETFE	
8	Spindle	1	SiC	
9	Thrust ring	2	SiC	
15	Machine screw	6	Stainless steel	
101	Motor	1	-	

CFRETFE : Carbon Fiber Reinforced Ethylene Tetraluoroethylene
SiC : Silicon Carbide
FKM-A : Fluorine-contained rubber

1. Before Installation

The pump should be handled or operated by qualified personnel with a full understanding of the pump.

⚠ WARNING

- Risk of electrical shock. Be sure to turn off power to stop the pump and related devices before service is performed.
- Electrical work should be performed by a qualified electrician. Otherwise, personal injury or property damage could result.

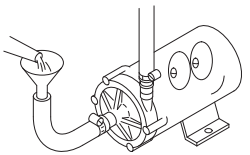
⚠ CAUTION

- 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.
- A strong magnet is inside the pump. Do not bring a watch or floppy disk which may be adversely affected by a magnetic force.

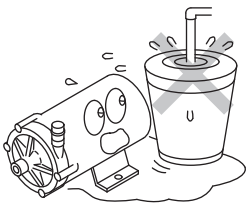
- Use care handling the pump. Do not drop. An impact may affect pump performance.



- The pump is not capable of self-priming. Always prime the pump before operation.



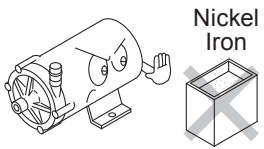
- The pump is not dust-/water-proof. Do not operate the pump while wet with solution or water.



- The pump doesn't have an ON-OFF switch and so starts as a power cable is plugged in.

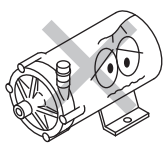
- Banned solutions
  - Halogenated hydrocarbons such as trichloroethylene and carbon tetrachloride
  - Ether and low-grade ester
  - Slurry (never use slurry, which wears out the pump bearings.)

- A strong magnet is inside the pump. Do not use the pump with any liquid which contains metals such as iron and nickel.



- Do not pull, knots, crush, modify, or heat the power cable. Damage to the power cable could lead to a fire or electrical shock if cut or broken. Stop operation and contact us.

- Use of a damaged pump could lead to an electric shock or death.



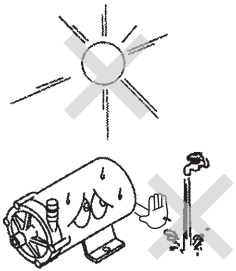
⚠CAUTION

Do not install or store the pump in the following places:

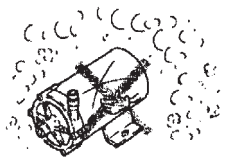
1. Where ambient temperature exceeds 40°C or falls below 0°C.

2. In a dusty/humid place.

3. In direct sunlight or wind & rain.



- Install the pump as close to a supply tank. Keep a liquid level in the tank higher than the pump at any time.



- An electrical failure of the pump may result in electric shock. Purchase and install an earth leakage breaker separately.

- Noise level during operation is as below.

Model	Noise level	Model	Noise level
MD-15FX	55dB	MD-55FX	55dB
MD-15FY		MD-55FY	
MD-15FZ		MD-55FZ	
MD-30FX	60dB	MD-100FX	75dB
MD-30FY		MD-100FY	
MD-30FZ		MD-100FZ	

*Noise level is measured in A scale at a distance of 1m.

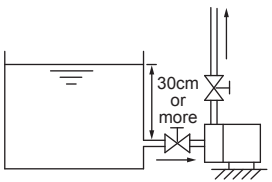
2. Installation/ Piping/ Electrical wiring

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

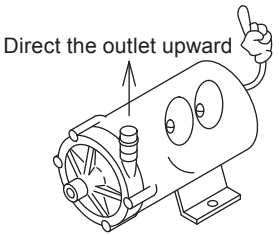
2.1 Installation

1. Install the pump:
   - Where ambient temperature will not falls below 0ºC or exceeds 40ºC.
   - Where ambient humidity is 90%RH or below.
   - Where sufficient space is kept around the pump for easy access and maintenance.

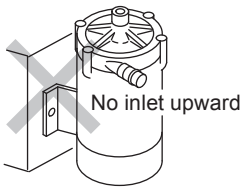
2. Mounting position
   This pump is not capable of self-priming. Flooded suction application is ideal. The pump should be installed 30cm lower than a suction liquid level, or a bearing may be worn soon by entrained air.



3. Outlet direction
   Always direct the outlet upward or entrained air can not be expelled.

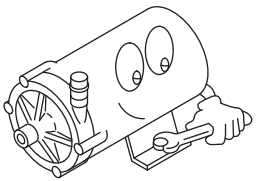


4. Do not mount the pump vertically.



5. Pump fixation
   Secure the pump by fixing its base on a flat and a stable foundation.

NOTE: Use corrosive resistant fixing screws.

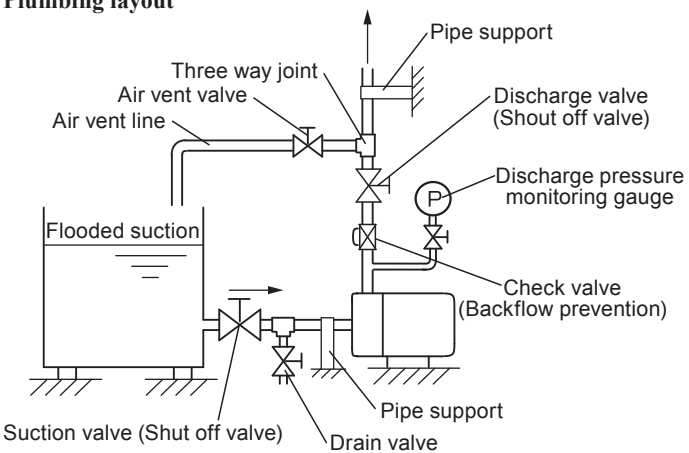


2.2 Piping

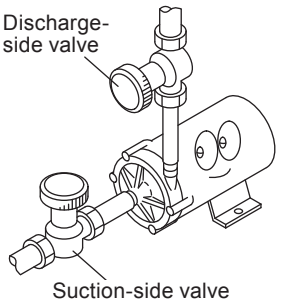
■ Before tubing

- Using a high flow pump and a small supply tank, a liquid level in the tank changes greatly.
- Do not allow a drop of adhesive agent or sealant into pipework. They may cause fatal damage to the pump.
- If pipework directory weighs on the pump, deformation or damage may result. Be sure to install pipe supports.

Plumbing layout



1. Flow/head adjustment & maintenance valves
   Install a ball valve on a discharge line for flow rate adjustment and on a suction line for the convenience of maintenance, as close to the pump as possible.

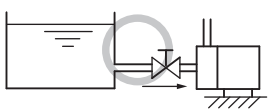
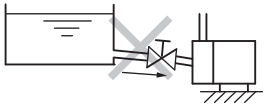
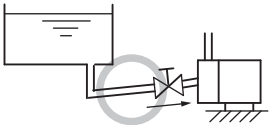
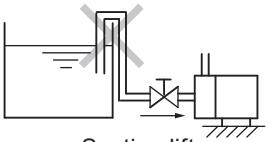
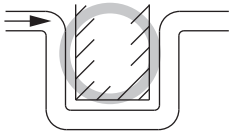
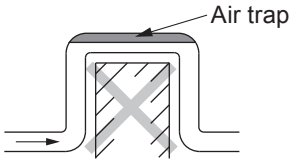


2. Pressure gauge
   Install a pressure gauge for monitoring discharge line pressure.
3. Drain valve
   Install a drain valve in between the pump inlet and a suction valve for blowing down liquid.
4. Air vent line and air vent valve
   Install an air vent line and an air vent valve when a discharge line is laid long in a horizontal direction.
5. Check valve
   Install an check valve when a discharge line is laid long in a vertical direction.

■ Suction line

• Avoid any loops in a plumbing run that could form a vapour trap. A suction line should be laid on a rising gradient of 1/100 toward the pump so as to expel air easily.

Suction line examples

Acceptable	Unacceptable
 Flooded suction	 Descending gradient
 Ascending gradient	 Suction lift
 U-shaped piping	 Arched piping

• In order to minimize plumbing resistance, have plumbing shortest with the minimum bends. Note cavitation*1 tends to occur when plumbing length is too long.

• A liquid level should be at least 30cm higher than the tank outlet for the prevention of air ingress.

• Keep liquid in the supply tank free from foreign matters. Clean the supply tank at intervals.

• Be sure to secure connections on a suction line for the prevention of entrained air. The presence of air in a suction line may prevent liquid delivery.

■ Discharge line

• Piping resistance changes with properties of liquid, specific gravity, liquid temperature and pipe length, and may adversely affect pump operation when the resistance is too great. In order to minimize the piping resistance, have piping length shortest with the minimum bends. Contact us for detail.

• When a discharge line is too long, water hammer*2 phenomenon may occur and damage the pump with impact pressure when the pump stops running. Provide a check valve to prevent water hammer.

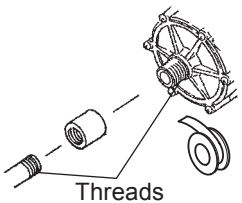
Word & Terms:

*1 Air bubbles caused by a negative pressure in the pump, accompanied with vibration and noise: Performance deterioration or parts corrosion results.

*2 Shutting off a discharge line at once, liquid pressure change causes an impact pressure, accompanying impact noise and vibration. This phenomenon is called water hammer. Water hammer damages the pump & pipework and may cause leakage.

<Thread connection>

- Use of a Teflon pipe or a Teflon-lined pipe is recommended.
- Select a suitable pipe I.D. for secure connection. See page 4 for applicable connection size.
- Wrap a thread seal tape around the exposed threads of pipes, a pump inlet and outlet to create an air- and water-tightness before connection.



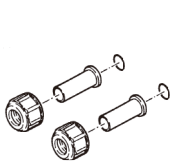
⚠CAUTION
Do not tighten a pipe too much, or a plastic inlet or outlet may break.

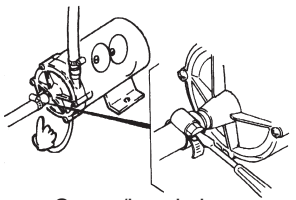
⚠CAUTION
Imperfect connection on a suction line introduces air into the inside. Air ingress may cause a poor flow, dry running and consequently impeller seizing.

<Union connection>

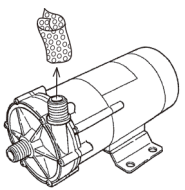
Optional unions are available to pumps with thread connections as a tube coupling device. Purchase separately.

- Use applicable tubes to liquid characteristics.
- Use temperature-/pressure-resistant braided tubes.
- Secure a tube on a union with an applicable screw/band clamp.





NOTE: For the MD-55F/-100F, be sure to remove a cushion from the outlet before pipework. Be careful not to damage the wet ends.



2.3 Electrical wiring

Electrical wiring must be performed by a qualified electrician. It is not the manufacture's responsibility for personal injury or property damage resulting from unauthorized service. Contact us or your nearest distributor for wiring as necessary.

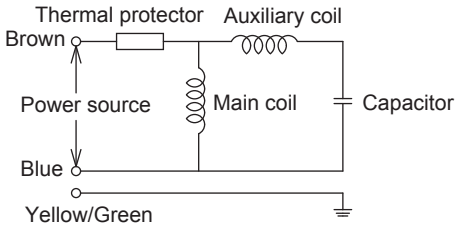
■ Before wiring

1. Check that the main power is turned off.
2. Electrical work should be performed in accordance with local electric codes, with an appropriate wire gauge or so.
3. Apply the specified power voltage. See the spec label.
4. The pump doesn't have an ON-OFF switch. The pump starts as a power cable is plugged in.
5. Earth the pump through the earth terminal.
6. When an earth leakage breaker is used and has tripped, always investigate and solve root causes. Be sure to unplug the pump before investigation is performed.

■ Connection diagram

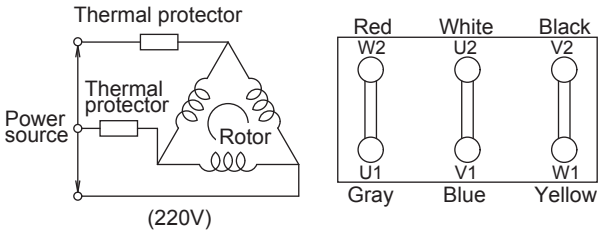
Single-phase capacitor-run induction motor

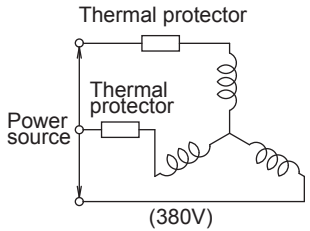
(MD-15/-30/-50/-100F types)

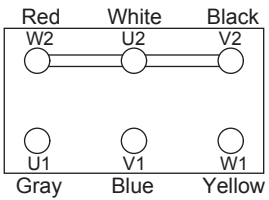


220/380V 3-phase motor

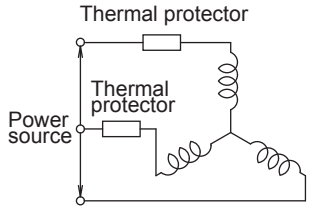
(MD-100F type)







400/440V 3-phase motor
(MD-100F type)



■ Rated current & Starting current (50/60Hz)

Model	Rated current			Starting current		
	220/240V Single phase	220/380V 3 phases	400/440V 3 phases	220/240V Single phase	220/380V 3 phases	400/440V 3 phases
MD-15FX-220N	0.18 / -	-	-	0.3 / 0.29	-	-
MD-15FY-220N	0.18 / 0.2	-	-	0.4 / 0.4	-	-
MD-15FZ-220N	- / 0.2	-	-	0.4 / 0.4	-	-
MD-30FX-220N	0.41 / 0.49	-	-	0.4 / 0.4	-	-
MD-30FY-220N	0.37 / 0.37	-	-	1.2 / 1.25	-	-
MD-30FZ-220N	- / 0.32	-	-	1.2 / 1.25	-	-
MD-55FX	1.0 / -	-	-	1.2 / 1.25	-	-
MD-55FY	1.0 / 0.9	-	-	1.1 / 1.0	-	-
MD-55FZ	- / 0.9	-	-	1.1 / 1.0	-	-
MD-100FX	1.93 / -	1.18-0.69 / -	0.62-0.6 / -	3.8-4.3 / -	3.8-2.2 / -	1.9-2.2 / -
MD-100FY	1.93-1.93 / 1.85-1.83	1.18-0.69 / 1.17-0.67	0.62-0.6 / 0.6-0.58	3.8-4.3 / 3.6-4.0	3.8-2.2 / 3.7-2.1	1.9-2.2 / 1.85-2.1
MD-100FZ	- / 1.85-1.83	- / 1.17-0.67	- / 0.6-0.58	- / 3.6-4.0	- / 3.7-2.1	- / 1.85-2.1

1. Before operation

Read through this section before use.

⚠ CAUTION

- Do not keep a discharge or a suction line little open or closed in operation.
- Do not open/narrow a discharge or a suction line sharply, otherwise the magnetic coupling*1 may be disconnected*2 (In this case turn off power once. The the drive and driven magnets will be coupled again as the pump is turned on.).
- If foreign matters enter the pump, turn off power and remove them, otherwise failure or malfunction may result.
- Do not run pump dry (operation with no liquid). Friction heat builds up and damages the internal parts of pump.

Word & Terms:

*1 A pair of drive and driven magnets

*2 A state that a driven magnet (combination of impeller and magnet capsule units) does not rotate in sync with the drive magnet.

■ Preparations for operation

1. Check that the pump is under a flooded suction system and a liquid in a supply tank is at an appropriate level.
2. Check the connection between the pump and piping.
3. Check the pump is securely anchored.

2. Pump operation

- Do not run the pump in closed-discharge operation. Always keep the rated minimum flow rate (a tenth of the max flow rate).
- The pump should never be operated for a lengthy period (1 minute or more) with a discharge valve closed. Operation below the minimum flow can reduce lubricant and cooling effects on sliding parts. This could lead to failure.
- Do not send any medium other than fluid.
- Be sure to secure connections on a suction line for the prevention of entrained air. The presence of air in a suction line may prevent liquid delivery.
- Do not turn ON and OFF power in a short time. Before resuming operation, wait 30 minutes to turn on power after a motor has completely stopped rotating. Otherwise, motor may fail.

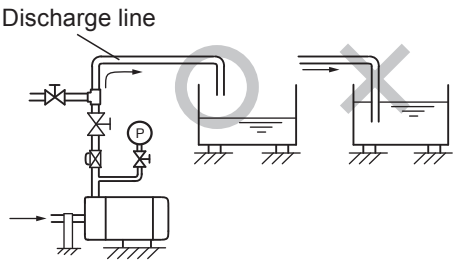
■ Operation

Operate the pump according to the following steps.

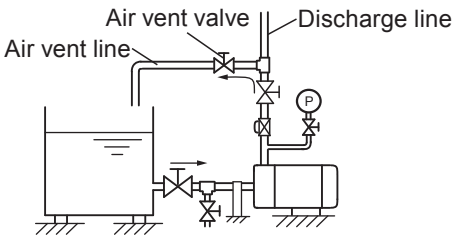
No.	Procedure	Points to be checked
1	Check piping, wiring and voltage.	• See the "2.2 Piping" and "2.3 Electrical wiring" sections. • Check the spec label to see if power supply voltage is correct.
2	Open or close a valve.	• Fully open a suction-side valve. • Fully close a discharge-side valve.
3	Prime the pump chamber.	• Prime the pump with liquid. Note: If the pump chamber is not filled with liquid due to residual air in it, run the pump for degassing and eliminate air completely. See the "Degassing" section on the next page.
4	Supply power to the pump.	• Turn on power and start the pump. Note: Do not keep a discharge-side valve closed more than 1 minute once the pump has started.
5	Adjust discharge capacity & discharge head to specified level.	• Open a discharge-side valve gradually till a flow and a head reach a specified level. Do not open or close the valve sharply. Note: Check that the pump transfers a liquid without trouble. If there is a problem, turn off power immediately and solve causes. See the "***Troubleshooting***" section.
6	Check the operation.	• Do not allow foreign matters to enter the pump. Foreign matters may cause the impeller to be locked, hindering liquid circulation. In this case turn off power immediately (contact us). • Turn off power when a leakage breaker has tripped. Investigate a root cause on the basis of the trouble shooting section.

■ Degassing

Open the discharge line. The end of the line immersed in liquid is not ideal for degassing. Take it out from liquid as necessary. Run the pump for 1 second and repeat the 1-second operation until the trapped air is removed (from 3 to 5 times).



If an air vent line is laid on, open it instead of a discharge line before degassing.



■ Shutdown

No.	Procedure	Description
1	Close the discharge line.	Close a discharge-side valve gradually. Do not cause sharp closure by using a solenoid valve.
2	Turn off power.	Check if a motor stops rotating smoothly as turning off power. If it is not smooth, check the motor. Contact us for detail.

■ Before a long period of storage

Empty the pump before it is left stopped for a long time. Run the pump with clean water for 5 minutes every 3 months to prevent the motor bearing from being rusty and stuck.
Follow the operation table above to resume operation.

1. Trouble shooting

If you notice any abnormal or dangerous conditions, suspend operation immediately and inspect/solve problems. Contact us or your nearest distributor as necessary.

Phenomenon / Causes	The pump does not run.	Poor discharge head	Overcurrent	Noise and vibration problem	Leakage	Measure
Wrong wiring	○		○			Inspect wiring. Rewire as necessary.
Motor failure	○		○			Contact us.
Air is trapped.		○		○		Eliminate air.
Air ingress from the inlet		○				Check suction piping.
Dry running		○	○	○		Prime the pump before operation.
Too high SG or viscosity	○	○	○			Replace with suitable pump.
Impeller magnet hits the rear casing.		○	○	○		Contact us.
Impeller is damaged.	○	○	○	○		Contact us.
Foreign matters on the impeller.		○	○	○		Contact us.
O ring is damaged.					○	Contact us
Pump head mounting screws are loose.		○			○	Tighten the mounting screws.

2. Maintenance & Inspection

Handling of the pump, maintenance and inspection should be carried out within this instruction manual.
It is not the manufacturer's responsibility for personal injury or property damage resulting from unauthorized service. Contact us or your nearest distributor as necessary.

2.1 Maintenance

■ Retightening

After a long period of operation or storage, the pump head mounting screws may be loose. Tighten the mounting screws periodically. Do not use excess force. The plastic pump head may deform.

Tightening torque

MD-15F/-30F	1.8N•m
MD-55F	3.0N•m
MD-100F	3.5N•m

■ Use with an earth leakage breaker

When an earth leakage breaker is used and has tripped, always solve the root cause of problems. Be sure to unplug the pump before investigation is made.

2.2 Inspection

■ Daily inspection

Always check for abnormality in vibration, noise, a current value, and a discharge capacity. If you notice any abnormal or dangerous conditions, suspend operation immediately and inspect/solve problems according to the troubleshooting section.

■ Cleaning

Periodically flush the inside of a supply tank and piping with water to keep clean conditions.
Turn off power before cleaning the pump exterior. Wait until the pump cools down if it is right after operation. Wet a cloth with tap water and wring it out for cleaning the pump. Use a neutral detergent for greasy dirt and then rub with a dry cloth.
Check the pump exterior is dried before a restart.

⚠CAUTION
Do not clean the pump with solvents such as benzine, alcohol and thinner. This may discolour the pump or erase printing.

⚠CAUTION
Risk of electrical shock or short circuit. Do not wet a motor or electrical wiring.

■ Wear parts

To run the pump for a long period, wear parts such as the impeller and O ring need to be replaced periodically.
Contact us for detail.

■ Before a long period of storage

Turn off power and empty the pump completely. Protect the pump from dust with a cover as necessary.
Do not store the pump:
- Under a flammable atmosphere
- Under a corrosive atmosphere
- Where ambient temperature exceeds 40°C.
- Where ambient temperature falls below 0°C.
- Under a dusty or humid space.
- Under direct sunlight
- Under wind and rain
- Under vibration

3. Drainage

No drain port is provided to this pump. See drainage procedure below.

⚠ WARNING

- Risk of electrical shock. Be sure to turn off power to stop the pump and related devices before service is performed.
- Always wear protective clothing such as an eye protection, chemical resistant gloves, a mask and a face shield during disassembly, assembly or maintenance work.

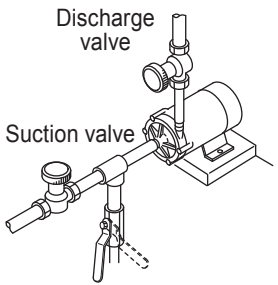
⚠ CAUTION

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

*Dilute and flush out harmful liquid before removing a pipe.

■ Procedure

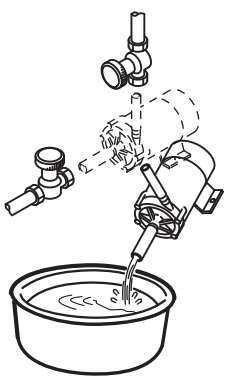
1. Turn off power. Make sure no one turns on power while working on the pump.
2. Close a discharge and a suction valve fully. Open a drain valve to empty the pump. Note liquid can not be removed completely through the drain valve.
3. Place a container under the pump and then remove a discharge and a suction line from the pump.



⚠ CAUTION

Be careful not to get wet with chemical liquid.

4. Unfix and take out the pump.
5. Direct the inlet downwards to run off liquid in a container.



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