

Thank you for selecting an Iwaki Walchem MDH-(F) Series magnetic drive pump. This instruction manual explains the correct handling, maintenance, inspection and troubleshooting procedures for your pump. Please read through it carefully to ensure the optimum performance, safety and long service of your pump.

1 Unpacking and Inspection

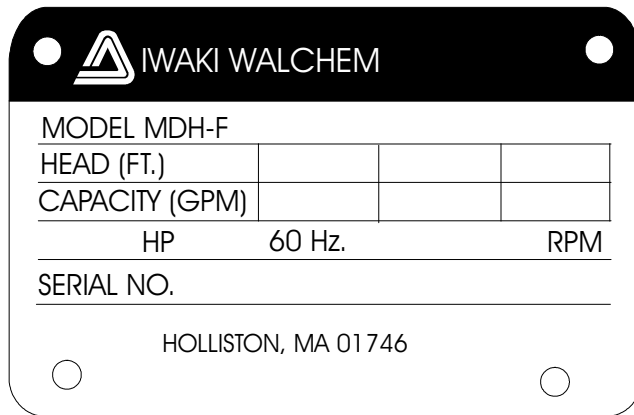


Fig. 1

Open the package and check that the product conforms to your order. Also, check each of the following points. For any problem or inconsistency, contact your distributor at once.

1. Check that the model number and the HP indicated on the nameplate conform to the specifications of your order.
2. Check that all the accessories you ordered are included.
3. Check that the pump body and parts have not been accidentally damaged or that any bolts or nuts have not been loosened in transit.



IWAKI WALCHEM
MAGNETIC DRIVE PUMP
MDH-(F) SERIES
INSTRUCTION MANUAL



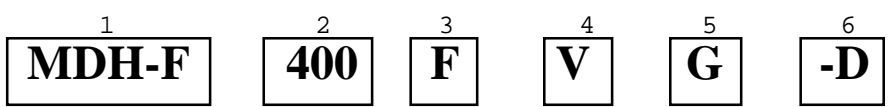
IWAKI WALCHEM Corporation

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Model Identification Guide



1. Casing Material

MDH: Glass fiber reinforced polypropylene (GFRPP)
MDH-F: Carbon fiber reinforced fluoroplastic (ETFE)

2. Pump Size

	Suction	×	Discharge		Suction	×	Discharge
400:	1½" NPTM		1½" NPTM	422:	2" NPTM		1½" NPTM
401:	1½" NPTM		1½" NPTM	423:	2" NPTM		1½" NPTM
				425:	2" NPTM		1½" NPTM

3. Bearing System, materials of construction

Pump Series	MDH Series			MDH-F Series		
Pump Size	400 - 401 - 422 - 423 - 425			400 - 401 - 422 - 423 - 425*		
Bearing Option	C	R	S	A	C	F
Bearing	Carbon	PTFE	Carbon	Alumina Ceramic	Carbon	
Spindle	Alumina	Alumina	316 S.S.		Alumina	High Purity
Front Thrust	Ceramic	Ceramic	316 S.S.		Ceramic	Alumina
Rear Thrust			Carbon	Ceramic		
Mouth Ring	PTFE					
Dry Run Capability (See No. 6)	YES	NO	YES	NO	YES	YES

* F425 available in "FVG" bearing system only

4. O-Ring Material

V: FKM (Viton®) **E:** EPDM **A*:** Aflas® **K*:** Kalrez®
 * Special order only

5. Impeller

		400	401	422	423	425
MDH Series	6:	½ hp	1 hp	2 hp	3 hp	5 hp
	7:	¾ hp	1½ hp	----	----	
MDH-F Series	X:	----	----	2 hp	3 hp	----
	G:	¾ hp	1½ hp	----	----	5 hp

6. Dry Run Capability (Bearing system specific. See also No. 3)

-D: Dry run available **-E:** Dry run not available

3

Specifications

Model Series	Impeller Code (Size)	Specific Gravity Capability ⁴	Maximum Flow Capacity (GPM)	Maximum Head/TDH (FT)	Motor Output (HP)	Connections Suction & Discharge (NPTM)
MDH-400	6	1.10	72	37	½	1½ x 1½
	7		66	42	¾	
MDH-401	6		85	66	1.0	
	7		92	70	1½ ⁵	
MDH-422	6		95	79	2.0	2 x 1½
MDH-423	6		120	78	3.0	
MDH-425	6	1.20	158	100	5.0	
MDH-F400	G	1.10	66	42	¾	1½ x 1½
MDH-F401	G	1.20	92	70	1½	2 x 1½
MDH-F422	X		95	80	2.0	
MDH-F423	X		120	77	3.0	
MDH-F425	G		158	100	5.0	

Notes:

1. Rated performance (head/capacity) represents the maximum discharge head/capacity measured with water at 70° F (21° C).
2. Liquid temperature range: 32 - 176° F (0 - 80° C)
Ambient temperature range: 32 - 104° F (0 - 40° C)
3. Slurry: Standard pumps are not suitable for slurry applications. Only MDH-F(AV) models are capable of handling applications with a slurry hardness 80Hs or below, grain size maximum 2 mil, maximum density 5% wt. Contact Iwaki Walchem or your distributor for details.
4. Specific gravity capability at maximum flow with maximum impeller when fluid viscosity is 1cp. Specific gravity fluids up to 2.0 can be handled with appropriate trimming of impeller. Consult Iwaki Walchem or your distributor for recommended model and impeller trim.
5. The MDH-401-7, when coupled to a 1½ HP motor should use a flywheel drive magnet assembly, part number MFL1361.

Note that the MDH-(F)401 with a 1 HP motor does NOT require the flywheel drive magnet.

■ **Materials of Main Components**

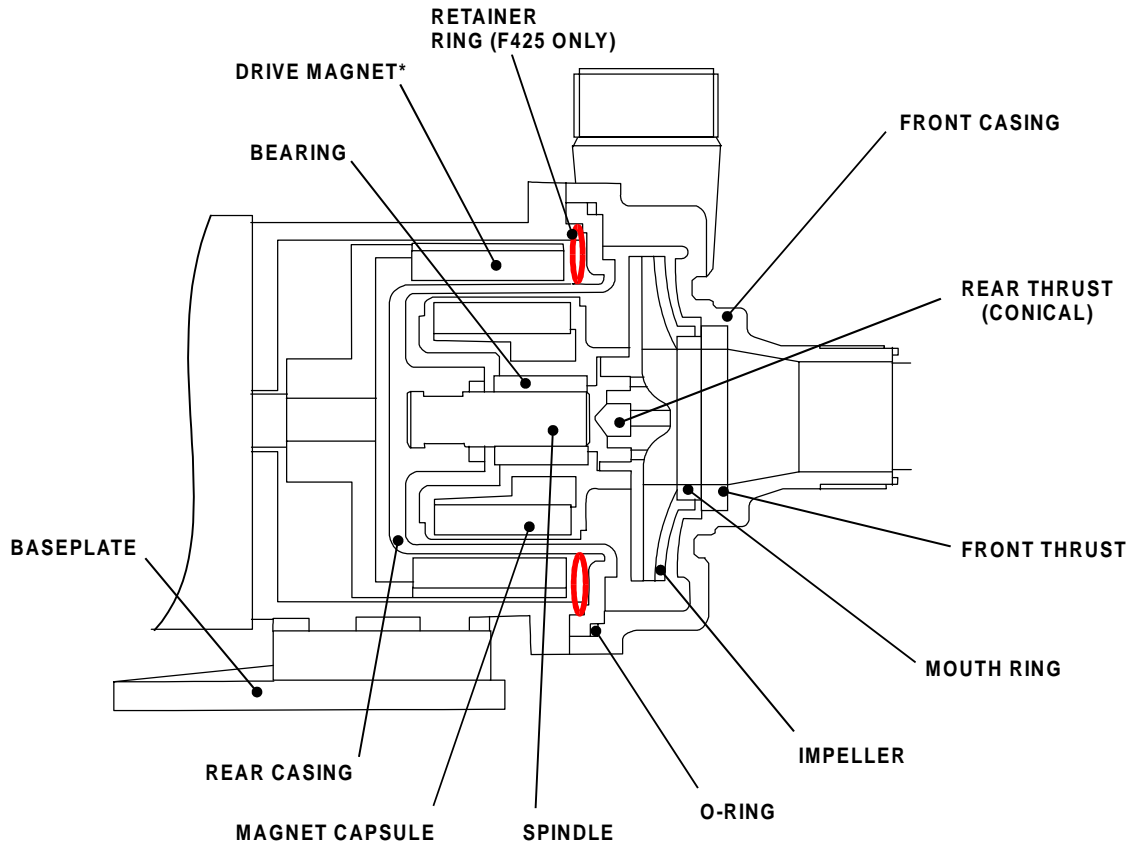


Fig. 2

Parts	Model Series					
	MDH			MDH-F		
	CV	RV	SE	AV	CV	FV
Casings & Impeller	Glass fiber-filled polypropylene			Carbon fiber-filled ETFE		
Magnet capsule	Glass fiber-filled polypropylene			Carbon fiber-filled ETFE		
Spindle	Alumina ceramic		316 SS	Alumina ceramic		99.8% Alumina ceramic
Bearing	Carbon	PTFE	Carbon	Alumina ceramic	High density carbon	
Mouth Ring	PTFE			PTFE		
Thrust Ring	Alumina ceramic		316 SS	Alumina ceramic		99.8% Alumina ceramic
Drive magnet	Ferrite/Neodymium*					

* Ferrite in 400/401 - Neodymium in 422/423/425

1. Dry run operation, unless using a "-D" model

Dry run operation of the pump may cause damage to the pump internally. The internal bushings used in the MDH-(F) series pump are lubricated and cooled by the fluid being pumped. If the pump is unavoidably or accidentally operated dry, with no obvious damage, allow the pump to cool down for a minimum of one hour before attempting to restart. Do not allow fluid to enter the pump cavity until the pump has cooled down. Sudden or rapid introduction of a cold fluid may cause damage to the bearing system. A dry run protection device is recommended for the prevention of damage when dry pump operation is anticipated.

"-D" Models

Most MDH-(F) models are designed to tolerate brief or intermittent dry run operation, they are identified by a "-D" at the end of the model number. These models can tolerate dry run conditions for up to one hour. Longer dry run periods, or frequent dry running may result in premature wear of the bearing surfaces. This can rapidly affect the standard clearances of the rotating elements inside the pump. These pumps are designed to reduce the likelihood of cracking resulting from sudden cooling with liquid immediately after dry run operation. However, to ensure that this does not occur, Iwaki Walchem recommends that the pump be allowed to cool for at least 20 minutes after dry running before introducing fluid again.

"-E" Models

Pumps identified with "E" at the end of the model identification cannot endure dry running operation.

2. Starting and Stopping

Pay close attention to the following points to avoid water hammer upon starting and stopping pump operation. Extra attention is required when the discharge piping is very long.

Starting

Prior to starting the pump, make sure that the power is turned off. Then carry out priming to fill the pump cavity with liquid. Close the cocks of any pressure or vacuum gauges to prevent damage from sudden pressure changes. Open only when taking measurements.

Next, close the valve on the discharge side. Now you can turn the power on and start up the pump. Run the motor momentarily to check the direction of motor rotation. The motor should run in the direction indicated by the arrow sealed on the pump. If the direction is reversed, exchange two wires of the three-phase power wires. When the pump has reached full speed and line pressure is stable, the discharge valve can be opened until the desired pressure setting is obtained.

Stopping

When stopping the pump, first close the discharge valve gradually. When it is completely closed, turn off the power switch so that the pump stops. Never stop the pump suddenly by quickly closing a valve (i.e., solenoid or hydraulic valves).



Caution

Quick valve closure may cause water hammer which may result in severe damage to the pump.

3. Maximum system pressure rating

The table on the right shows the maximum pressure rating of each model. Take care that the system pressure does not exceed the maximum pressure rating.

Pump Size	Max. Pressure Rating	
	PSI	kgf/cm ²
400	23	1.6
401	34	2.4
422	43	3.0
423	43	3.0
425	57	4.0

4. Handling of slurries

In general, slurries should not be handled. However, the MDH-F(AV) models or custom order models with SiC bearings (KK type) can handle slurries if the density is 5% or less and the grain size is 2 mil (50 micron) or less. Prior to pumping such slurry liquid, you should call Iwaki Walchem or your distributor to verify that the operation is feasible.

5. Influence of specific gravity on pump performance.

The performance of the MDH-(F) pumps does not change when pumping fluids of high specific gravity. However, the effect of specific gravity on shaft power and magnet coupling torque requirements must be considered in the selection of the appropriate model for your application.

6. Influence of liquid viscosity on pump performance.

When pumping a high viscosity liquid, the discharge head and capacity of the pump may be lower than in the case of pure water. The required driving power may also vary and should be checked.

7. Intermittent operation.

Frequent start/stop switching shortens the service life of the pump. Limit the frequency of switching to six times or less per hour.

8. Effects of temperature.

The pump itself may not suffer a change in performance due to temperature fluctuation. However, the liquid may change in terms of viscosity, vapor pressure, and corrosive properties. Pay special attention to changes in liquid characteristics as a result of temperature fluctuation.

Liquid temperature range: 32 - 176° F (0 - 80°C)

Ambient temperature range: 32 - 104° F (0 - 40°C)

* Refer to corrosion resistance tables for the recommended temperature range for various types of liquids. In case of any questions, contact Iwaki Walchem or your local distributor to determine if operation is feasible.

9. Separation of magnet coupling (Decoupling).

If the magnet coupling should disconnect, stop the pump immediately. If operation is continued, the torque rating of the coupling will be permanently reduced.

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Installation, Piping, and Wiring

■ Installation Position

1. Install the pump as close to the suction tank as possible (flooded suction). If the suction port of the pump is positioned higher than the suction tank (suction lift), be sure to arrange a foot valve in the priming pipe and the suction pipe. The lifting capability depends upon the liquid properties, temperature, and length of suction piping. For details, consult Iwaki Walchem or your distributor.
2. The pump can be installed indoors or outdoors. However, there should be sufficient space around the pump to enable efficient and easy maintenance.

■ Installation

1. The pump anchoring area must be greater than the area of the pump baseplate. If the anchoring area is not large enough, the baseplate may be damaged due to the concentration of loads placed on it.
2. Set the pump baseplate on a concrete foundation and fasten the anchor bolts tightly to prevent the pump from vibrating during operation. A sturdy metal (or reinforced) skid or platform is also an acceptable mounting surface.
3. In case there is influence of motor vibration during operation (e.g., sympathetic vibration with piping), an expansion joint should be provided between the pump and the piping before the installation. Otherwise, pipes and gauges may be damaged.
4. MDH-(F) series pumps should always be mounted horizontally.

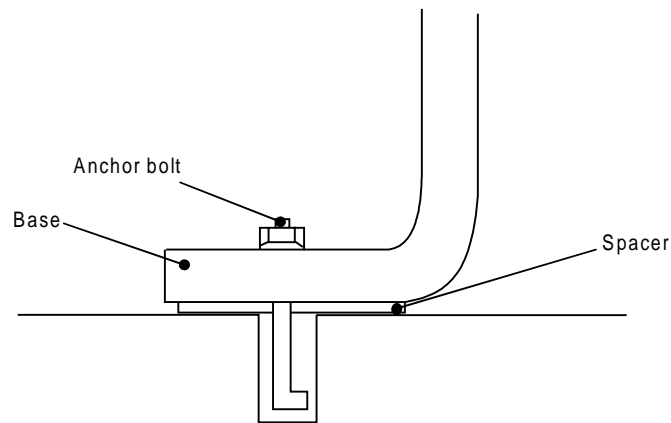


Fig. 3

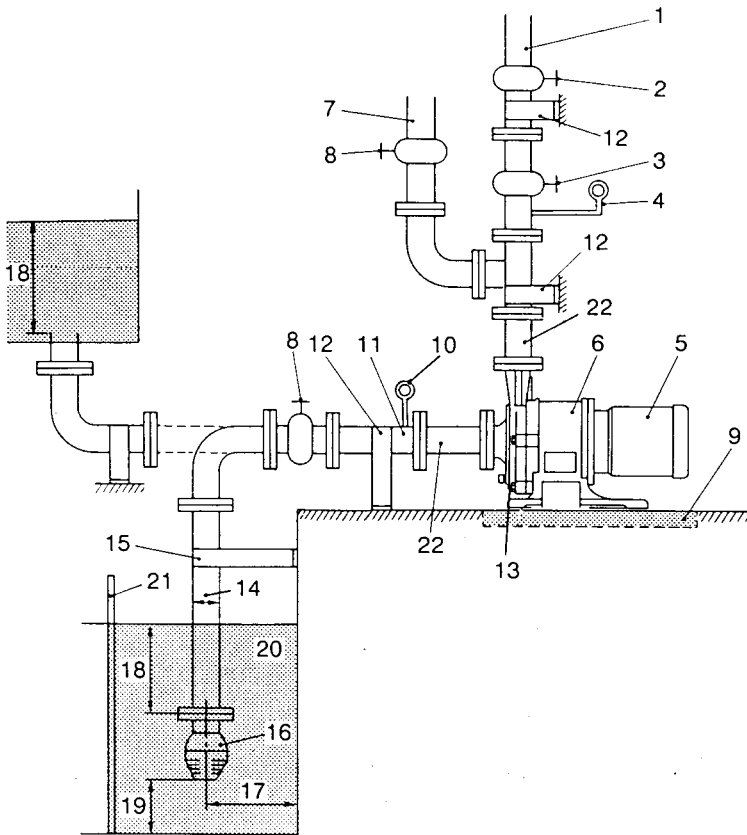


Fig. 4

■ Piping

1. Discharge pipe (Use a support to keep the pump free from the load of the pipe.)
2. Gate valve
3. Check valve
4. Pressure gauge
5. Motor
6. Pump
7. Priming pipe
8. Gate valve
9. Drain ditch
10. Compound gauge
11. Suction pipe (D=Diameter of pipe) (Shortest horizontal section with an ascending gradient toward the pump)
12. Pipe support
13. Pump drain (not applicable to MDH-(F))
14. Suction pipe (D=Diameter of pipe)
15. Suction pipe stabilizer brace (Used if the suction pipe is particularly long.)
16. Foot valve
17. 1.5D or more
18. 18 inches or more
19. 1- 1.5D or more (if sediment accumulates easily)
20. Suction tank
21. Screen
22. Short pipe

■ Suction Piping

1. The suction pipe should employ the flooded suction method if possible. The shortest pipe possible, with the minimum number of bends, should be designed. Arrange a proper support on the suction pipe so that the load and the thermal stress of the pipe itself are not applied to the pump.
2. Attach the coupling on the suction pipe carefully, so that no air enters the line. The presence of air in the suction pipe may prevent priming of the pump.
3. Avoid installations with poor suction conditions (e.g. vacuum in suction tank, large suction head or long suction piping). NPSHa should always be at least 2 feet greater than NPSHr. For NPSHr values, refer to the standard performance curve for your pump model or contact Iwaki Walchem or your distributor.
4. When using a bend on the suction side, install a straight pipe which is more than 20 inches long or 10 times as long as the suction port diameter before the suction port of the pump. Use the largest possible radius of curvature for the bend.
5. Do not allow any projection where air may be trapped along the suction pipe. The suction pipe should have an ascending gradient toward the pump.

6. If the diameters of the pump suction port and the suction pipe are different, use an eccentric reducer pipe. Connect the eccentric reducer pipe such that the upper part of it is level. **Never use a suction pipe with a diameter smaller than that of the suction port.**
7. When using the flooded suction method, the suction pipe should be given a slight ascending gradient toward the pump so that no air pocket is created on the suction side.
8. The end of the suction pipe should be located 18 inches or more below the surface of the liquid.
9. A screen should be provided at the inlet of the suction tank to prevent the entrance of foreign matter into the suction pipe. Foreign matter may cause malfunctioning of the pump. The end of the suction pipe should be a least 1- 1.5D from the bottom of the suction tank. (D=Diameter of suction pipe).
10. When employing the suction lift method, install a foot valve on the suction pipe.
11. When using the flooded suction method, it is recommended that a gate valve be installed on the suction pipe for easier overhaul inspection of the pump. Since this valve is used only in the overhaul inspection of the pump, keep it fully opened during normal pump operation.

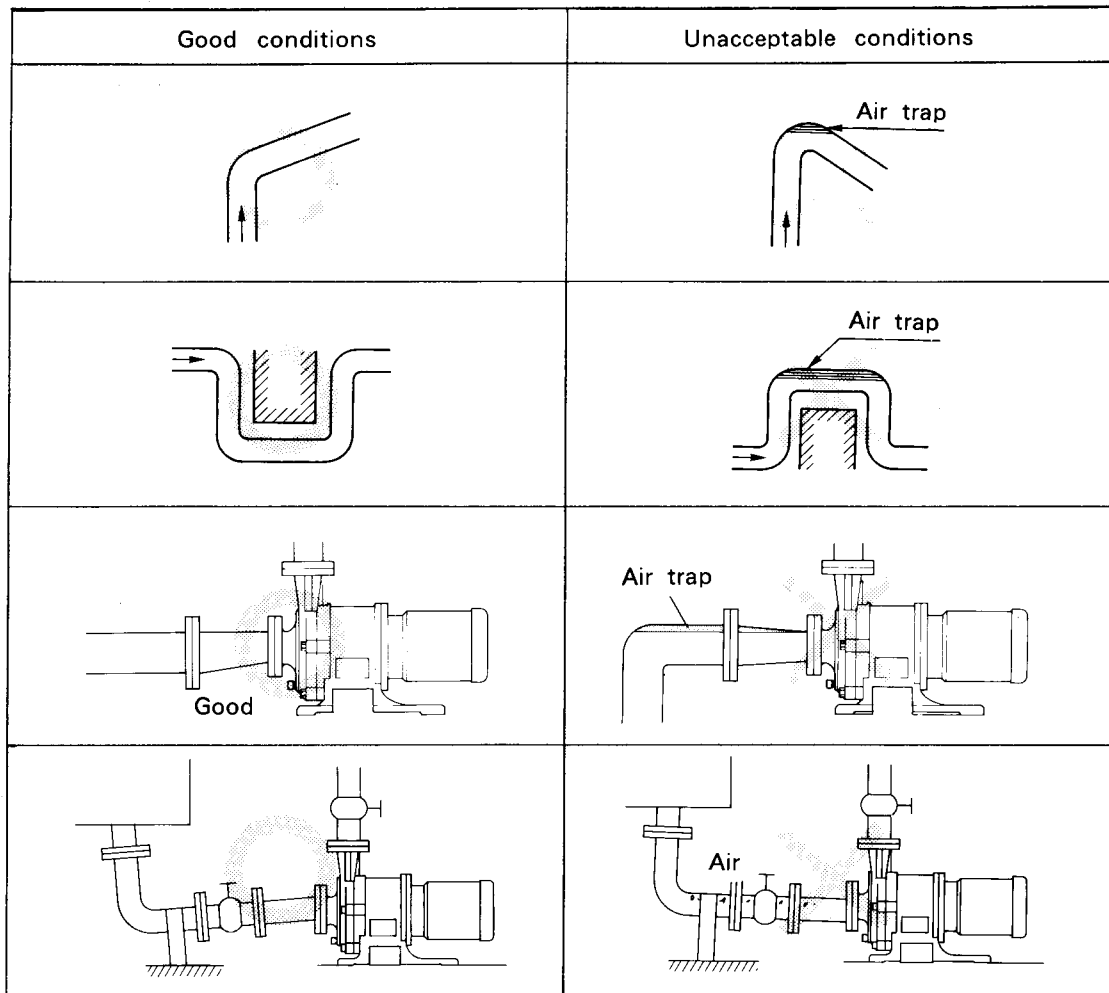


Fig. 5

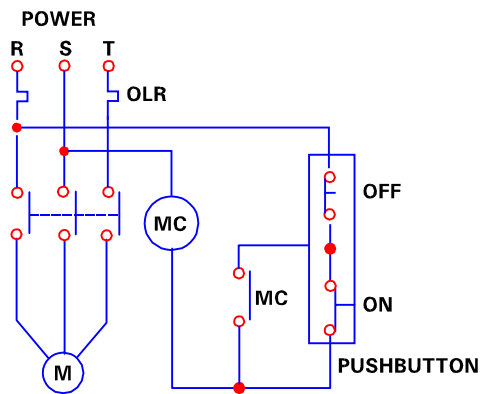
12. Pay close attention to the lowest level of the liquid in the suction tank so that air entrainment to the suction piping will not occur.

The inflow pipe into the suction tank should be distanced from the suction pipe and positioned below the liquid surface as a means of preventing air entrainment to the suction pipe. If air bubbles are generated in the suction tank, install a baffle.

13. It is recommended that a vacuum/pressure gauge be installed on the suction piping approximately 6 pipe diameters from the pump suction port.

■ Discharge Piping

1. Use proper pipe supports so that the weight of the piping does not load the pump nozzle.
2. If a method other than flooded suction is used, install a special pipe for priming.
3. 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.
4. A check valve should be installed if any of the following conditions exists in the piping:
 - The discharge piping is very long.
 - The discharge head is 50 feet or more.
 - The end of the discharge pipe is located 30 feet higher than the surface of the suction tank.
 - Several pumps are connected in parallel with the same piping.
5. The installation of a gate valve on the discharge pipe is recommended for the adjustment of discharge quantity and for the prevention of motor overload. When installing both a check valve and a gate valve, the check valve should be positioned between the pump and the gate valve.
6. A pressure gauge must be installed on the discharge piping.
7. An air bleeding valve should be installed if the discharge pipe is very long in the horizontal direction.
8. A drain valve should be installed for the drainage of liquid if there is a chance that the liquid in the discharge pipe will freeze.



M	Motor
MC	Motor contactor
ON	Push button
OFF	
CLR	Overload relay

Fig. 6

■ Wiring

Use appropriate wiring materials, follow the instruction manual for the motor and abide by the local and national electrical codes. In addition, follow the instructions given below:

1. Use a motor contactor that conforms to the specifications (voltage, current, etc.) of the pump motor.
2. If the pump is installed outdoors, use waterproof wiring to protect the switches from rainwater and moisture.
3. The motor contactor and push button should be installed a reasonable distance from the pump.
4. Refer to the wiring example shown on the left. (This example does not include the installation of a dry-operation prevention device. Follow the instruction manual of the dry-operation prevention device when installing it.)

6 Operation

■ Notes on Operation

1. Never operate the pump with the suction-side valve (gate valve) closed. Otherwise, the internal bushings of the pump will be damaged.
2. In the event of cavitation, stop the pump immediately.
3. If the magnet coupling disconnects, stop the pump immediately. The torque rating of the magnet coupling will be reduced if operation is continued with the coupling disconnected.
4. Liquid temperature fluctuation should not exceed 176°F when starting, stopping, and operating the pump.
5. Be sure to close the discharge valve completely before starting operation in order to prevent water hammer upon start-up.
6. The pump should never be operated for a lengthy period with the discharge valve closed. A resulting rise in temperature of liquid in the pump may cause damage to the pump.
7. In the event of a service power failure, turn off the power switch immediately and close the discharge valve.

■ Start-Up Preparation

When operating the pump for the first time after installation, and when restarting operation after a long interval, prepare for operation as described below.

1. Thoroughly clean the inside of the piping and pump.
2. Tighten the union fittings or flange connecting bolts and baseplate installation bolts. Check that bolts which couple the front casing and the bracket together are securely fastened.
3. Close the cocks of any pressure or vacuum gauges to prevent damage from sudden pressure changes. Open only when taking measurements.
4. Fully open the suction gate valve and partly open the discharge valve. Discharge valve may be adjusted after completion of priming and start-up process.
5. Use a screwdriver to rotate the motor fan and check that the fan rotates smoothly. This also purges any residual air from in and around the impeller.
6. If using flooded suction, measure the pressure in the suction pipe to check that the pump is filled with liquid.
7. Run the motor momentarily to check the direction of motor rotation. The motor should run in the direction indicated by the arrow sealed on the pump. If the direction is reversed, exchange two wires of the three-phase power wires.

Note: All Iwaki Walchem MDH-(F) series pumps spin counter-clockwise when looking at the suction port of the pump. Naturally, from the motor fan side, this would be viewed as clockwise.


■ Starting Operation

Pump operation is detailed below.

Check/Operation Step	Remarks
1. Verify valve position.	Suction valve fully open. Discharge valve fully closed.
2. Check that the pump is filled with liquid.	If pump is not filled with liquid, fill it in accordance with steps 5-6 of 'Start-up Preparation'.
3. Turn ON motor switch momentarily and check for correct direction of pump operation.	See the arrow on the casing to confirm the direction of rotation (clockwise when viewed from the motor fan side).

Check/Operation Step		Remarks
4.	<p>Flow rate adjustment. Once total discharge pressure is increased to shut off pressure. Open discharge valve gradually to set discharge pressure to desired specification.</p> <p>Pump should be operated at a minimum flowrate: 400/401: 2.5 Gal/min (10L/min) or more 422/423/425: 5.0 Gal/min (20L/min) or more</p> <p>In case of automatic control, close discharge valve when starting pump and gradually open the discharge valve thereafter.</p> <p>Don't operate the pump with the discharge valve closed for more than one minute.</p>	<p>Open valve slowly, paying attention to the motor amp meter to prevent it from being overloaded through excessive opening of the valve.</p>
5.	<p>Points to be observed during operation. If pump enters continuous operation condition, check flow meter and confirm that pump operation meets specifications.</p>	<p>If flowmeter is unavailable, check values of discharge pressure, suction pressure and current in relation to piping resistance.</p>

■ Stopping Operation

Check/Operation Step		Remarks
1.	Close discharge valve gradually.	 Caution Do not cause sudden closure by using solenoid valve, etc. Otherwise, pump may be damaged by water hammer.
2.	Stop motor.	Observe that the motor stops rotating slowly and smoothly. If not, check inside of pump.
3.	<p>Points to be observed when stopping pump.</p> <p>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. In case of short-term shut down, which does not allow removal of liquid, use band heater, etc., to prevent liquid from freezing.</p> <p>In case of service power failure turn OFF power switch and close discharge valve.</p>	

■ Daily Inspection

1. Check that the pump operates smoothly, without generating abnormal sounds or vibration.
2. Check the level of the liquid in the suction tank, and the suction pressure.
3. Compare the discharge pressure and current measured during operation with the specifications indicated on the motor and pump nameplates to verify normal pump load.

* Note that the indicated value of the pressure gauge varies in proportion to the specific gravity of the liquid.



Caution The valve of the pressure gauge or vacuum gauge should be opened only when measurements are recorded. It must be closed after completion of each measurement. If the valve remains open during operation, the gauge mechanism may be affected by abnormal pressure caused by water hammer.

4. If a spare pump is included in the installation, keep it ready for use by operating it from time to time.

■ Periodic Inspection

To ensure efficient, smooth operation of the pump, carry out periodic inspection by following the procedure described below. When carrying out an overhaul inspection, handle the internal bushings and plastic components most carefully. Since the outer drive magnet and inner magnet capsule are very powerful, handle these components with caution. Take care not to trap hands and fingers between the magnets and metal objects. Also avoid positioning the magnets near any electronic device (or ATM cards with magnetic strips) that could be affected by a strong magnetic field.

Inspection Interval	Part	Inspection Points	Operator Action
Every 6 months * Inspection record should be maintained.	Drive magnet assembly	<ul style="list-style-type: none"> ● Is there scoring? ● Is magnet mounted normally? Are hexagonal socket setscrews loose? ● Are inner perimeter of magnet and motor shaft concentric? 	<ul style="list-style-type: none"> ○ Contact your distributor if any abnormality is observed. ○ Reinstall magnet on motor shaft and fasten hexagonal socket setscrews. ○ Retighten or replace hexagonal socket setscrews.
Every 3 months * Inspection record should be maintained.	Rear casing	<ul style="list-style-type: none"> ● Is there scoring on inner diameter? ● Are there any cracks in liquid-containing section? ● Stain in rear casing? 	<ul style="list-style-type: none"> ○ Contact your distributor if abnormality is observed. ○ Replace if abnormality is observed. ○ Clean.
	Magnet capsule	<ul style="list-style-type: none"> ● Is there scoring in rear face or cylindrical body? ● Are there any cracks in the plastic of the rear section or cylindrical body? ● Bearing wear. 	<ul style="list-style-type: none"> ○ Contact your distributor if any abnormality is observed. ○ Contact your distributor if abnormality is observed. ○ Replace if abnormality is observed. ○ See tolerance chart.
	Impeller	<ul style="list-style-type: none"> ● Are there any cracks? ● Are there any cavitation marks? ● Stain or clogging inside impeller. ● Dimensional change of impeller. ● Conical thrust wear 	<ul style="list-style-type: none"> ○ Replace if abnormality is observed. ○ Eliminate cause. ○ Clean. ○ Replace if abnormality is observed. ○ Replace if abnormality is observed. ○ See Tolerance Chart

Inspection Interval	Part	Inspection Points	Operator Action
Every 3 months * Inspection record should be maintained.	Front casing	<ul style="list-style-type: none"> ● Stain in liquid-contacting section. ● Are there any cracks? ● Wear or crack of front thrust ring. ● Expansion or wear of o-ring. ● Scoring on inner surface. 	<ul style="list-style-type: none"> ○ Clean. ○ Replace if abnormality is observed. ○ Contact your distributor if abnormality is observed. ○ Replace if part is damaged. ○ Contact your distributor if abnormality is observed.
	Spindle	<ul style="list-style-type: none"> ● Are there any cracks? ● Wear on surface. 	<ul style="list-style-type: none"> ○ Replace if abnormality is observed. ○ Replace if wear limit is exceeded.

■ **Wear Limits of Spindle, Bearing, Mouth Ring & Impeller Thrust**

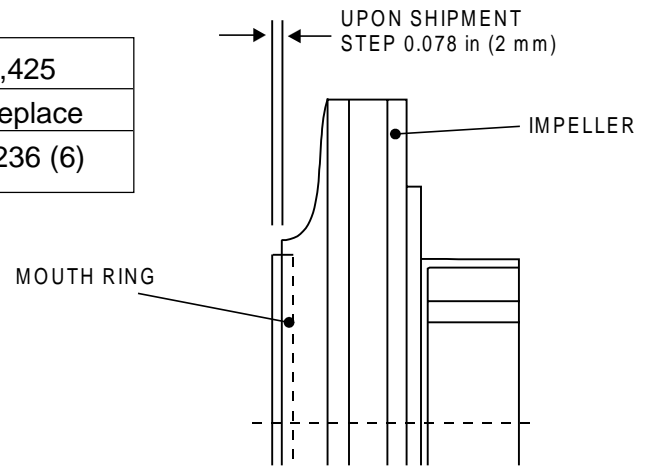
Model MDH-(F)	400		401, 422, 423, 425	
	New	Replace	New	Replace
Bearing I.D. inches (mm)	0.709 (18)	0.749 (19)	1.024 (26)	1.064 (27)
Spindle O.D. inches (mm)	0.709 (18)	0.670 (17)	1.024 (26)	0.985 (25)

If the difference between Bearing I.D. and Spindle O.D. exceeds 0.039 in. (1mm), either the bearing or the spindle, whichever has the greater wear, should be replaced regardless of the values in the above table. In case of a ceramic bearing type pump, the spindle and the bearing should be replaced simultaneously.

Initial wear may appear on the sliding parts during the first stages of operation. This should not be mistaken for an abnormal condition.

Note: The spindle of all models can only be replaced with the rear casing since it cannot be detached. They are an integral unit.

Model MDH-(F)	400,401,422,423,425	
Thickness of mouth ring inches (mm)	New	Replace
	0.315 (8)	0.236 (6)



The step between the surfaces of the mouth ring and the impeller upon shipment is 0.078 in. (2mm). Replace the mouth ring when this step is reduced to 0 in.

■ Wear limits of impeller thrust and spindle

Pumps whose model identification codes have D or E at the end are designed to have contact between the impeller thrust tip and the spindle face in the event of an abnormal operating condition (cavitation, dry operation, etc.). If the surfaces are worn out beyond the wear limit "A", the pump is subject to serious damage. The condition of the surfaces in contact must be checked if an abnormal operation such as dry running or cavitation lasts a total of over 3 hours.

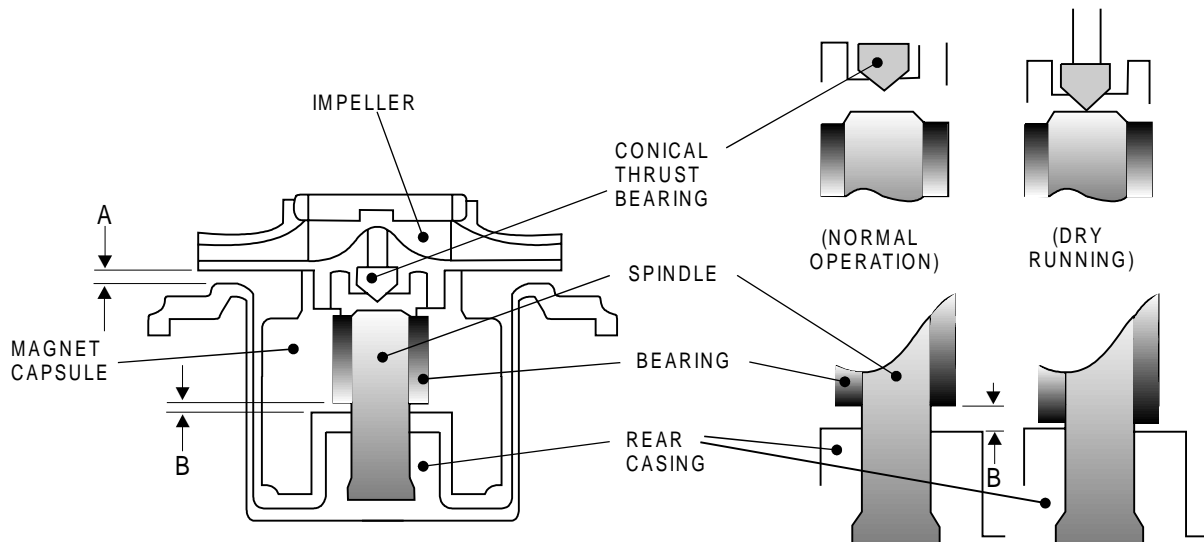


Fig. 8

■ Wear Checking Steps

1. After thorough decontamination of the pump, remove liquid end assembly from motor bracket.
2. Remove front casing from the liquid end.
3. Insert magnet capsule with impeller into rear casing.
4. Measure clearance between backside of impeller shroud and face of rear casing, dimension "A" shown below.

Model MDH-(F)	Dimension A	
	MDH-(F)400/401/422/423/425-D & E	
Wear limit of Impeller thrust	New	Replace
Inches (mm)	.102 (2.60)	.039 (1.0)

5. Physically confirm that clearances are adequate by spinning impeller by hand in rear casing.
 - Tips are not worn out beyond wear limit:
The impeller and magnet capsule rotate smoothly in the rear casing and there is clearance at the A and B sections.
 - Tips are worn out beyond wear limit:
The impeller and magnet capsule do not rotate smoothly. Contact between the rear casing and impeller at location A, or contact between the rear casing and the magnet capsule bearing at location B, as shown in the figure above, does not allow for the continuous smooth rotation of the impeller and the magnet capsule assembly. The tips of the impeller thrust and/or the spindle are excessively worn. In this case, replace the impeller and rear casing.

If no recess or dimple has been created on the spindle face due to wear by the tip of the conical thrust, the rear casing need not be replaced.

Note: If the impeller and magnet capsule spin freely, these parts may continue to be used. If the impeller does not spin freely, this indicates the bearing is contacting the rear casing. The pump must not be operated until the worn or damaged parts have been replaced.

8 Troubleshooting

Trouble	Symptom on Pump		Cause	Inspection and Countermeasures
	With Discharge Valve Closed	With Discharge Valve Open		
		Pressure gauge and vacuum gauge indicate 'zero'	<ul style="list-style-type: none"> ● Insufficient priming. ● Dry Operation 	<ul style="list-style-type: none"> ○ Stop pump, feed priming liquid and restart pump.
	Liquid Level drops immediately when priming is carried out		<ul style="list-style-type: none"> ● Foot valve is clogged with foreign matter. 	<ul style="list-style-type: none"> ○ Replace strainer. ○ Check whether seat is clogged with foreign matter.
Liquid is not pumped	Liquid level drops if discharge valve is opened after starting operation.	Needles of pressure and vacuum gauges swing but return to zero immediately.	<ul style="list-style-type: none"> ● Air enters through suction pipe or gasket section. 	<ul style="list-style-type: none"> ○ Check that the connection flange in suction piping is sealed airtight. ○ Check whether suction liquid level is abnormally low.
			<ul style="list-style-type: none"> ● Magnet coupling is disconnected. 	<ul style="list-style-type: none"> ○ Stop pump and use a screwdriver to check for easy and smooth rotation of motor fan. ○ Measure current level to check for low reading. ○ Check for foreign matter inside pump cavity. ○ Check whether voltage level is normal. ○ Replace drive magnet and/or magnet capsule.
			<ul style="list-style-type: none"> ● RPM of pump is insufficient. ● Pump rotation is reversed. 	<ul style="list-style-type: none"> ○ Check wiring and motor, and fix as necessary. ○ Correct motor wiring.

Trouble	Symptom on Pump		Cause	Inspection and Countermeasures
	With Discharge Valve Closed	With Discharge Valve Open		
Discharge quantity is small.	Needles of pressure and vacuum gauges indicate normal values.	Needle of vacuum gauge indicates high value.	<ul style="list-style-type: none"> ● Strainer is clogged with foreign matter and liquid passage is blocked. 	<ul style="list-style-type: none"> ○ Remove foreign matter in strainer.
		Needle of vacuum gauge indicates abnormally high value.	<ul style="list-style-type: none"> ● Air is trapped in suction pipe. 	<ul style="list-style-type: none"> ○ Inspect installation of suction pipe and modify it as necessary.
			<ul style="list-style-type: none"> ● Inlet section of impeller unit is clogged with foreign matter. 	<ul style="list-style-type: none"> ○ Partially disassemble unit and remove foreign matter.
		Needles of pressure gauge and vacuum gauge fluctuate.	<ul style="list-style-type: none"> ● Air enters via suction pipe or gasket section. 	<ul style="list-style-type: none"> ○ Check flange gaskets of suction pipe and tighten
			<ul style="list-style-type: none"> ● Discharge side of pump is clogged with foreign matter. 	<ul style="list-style-type: none"> ○ Remove foreign matter in pump. ○ Remove foreign matter or scale inside of piping.
		Vacuum gauge needle indicates high value while pressure needle indicates normal value.	<ul style="list-style-type: none"> ● Air pocket or resistance in suction pipe. 	<ul style="list-style-type: none"> ○ Inspect suction piping installation and make corrective adjustments.
		Pressure gauge needle indicates high value while vacuum gauge needle indicates normal value.	<ul style="list-style-type: none"> ● There is a section in discharge pipe that causes high resistance or actual head and loss of head are too high. 	<ul style="list-style-type: none"> ○ Check actual head and piping loss of discharge pipe and take necessary measures.

Trouble			Cause	Inspection and Countermeasures
	With Discharge Valve Closed	With Discharge Valve Open		
Discharge quantity is too low.	Needle of pressure gauge indicates low value and vacuum gauge indicates extraordinarily low value.	Needle of pressure gauge and vacuum gauge indicate low value.	<ul style="list-style-type: none"> ● Rotating direction of pump/motor is reversed. 	<ul style="list-style-type: none"> ○ Correct motor wiring to reverse rotation. (Clockwise when viewed from motor side.)
Motor overheats			<ul style="list-style-type: none"> ● Voltage is insufficient ● Overload. ● Ambient temperature is high. 	<ul style="list-style-type: none"> ○ Check whether voltage and frequency levels are adequate. ○ Check whether specific gravity and viscosity of liquid are above specification. ○ Stop pump and use screwdriver, etc., to check whether motor fan rotates easily and smoothly. ○ Improve air ventilation.
Discharge quantity is suddenly lowered.		Needle of vacuum gauge indicates high value.	<ul style="list-style-type: none"> ● Strainer is clogged with foreign matter. 	<ul style="list-style-type: none"> ○ Remove foreign matter.



Trouble	Symptom on Pump		Cause	Inspection and Countermeasures
	With Discharge Valve Closed	With Discharge Valve Open		
Pump vibrates.			<ul style="list-style-type: none"> ● Foundation is inadequate. ● Anchor bolt is loose. ● Suction pipe is closed or restricted. Cavitation is caused. ● Wear or melting of pump bushing. ● Damaged inner magnet assembly or pump spindle. ● Fluctuating dynamic balance of outer drive magnet assembly ● Wear of motor bearing. 	<ul style="list-style-type: none"> ○ Carry out installation process again. ○ Retighten bolt. ○ Clean, eliminate cause of cavitation. ○ Replace. ○ Replace. ○ Remove or replace. ○ Replace bearing or motor.

9

Parts Description and Exploded View

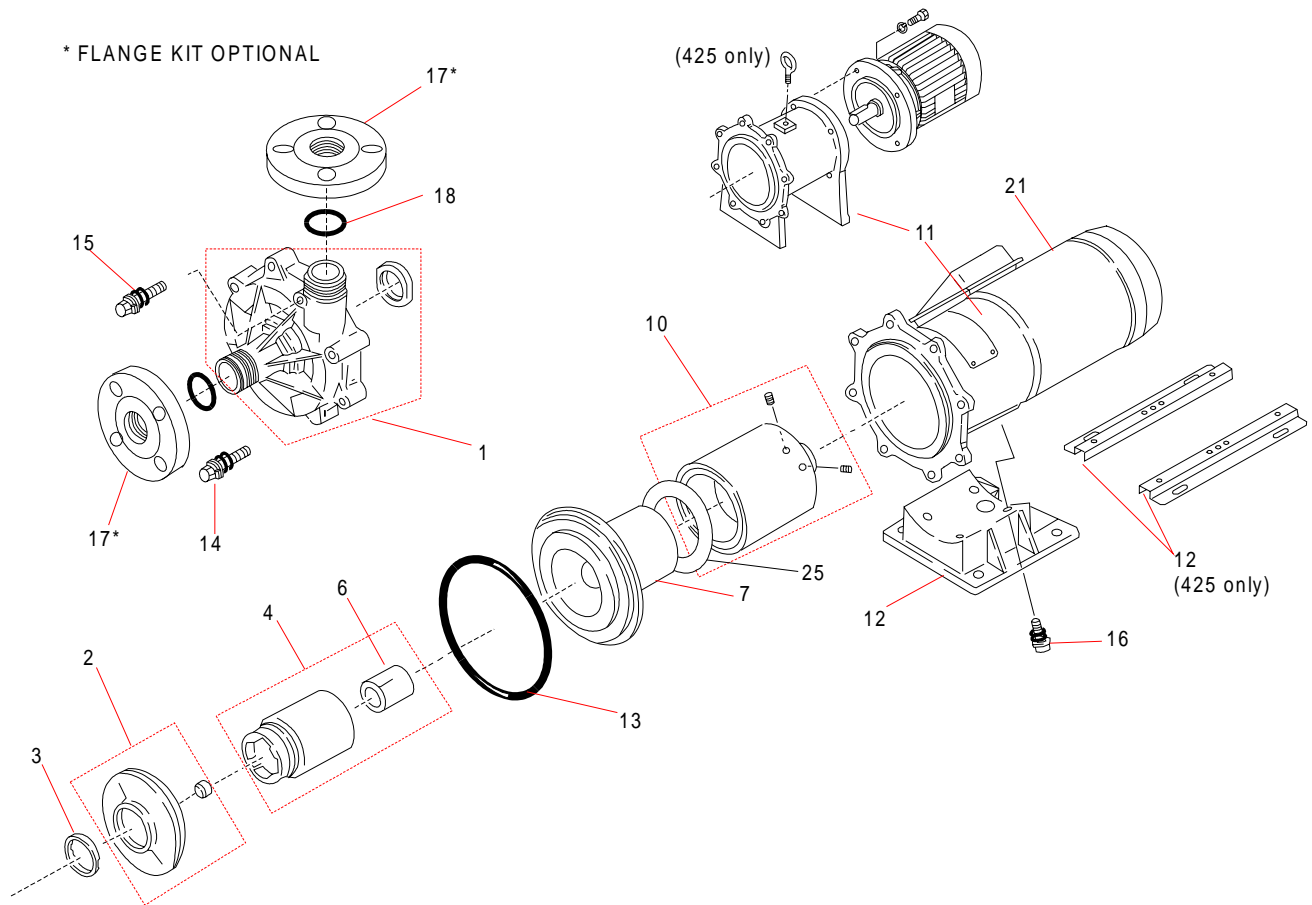


Fig. 9

No.	Description	Qty	No.	Description	Qty
1	Front casing assy	1	12	Baseplate rails	1
2	Impeller	1	13	O-ring, casing	1
3	Mouth ring	1	14	Bolt w/washers	6
4	Magnet capsule & bearing assy	1	15	Bolt w/washers	2
6	Bearing	1	16	Bolt w/washers	4
7	Rear casing & spindle unit	1	17	Flange (option)	2
10	Drive magnet assy	1	18	O-ring (option)	2
11	Motor bracket	1	25 †	Retainer ring	1

† MDH-F425 models only

⚠ Caution!

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 (or ATM card with a magnetic strip) that could be affected by a strong magnetic field.

Prior to servicing, the suction and discharge valves must be closed. The piping and the pump often retain some liquid. It is recommended the piping and pump cavity be drained prior to servicing.

If dangerous liquid is used, wear protection and flush pump with clean water or decontaminant prior to service.

Make sure power to the motor is off.

■ **Disassembly**

1. Loosen and remove front casing bolts (14) and (15).
2. Remove front casing (1). Wash and clean pump inside.
3. Remove impeller (2) and magnet capsule (4) from rear casing (7). Magnet capsule should be kept free of all metal chips. Store in a clean area.
4. Insert a screwdriver into the clearance between the surface of motor bracket (11) and rear casing. Pull rear casing forward while slightly lifting the screwdriver.

Note! Take care not to damage the sealfaces. Do not remove rear casing assembly unless necessary. Spindle of all models "-D" and "E" cannot be removed.

5. Flush and clean bearing (6) inserted into magnet capsule as residue in the groove of bearing causes insufficient lubrication and cooling.
6. For removing drive magnet assembly (10), stand motor with motor bracket (1) on end (vertically). Loosen 2 set screws with a socket screw key, accessible thru the hole located at the bottom of motor bracket.

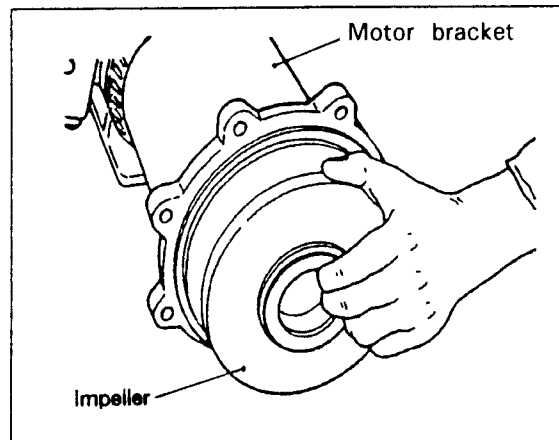


Fig. 10

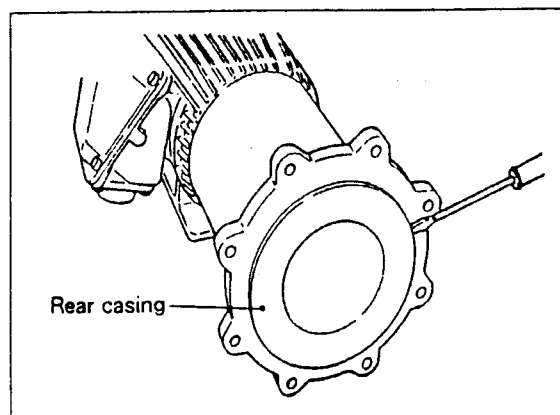


Fig. 11

7. Extract drive magnet assembly from motor shaft, using a puller or a screwdriver as a handspike. Keep it free of all metal chips and particulate.

■ Replacement of Bearing and Mouth Ring

Bearing (MDH-(F)400/401):

1. After separating impeller from magnet capsule, prepare a rod with slightly smaller outside diameter than the bearing (6), and a hand press.
2. Warm magnet capsule assembly (4) in hot water of 194° F (90° C) for approximately 20 minutes.
3. Place magnet capsule on the hand press with the impeller side upward. Put the rod on the bearing face. Slowly remove the bearing from magnet capsule by pressing the rod.
4. Place magnet capsule (impeller side) face down. Place and align new bearing and the rod on magnet capsule. Insert new bearing into magnet capsule by pressing the rod. If magnet capsule has cooled too much by this time to insert the new bearing smoothly, warm it again in the same manner as described above.
5. Make sure that bearing is seated at the top of the capsule and protrudes from the bottom of magnet capsule.

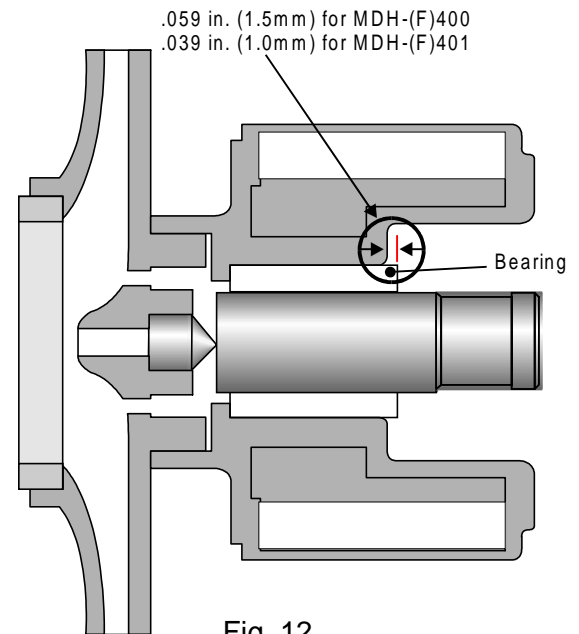


Fig. 12

Bearing (MDH-(F)422/423/425):

1. Separate the impeller from magnet capsule by unscrewing it counterclockwise (from impeller side). Note: If the impeller cannot be removed by unscrewing it, place the impeller and magnet capsule in hot water of 194°F (90°C) for 5 minutes, then repeat step 1.
2. Warm the magnet capsule assembly (4) in hot water of 194°F (90°C) for approximately 20 minutes.
3. Place the magnet capsule on the hand press with the impeller side face down. Place a rod, which has a slightly smaller outside diameter than that of the bearing, on the bearing face. Slowly remove the bearing from the magnet capsule by pressing the rod.

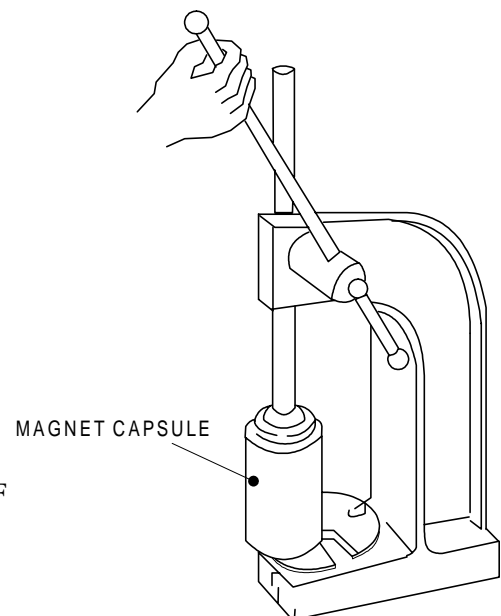


Fig. 13

4. Place and align new bearing and the rod on magnet capsule (impeller side up). Insert new bearing into magnet capsule by pressing the rod. If magnet capsule has cooled too much by this time to insert the new bearing smoothly, warm it again in the same manner as described above.
5. Make sure that the bearing is seated at the bottom of the magnet capsule.

Mouth Ring (MDH-(F)400/401):

1. Warm impeller (2) with mouth ring (3) in a thermostatic oven for approximately 20 minutes. Temperature should be set at 212° F (100°C) for MDH models or 284°F (140°C) for MDH-F models. Do not expose the parts to higher temperatures.
2. Lift up and remove mouth ring by applying a screwdriver to the bottom of mouth ring.
3. Place new mouth ring into impeller properly. Align recessed area of mouth ring with mating surface on impeller. Lightly knock and insert it into impeller with a plastic hammer while impeller is warm.

Mouth Ring (MDH-(F)422/423/425):

1. Heat two sections of impeller locking tabs for the mouth ring with a hot gas welder or industrial dryer. Pay attention that resin temperature should be kept at 248-266°F (120 to 130°C) for MDH models or 356-392°F (180 to 200°C) for MDH-F models.
2. Lift up and remove mouth ring by applying a screwdriver to the bottom of mouth ring.
3. Place new mouth ring into impeller properly. Align recessed area of mouth ring with mating surface on impeller. Lightly knock and insert it into impeller with a plastic hammer while impeller is warm.
4. Prepare a welding rod of polypropylene for MDH models or one of ETFE for MDH-F models. Secure mouth ring at two notches of impeller by welding. Heat the welding points of impeller locking tabs at the same temperature as that of the welding rod for secure welding. Make sure that the welding points are lower than the surface of mouth ring.

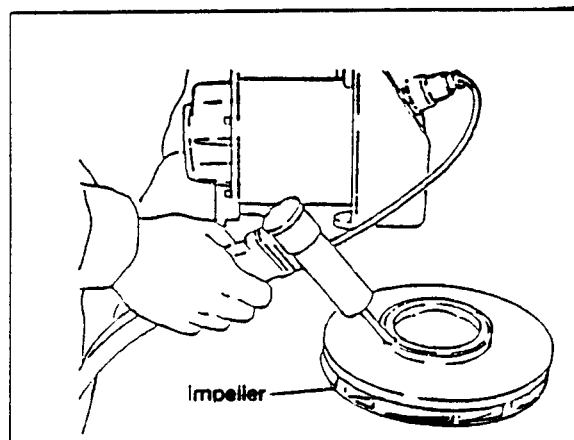


Fig. 14

■ Reassembly

Reassemble the pump by reversing the order of disassembly. Take care not to contaminate or damage the seal faces for o-rings. Tighten bolts uniformly to prevent uneven tightening.

1. Place the drive magnet assembly onto the motor shaft.

- For MDH-400/401/422/423 models

Motor shaft should be flush with the drive magnet boss. Secure drive magnet to motor shaft with two set screws. Apply Loctite 242 (or equal) to both set screws. Check that there is no foreign matter adhering to magnets.

- For MDH-(F)425 models

Place drive magnet assembly onto motor shaft with two set screws. Mount motor bracket with base plate side down onto motor face. Adjust position of drive magnet on motor shaft such that it measures 1/10" below the face of the motor bracket (see figure below). After magnet set height is correct, tighten two set screws to secure magnet to motor shaft.

2. Insert rear casing into motor bracket. For MDH-F425, slide retaining ring onto rear casing, and then insert rear casing into motor bracket.

3. Install impeller to magnet capsule assembly.

- For MDH-(F)400/401 models

Align the impeller and magnet capsule, and with an arbor press, press the impeller into the magnet capsule assembly. Note: Use a flat surface material greater than the mouth ring for proper alignment. Should the impeller be hard to insert, place magnet capsule in hot water (approx. 194°F, 90°C) for five minutes, then assemble impeller to magnet capsule assembly.

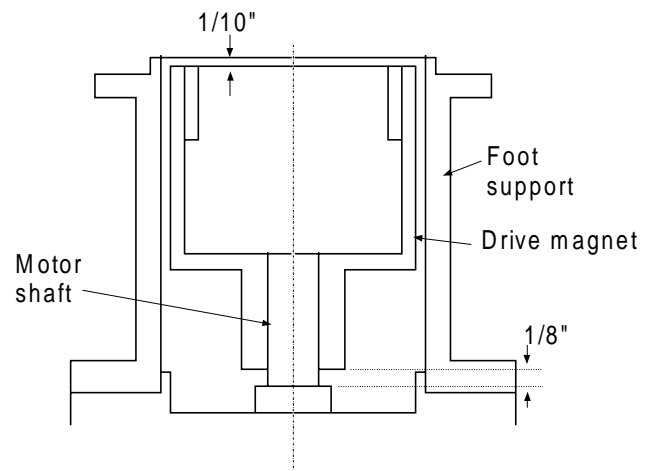
- For MDH-(F)422/423/425 models

Screw the impeller clockwise onto the magnet capsule assembly, hand tighten. Secure magnet capsule and tighten impeller the rest of the way using a strap wrench. Should the impeller be hard to screw on, place magnet capsule in hot water (approx. 194°F 90°C) for five minutes, then assemble. Gap between rear shroud of impeller and top of magnet capsule should be less than 0.020".

4. Check that there is no foreign matter adhering to magnet capsule assembly.
5. Slowly insert magnet capsule assembly with bearing, impeller and mouth ring into rear casing.

⚠ Caution Watch fingers! (Strong magnets)

6. Check that there is no dust or defects on the seal faces of front casing and rear casing.
7. Place O-ring into front casing.
8. Mount front casing with O-ring onto rear casing.



9. Tighten front casing bolts diagonally to avoid uneven tightening. See chart below.

Pump Model	Front Casing Bolt Torque lbf.in (kgf-cm)
MDH-(F)400/401	104 (120)
MDH-(F)422/423/425	130 (150)

10. To avoid damaging the pump: Before starting, check with a screwdriver that motor-fan rotates smoothly/freely.

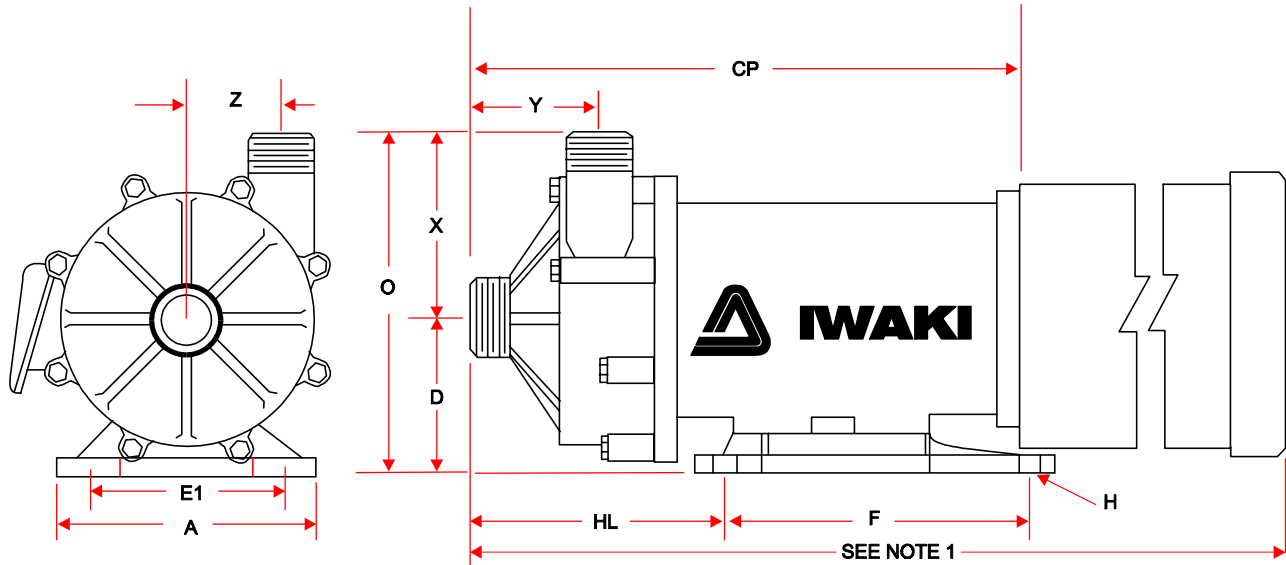
11 Spare Parts

Appropriate spare parts are necessary to ensure continuous pump operation. Expendable parts, such as bearings, spindles and mouth (thrust) ring should always be kept on hand. Consult your distributor or Iwaki Walchem for the correct part number and pricing. When placing orders, supply the following information.

1. Description and item number (according to this instruction manual).
2. Pump model number and serial number (as shown on the nameplate of the pump).
3. Drawing number if you have received a certified drawing.

12 Weights and Dimensions

■ MDH-400/401/422/423

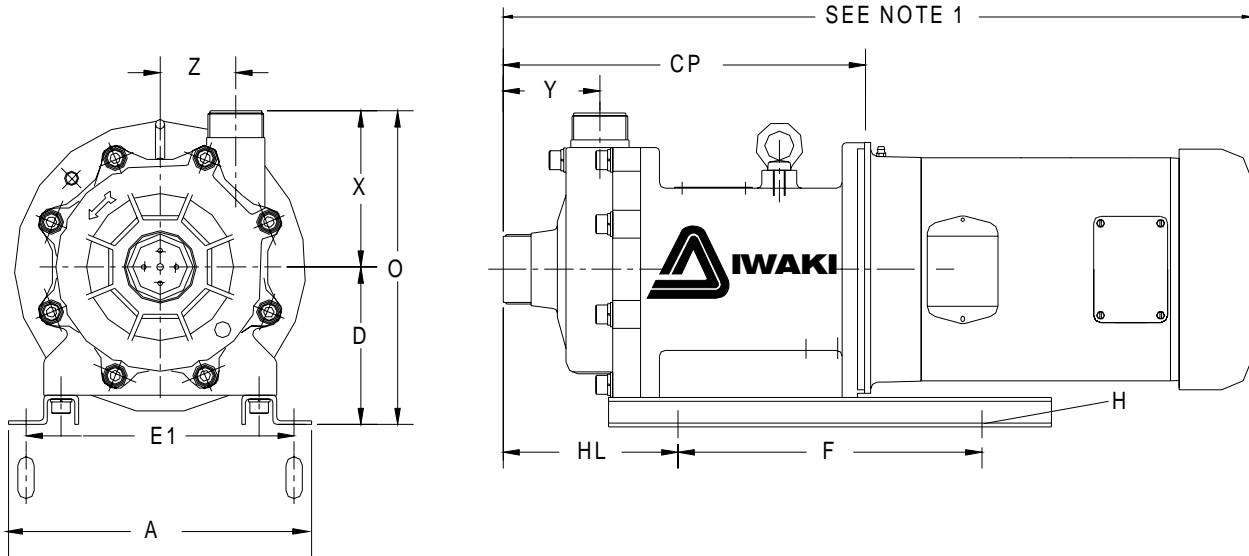


Note 1: Overall length varies with motor type and manufacturer.

Model Series	Connections (NPTM)	A	E1	HL	F	H	CP	O	D	X	Y	Z
400	1½ x 1½	5.51 (140)	4.33 (110)	5.67 (144)	3.86 (98)	0.47 (12)	8.75 (222)	8.27 (210)	3.74 (95)	4.53 (115)	3.19 (81)	2.00 (51)
401	1½ x 1½	6.30 (160)	5.12 (130)	7.00 (178)	5.12 (130)	0.47 (12)	11.50 (292)	9.76 (248)	4.53 (115)	5.24 (133)	3.84 (97.5)	2.26 (57.5)
422/423	2 x 1½	10.24 (260)	8.19 (208)	5.83 (148)	7.87 (200)	.55 x 1.4 (14 x 36)	11.26 (286)	9.81 (249)	4.53 (115)	5.24 (133)	3.27 (83)	2.56 (65)

Model	Pump Weights without motor, lbs (kg)
400	14 (9.9)
401	24 (10.8) w/o flywheel - 27 (12.3) w/flywheel
422	40 (18.1)
423	39 (17.7)

■ MDH-(F)425 Weight & Dimensions



Note 1: Overall length varies with motor type and manufacturer.

Model Series	Connections (NPTM)	A	E1	HL	F	H	CP	O	D	X	Y	Z
425	2 x 1½	10.24 (260)	9.06 (230)	5.91 (150)	10.28 (261)	.55 x 1.4 (14 x 36)	12.24 (311)	10.59 (269)	5.31 (135)	5.28 (134)	3.27 (83)	2.56 (65)

Model	Pump Weights without motor, lbs (kg)
425	44 (20)

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