

IWAKI Magnetic Drive Pump

MDE Series

Instruction Manual

 Read this manual before use of product

Thank you for selecting the Iwaki Magnetic Drive Pump type MDE. This instruction manual has been prepared to ensure correct and safe handling of the pump. Please read this manual carefully and thoroughly prior to operating the pump.

Pay special attention to the "Safety Instruction to Prevent Personal Injuries," "Warning," and "Caution" messages included in this manual.

This instruction manual should be kept by each end user and within reach of the actual operator, for quick reference when needed.

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Please contact the Iwaki sales office or Iwaki dealer for any inquiries or questions regarding this product.

IMPORTANT INSTRUCTIONS

Important notes and statements for safe operation, preventing physical injury, and property damage, are included on the body of the product and in the attached instruction manual.

Always Observe These Safety Instructions!

Safety Instruction to Prevent Personal Injuries

 Warning	Ignoring this message can lead to improper handling resulting in death or serious injury to the operator.
 Caution	Ignoring this message can lead to improper handling resulting in injury to the operator or damage to the product.

Export Restrictions

Information contained within this instruction manual may be considered controlled technology as set by the Japanese Ministry of Economy, Trade and Industry (METI). An export license issued by METI may be required when exporting or providing the manual to a 3rd party.

Warning

(Always read and observe the following instructions to prevent personal injuries.)

Damaged or deteriorated tools are very dangerous. Use qualified and suitable tools only.

Use of protectors: When disassembling, assembling, and conducting maintenance or when handling a dangerous type of liquid or a liquid of unknown property, be sure to wear safety gloves, a helmet, and protective shoes. In addition, when handling wet-end parts, always wear protective goggles, masks, etc.

To prevent death or injury from a falling pump, make sure the rope or chain used for lifting the pump is not accidentally cut or disconnected during installation. Make sure the rope or the chain used to lift the pump has sufficient strength in relation to the pump load. Also, be sure not to stand underneath a lifted or suspended pump.

When fixing the pump with rope or chain, be sure to use special bolts (or rings) for lifting. Never use any other points for lifting the pump.

Caution

Wear gloves when working with rope or chain. Working with bare hands may result in serious injury, since fingers are likely to be caught between the pump and the rope or chain when the rope or chain is under strong tension.

Always turn off the power supply prior to servicing the pump. Make special provisions so that no other operator mistakenly turns on the power supply while someone is working on the pump. In a noisy or poor visibility environment, display a sign near the power supply switch to notify others that someone is "WORKING" on the pump. Power supply mistakenly turned on during maintenance may lead to personal injury. Each operator must be especially careful of power supply operation.

To ensure greater safety, check and make sure that there is no one near the pump when switching on the power supply. The pump is not equipped with an ON/OFF switch. Connecting the power cable supplies the power to the pump and starts the operation.

Run the pump at the specified power supply voltage on the nameplate only. Otherwise, fire or electric shock may result.

If the pump operation is stopped due to a power failure or closure of discharge wire, turn off the power switch at once. After normal conditions return, turn the switch on again.

Do not use the pump for anything that it is not designed to do. User's failure to observe this instruction exempts Iwaki from any responsibility for personal injury or damage to the equipment or facility caused by the pump's misuse.

Countermeasure for static electricity.

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

 **Caution**

The pump is not designed to be used under water. Operate the pump on in-line mode only.

 **Caution**

The pump is not self-priming. Prime the pump by feeding water through the suction port.

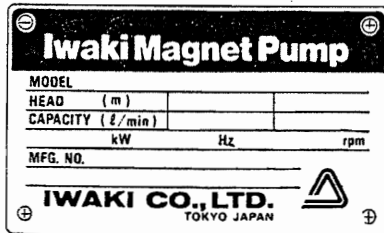
When handling a toxic or odorant liquid, ventilate the working area well. In addition, the operator must wear protector gear (such as a safety mask, safety goggles, and protective gloves).

Do not allow toxic substances such as lubricants, solvents, or similar substances to flow into the local sewage system or river systems. Do not drain hazardous liquids such as chemical solutions discharged out of the pump directly onto the ground. Instead, drain such liquids into some kind of container. Observe the laws and regulations related to the application, handling, and processing of hazardous substances.

OUTLINE OF PRODUCT

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1. Before Using Pump



After unpacking, check the following points to confirm that the delivered product and its accompanying parts and elements are exactly what you ordered.

When lifting the pump please follow the procedure mentioned "2. Installation" of "Pump operation".

[1] Does the model indicated on the nameplate conform to your order?

[2] Has the pump unit or any part of it been damaged or bolts and nuts been loosened during delivery?

[3] MFG.No. shows the year the product was manufactured.

(e.g.1) When first numeral is "7".

7xx5xxx

The forth numeral of MFG.No. shows the product was manufactured.

"5" shows the product was manufactured in the year 1995.

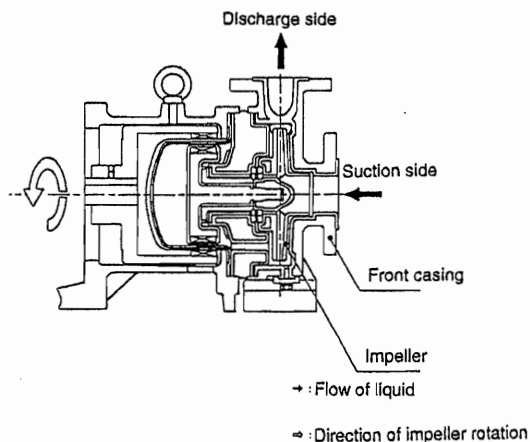
(e.g.2) When first numeral is not "7".

xx5xxx

The third numeral of MFG.No. shows the year the product was manufactured.

If you find anything wrong, please refer to the dealer you placed your order with.

2. Operating Principle



The MDE pump is a magnet-driven centrifugal type pump developed for various applications.

The impeller inside the pump chamber (front casing) is rotated by magnetic force to transfer liquid from the suction side to the discharge side.

The MDE type pump features excellent corrosion resistance, durability, and safety, and serves as a chemical pump for various processes. Most chemicals can be handled by the pump.

3. Identification Codes

Example:

MDE 40 - 160 E K V F 075 J - D 2 1 ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪	
① Nominal bore size	Suction×Discharge 40: 50A×40A, 50: 65A×50A, 65: 80A×65A
② Nominal Impeller size	100 ~ 200
③ Materials of liquid-contact parts	P: PFA, E: ETFE, V: PVDF
④ Materials of bearing and spindle	K: SiC C: Ceramics+Carbon (bearing) R: Ceramics+PTFE (bearing)
⑤ Material of O-ring	Z: KALREZ® V: FKM E: EPDM
⑥ Type of motor	C: Foot mount type motor F: Flange mount type motor
⑦ Motor output	037: 3.7kW, 055: 5.5kW, 075: 7.5kW, 110: 11kW, 150: 15kW, 185: 18.5kW
⑧ Pump standard	J: JIS flange, I: ISO dimensions, A: ANSI flange
⑨ Special version	A: Without drain, no element made to order D: With drain, no element made to order S: Without drain, element made to order X: With drain, element made to order
⑩ The number of motor poles	2: 2P, 4: 4P
⑪ Option	No core : Without option 1: With leak sensor 2: With bearing temperature monitor 3: With bearing creep sensor 4: With bearing flusher 5: With inducer 9: With two or more option

4. Specifications and Outer Dimensions

50/60Hz

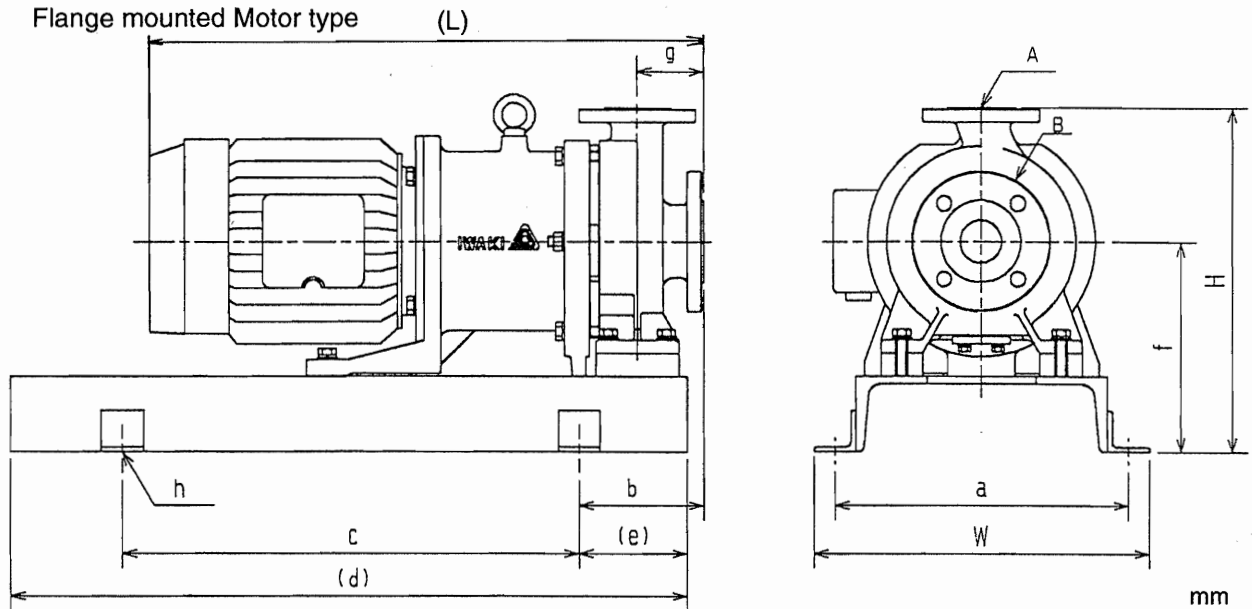
Models	Nominal bore size Suction Port × Discharge Port	Capacity l/min	Head m
MDE40-100	50A × 40A	208/250	16.0/23.0
110			19.0/27.5
120			22.5/32.0
130			27.0/38.0
140			30.0/42.0
150			34.0/49.0
160			38.5/56.0
170			39.0/54.5
180			44.0/61.0
190			49.0/67.5
200			52.5/71.0
MDE50-100			65A × 50A
110	18.0/25.5		
120	22.0/31.0		
130	25.0/36.5		
140	29.5/41.0		
150	33.0/45.0		
160	36.5/49.5		
170	40.0/53.5		
180	43.5/61.0		
190	49.0/68.5		
200	52.5/71.5		
MDE65-100	80A × 65A	833/1000	
110			12.5/20.0
120			19.0/27.0
130			23.5/33.0
140			28.5/39.5
150			33.0/46.0
160			36.0/51.5

■ Common Specifications

Temperature range of liquid handled	ETFE: 0~100°C, PFA: 0~120°C, PVDF: 0~90°C,
Allowable slurry	Hardness: Below 80Hs Particle size: Below 50 μm (Concentration up to 5wt%)
Motor (standard)	3-phase IEC, Foot mounted or Flange mounted type
Color of paint	Munsell 2.5R 3.5/6

Outer dimensions in mm

Flange mounted Motor type



mm

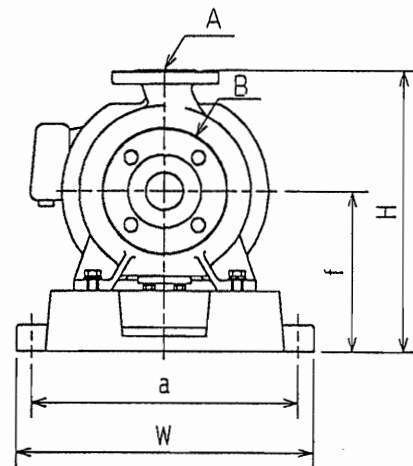
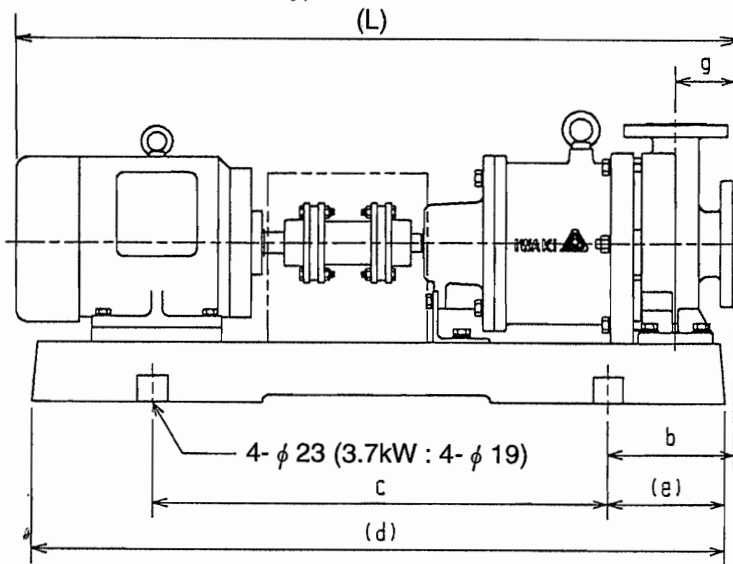
Model	Motor Output (kW)	W	H	(L)	a	b	c	(d)	(e)	f	g	A	B	Total mass including motor (kg)	Mass (kg)						
MDE40-160*1	3.7	400	410	658	350	150	540	800	130	250	80	40A	50A	135	95						
	5.5			724										165							
	7.5			724										170							
	11	480	480	878										430	170	600	900	150	320	240	135
	15			922																255	
	18.5			922																275	
MDE40-200*2	5.5	400	430	724	350	150	540	800	130	250	80	40A	50A	170	105						
	7.5			922										180							
	11	480	500	878				430	170	600				900	150	320	250	145			
	15			922													260				
	18.5			922										285							
MDE50-160*1	3.7	400	410	658	350	150	540	800	130	250	80	50A	65A	135	95						
	5.5			724										165							
	7.5			724										175							
	11	480	480	878										430	170	600	900	150	320	245	135
	15			922																255	
	18.5			922																275	
MDE50-200*2	5.5	480	430	744	350	190	600	540	800	130	100	65A	80A	170	110						
	7.5			942										180							
	11	500	500	898				430	190	600				900	150	320	250	145			
	15			942													265				
	18.5			942													285				
MDE65-160*1	5.5	400	430	744	350	170	540	800	130	250	100	65A	80A	170	110						
	7.5			942										180							
	11	480	500	898										430	190	600	900	150	320	250	145
	15			942																265	
	18.5			942																285	

*1 Applicable to impellers with nominal diameters of 100, 110, 120, 130, 140, 150 and 160.

*2 Applicable to impellers with nominal diameters of 170, 180, 190 and 200.

Outer dimensions in mm

Foot mounted Motor type



mm

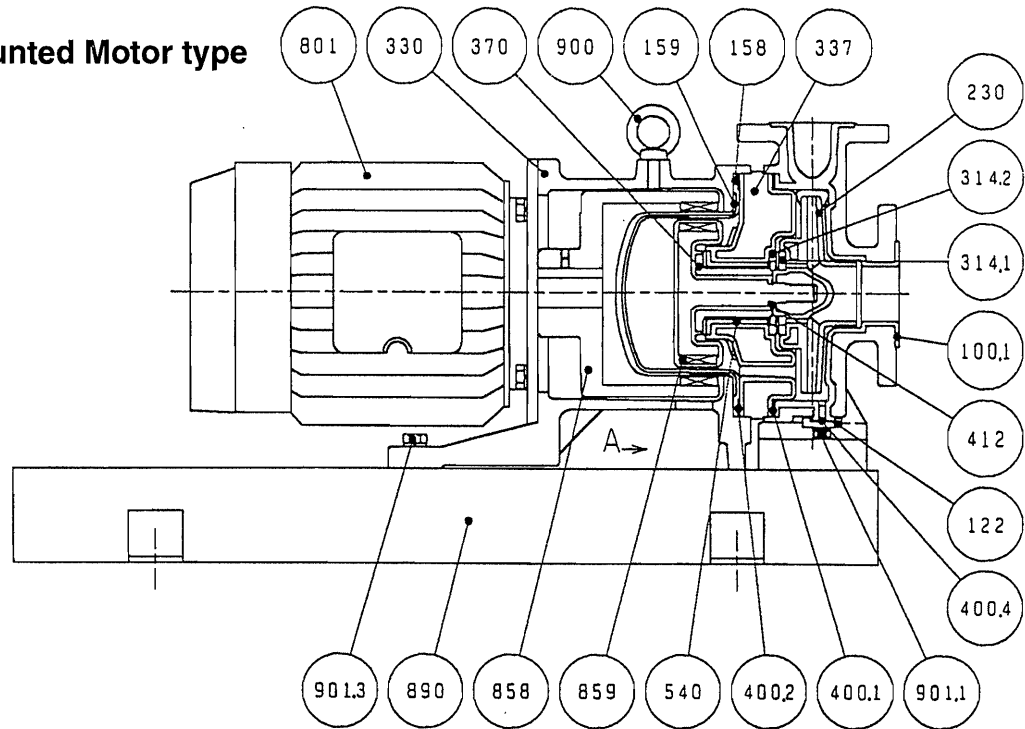
Model	Motor Output (kW)	W	H	(L)	a	b	c	(d)	(e)	f	g	A	B	Total mass including motor (kg)	Mass (kg)				
MDE40-160*1	3.7	390	372	948	350	170	600	915	158	212	80	40A	50A	175	135				
	5.5	400		1014	400	190	660	1015	178					210		150			
	7.5	490	400	1168	440	210	740	1135	198					240	100		50A	65A	220
	11															270			
	15															280			
	18.5															305			
MDE40-200*2	5.5	450	420	1014	400	190	660	1015	178	240	80	40A	50A	225	175				
	7.5	490		1168	440	210	740	1135	198					235					
	11	490	420	1212	440	210	740	1135	198					240	100	50A	65A	275	175
	15																	285	
	18.5																	310	
	3.7																	390	
5.5	450	1014	400	190	660	1015	178	215	155										
7.5	490	400	1168	440	210	740	1135	198		240	100	50A	65A	220	170				
11									270										
15									280										
18.5									305										
MDE50-200*2	5.5	450	420	1034	400		680	1015	178	240	100	50A	65A	225		165			
	7.5	490		1188	440	230	740	1135	198					235					
	11	490	420	1232	440	230	740	1135	198					240	100	50A	65A	275	175
	15																	290	
	18.5																	310	
	5.5																	450	
7.5	490	1188	440	230	740	1135	198	235											
11	490	420	1232	440	230	740	1135	198	240	100	65A	80A	275	175					
15													290						
18.5													310						

*1 Applicable to impellers with nominal diameters of 100, 110, 120, 130, 140, 150 and 160.

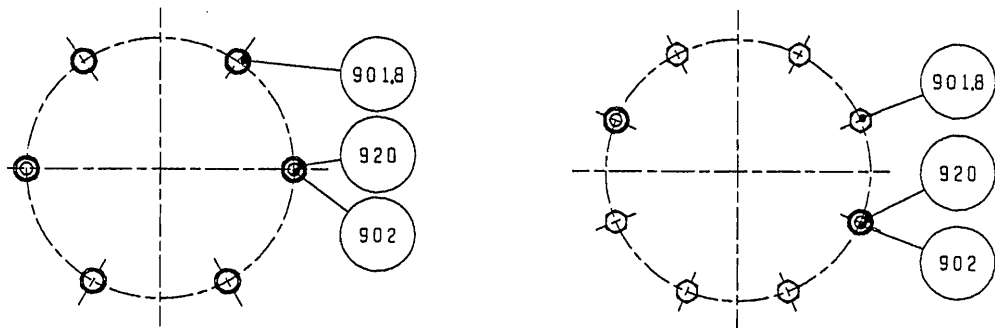
*2 Applicable to impellers with nominal diameters of 170, 180, 190 and 200.

5. Names of Parts

■ Flange mounted Motor type



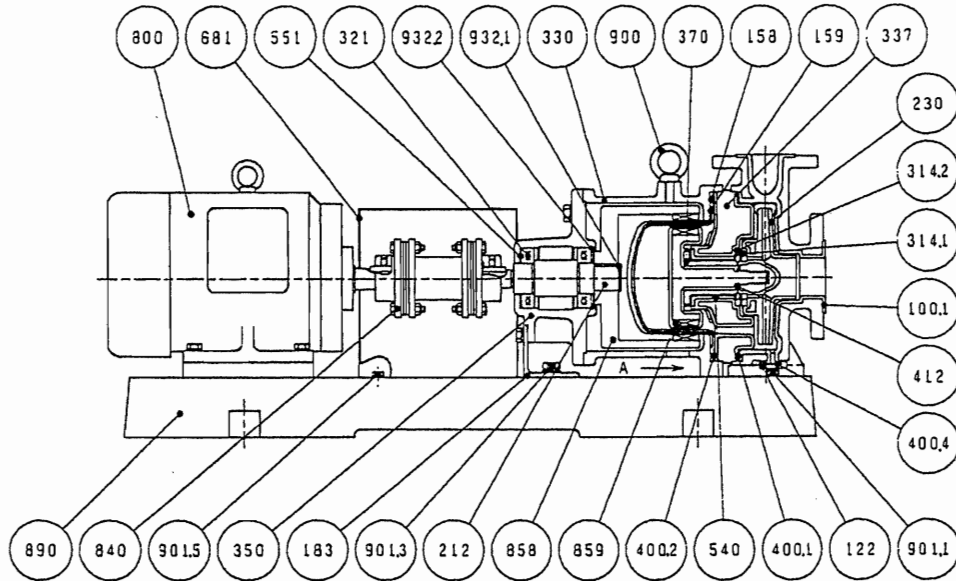
A (Arrangement Of Bolts For Fixing Bracket And Cover)



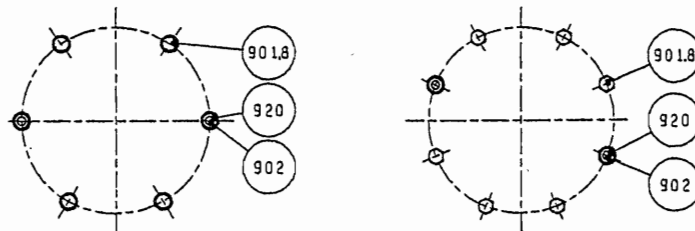
No.	Parts Name	Q'ty	Material	Remarks	No.	Parts Name	Q'ty	Material	Remarks
100.1	Front Casing	1	Fluororesin+FCD400		412	O Ring	1	See Note 1	
122	Drain Plate	1	Steel		540	Bushing	1	See Note 1	
158	Rear Casing	1	Fluororesin		801	Motor	1		
159	Rear Casing Cover	1	FRP		858	Drive Magnet Unit	1	Rare-Earth+Steel	
230	Impeller	1	Fluororesin+Steel		859	Magnet Capsule Unit	1	Rare-Earth+Fluororesin	
314.1	Thrust Bearing	1	See Note 1		890	Base	1	Steel	
314.2	Thrust Bearing	1	See Note 1		900	Eye Bolt	1	Steel	M12
330	Bracket	1	FCD400		901.1	Hex. Head Bolt	2	Stainless Steel	M8×20
337	Split Plate	1	Fluororesin+FCD400		901.3	Hex. Head Bolt	2	Stainless Steel	M12×35
370	Sleeve	1	See Note 1		901.8	Hex. Head Bolt	4/6	Stainless Steel	M12×65
400.1	Gasket Front	1	PTFE		902	Stud Bolt	2	Stainless Steel	M12
400.2	Gasket Rear	1	PTFE		920	Hex. Nut	2	Stainless Steel	M12
400.4	Gasket Drain	1	PTFE						

Note 1: Varies depending on pump type

■ Foot mounted Motor type



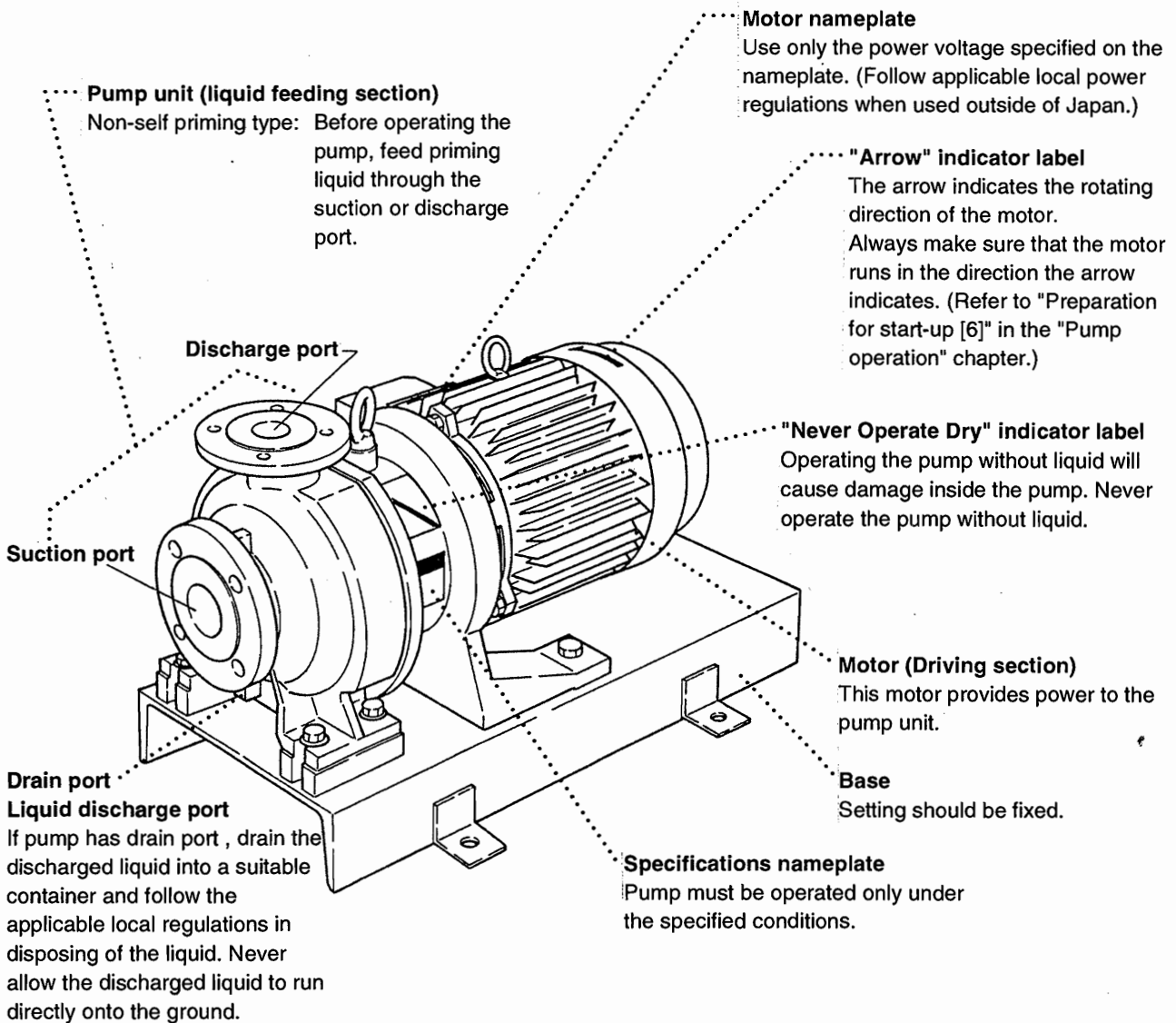
A (Arrangement Of Bolts For Fixing Bracket And Cover)



No.	Parts Name	Q'ty	Material	Remarks	No.	Parts Name	Q'ty	Material	Remarks
100.1	Front Casing	1	Fluororesin+FCD400		540	Bushing	1	See Note 1	
122	Drain Plate	1	Steel		551	Wave Washer	1	Spring Steel	
158	Rear Casing	1	Fluororesin		681	Coupling Cover	1	Steel	
159	Rear Casing Cover	1	FRP		800	Motor	1		
183	Support	1	Steel		840	Coupling	1		
212	Drive Shaft	1	Steel		858	Drive Magnet Unit	1	Rare-Earth+Steel	
230	Impeller	1	Fluororesin+Steel		859	Magnet Capsule Unit	1	Rare-Earth+Fluororesin	
314.1	Thrust Bearing	1	See Note 1		890	Base	1	FC200	
314.2	Thrust Bearing	1	See Note 1		900	Eye Bolt	5	Steel	M12
321	Ball Bearing	2	6208ZZ		901.1	Hex. Head Bolt	2	Stainless Steel	M8×20
330	Bracket	1	FCD400		901.3	Hex. Head Bolt	2	Stainless Steel	M12×20
337	Split Plate	1	Fluororesin+FCD400		901.5	Hex. Head Bolt	4	Stainless Steel	M8×15
350	Bearing Housing	1	FC200		901.8	Hex. Head Bolt	4/6	Stainless Steel	M12×65
370	Sleeve	1	See Note 1		902	Stud Bolt	2	Stainless Steel	M12
400.1	Gasket Front	1	PTFE		920	Hex. Nut	2	Stainless Steel	M12
400.2	Gasket Rear	1	PTFE		932.1	Retaining Ring	1	Steel Wire Rod	
400.4	Gasket Drain	1	PTFE		932.2	Retaining Ring	1	Steel Wire Rod	
412	O Ring	1	See Note 1						

Note 1: Varies depending on pump type

■ Description on Main Unit Body and Label



CAUTION



When cleaning the pump, be careful not to wipe the labels or the pump body with solvent.

PUMP OPERATION

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<i>5. Operation Step.....</i>	<i>23</i>

1. Handling Instructions

(Observe all the following instructions to prevent injuries and accidents.)

 Warning
<ul style="list-style-type: none">• Do not operate the pump for the circulation of hazardous mediums (such as explosive, combustible, flammable, or toxic substances, as well as corrosive or irritating substances considered harmful to human health).
 Caution
<ul style="list-style-type: none">• Read the following information prior to installing the pump.• Protective wear: When operating the pump or working near it, with the pump system loaded with chemical liquid, always wear protective clothing, face guard, goggles, and gloves. Further precautionary measures must be taken depending upon the type of liquid used.• Operating the pump dry (without supplying liquid to it) may cause seizure on wear of the inside of the pump section.• Pump repair beyond the range specified in this instruction manual: Do not try to disassemble or repair the pumps by yourself. *The pump must be repaired by trained and qualified operators only. When it needs to be disassembled and repaired, stop operation and contact the supplier for advice.

- [1] Handle the pump carefully.
Strong impacts caused by dropping the pump on the floor or striking it may result in damage or faulty performance.
- [2] Priming water
Be sure to fill the pump unit with feeding liquid as priming water before pump operation.
- [3] Do not operate the pump in the following places.
- Places where the temperature falls below 0 °C
 - Places where corrosive gas or explosive gas (such as chlorine gas) is generated
 - Places exposed to splashing water
 - Places where the ambient temperature is 40 °C or above
 - Places where the humidity is excessively high. (Permissible humidity: 35~85%RH)
 - Places filled with or likely to be filled with explosive or corrosive atmosphere.
 - Danger due to dust, fire, earthquake and/or any externally imposed shock.
- [4] Keep the pump away from fire.
To prevent fire and explosions, do not place dangerous or inflammable substances near the pump.
- [5] If pump is damaged
Do not operate a damaged pump, otherwise there may be electricity leakage or electric shocks.

[6] No remodeling

Never try to remodel the pump. This may cause a serious accident or damage.

[7] No disassembly or repair

Users are allowed to disassemble and repair the pump to the degree of the given description in "Disassembly and Assembly" in this manual.

[8] No dry running operation

Dry operation of the pump (pump operation without liquid inside) may cause damage to the pump internally. Never operate the pump dry. In the case of MDE type, the sliding parts are self-lubricated and self-cooled. If the pump is operated dry or with the suction-side valve closed, damage may result.

* Countermeasures to be taken in case of dry operation

1. Turn off the power switch of the pump immediately and leave the pump as it is for more than 1 hour.

2. Prime the pump and fill the pump with liquid.

(Note that the pump should be supplied with liquid after leaving the pump empty for more than 1 hour. Sudden supply of liquid may cause a crack in the part due to quenching effects.)

[9] Points to be noted when starting and stopping pump

Pay close attention to the following points to avoid water hammer action when starting and stopping pump operation. When the discharge-side piping is very long, extra attention is required.

(1) When starting the pump, first prime it. Then, close the discharge valve completely and turn on the power switch. After starting up the pump, open the discharge valve gradually and set it to the desired operation level.

(2) When stopping the pump, first close the discharge valve slowly. Turn off the power switch only after completely closing the discharge valve.

 **Caution**

In this procedure, never try to stop the pump quickly using a solenoid valve, etc. Quick closure may cause water hammer action, and the excessive pressure will destroy the pump.

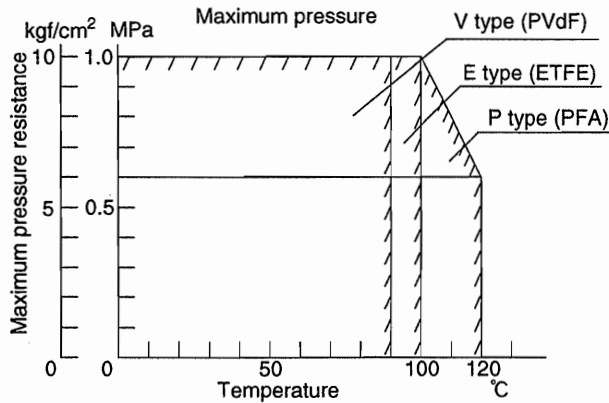
[10] Use of slurry liquid

Pumps can handle the pumping of slurry liquid with a density of 5wt% or less, grain size of 50 μm or less, and hardness of 80Hs or less. Prior to pumping such slurry liquid, be sure to confirm the operation feasibility with the supplier.

[11] Influence of specific gravity and viscosity of liquid on pump performance

If the specific gravity or viscosity of the liquid is higher than that of pure water, the shaft power, discharge volume, and pump head may vary somewhat. The delivered pump has been prepared to meet the specifications ordered by the user. To change the operating conditions after delivery, be sure to contact the supplier.

[12] Tolerable pressure and temperature limit



• Maximum pressure resistance

The table on the left shows the maximum pressure resistance of each model. Take care that the discharge pressure does not exceed the maximum pressure resistance.

[13] Intermittent operation

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

[14] Temperature humidity fluctuation

Temperature fluctuation may not change the performance of the pump itself. However, the liquid may change in terms of its viscosity, pressure, or corrosion resistance. Pay special attention to changes in liquid characteristics as a result of temperature fluctuation.

Liquid temperature range:	PFA: 0~120 °C ETFE: 0~100 °C PVdF: 0~90 °C
Ambient temperature range:	0~40 °C
Humidity range:	35~85%RH

* Refer to the corrosion resistance table for the temperature ranges recommended for various types of liquid. For inquiries or consultation, contact the dealer you placed your order with.

[15] Disengagement of magnet coupling

Though the motor is running, the liquid is not circulated. (The pressure gauge on the discharge side points to “0” point approximately.)

When the magnet coupling disconnects, stop the pump within 1 minute. If operation is continued with the coupling in the disconnected mode, the power of the coupling will decrease considerably.

[16] Operation within range of drooping head capacity curve

In the case of a pump which generates a drooping head capacity curve in a low-capacity range, do not operate the pump in the section where the line droops to the left. (Refer to the standard performance curve to verify the head capacity.) If the drooping section (left side) of the head capacity curve is part of the pump operation specifications, design the piping with the following points in mind.

- ① The discharge piping should have no water tank or air trap.
- ② The discharge amount should be adjusted with the valve installed near the discharge port.

2. Installation

[1] Installation position

- Install the pump as close to the suction tank as possible and in the lowest position available (for flooded suction).
- If the suction port of the pump is to be positioned higher than the suction tank (for suction lift), be sure to arrange for a foot valve in the priming pipe and suction pipe.
- * The lift head depends upon the liquid properties, temperature, and length of the suction piping. For details of the setup, consult Iwaki or your dealer.

[2] Indoor and outdoor use

The pump can be operated either indoors or outdoors. However, safety measures should be taken so as not to expose the motor and power distribution unit to flooding or other natural hazards.

[3] Installation site

Select an installation site that is flat and free of vibrations caused by nearby machines. Space sufficient for maintenance work should be provided.

■ Lifting

When lifting the pump, please pay attention to the following points.

- Pump must be lifted horizontally using two bolts located at pump and motor.
- In the case that there is no lifting bolt at the motor, rope or such kind materials should be tightly wined to the motor to lift the pump horizontally.
- Please use lifting chain or rope which has enough strength enduring pump weight.
- To prevent any human body accident caused by the pump drop, please do not enter under the lifted pump.

■ Foundation preparation (before pump installation)

- [1] The area for anchoring the pump must be greater than the area of the base. If the anchoring area is not enough, the base may be destroyed due to a concentrated load on it.
- [2] If pump operation is to be subject to vibration (resonation with the piping, for example), provide an expansion joint between the pump and the piping. Otherwise, the piping, gauge, etc., may be damaged.
- [3] Installation advice
 - Use anchor bolts to fasten the pump base firmly.
 - Install the pump horizontally.
 - Sufficient space is required to allow cool air from the motor fan to circulate.
 - Allow ample space around the pump for easy and efficient maintenance work.

3. Piping

Tightening torque for piping flange of pump.

Recommended bolt size for piping flange is M16 and tightening torque is 78.4N·m.
(In the case of steel flange with rubber gasket.)

Load of piping and momentum of piping for MDE

The permissible stress and moment applicable to pump connection arrangement are as shown below.

The piping should be designed and worked so that stress and moment, higher than those values indicated in the table, should not be applied to the pump.

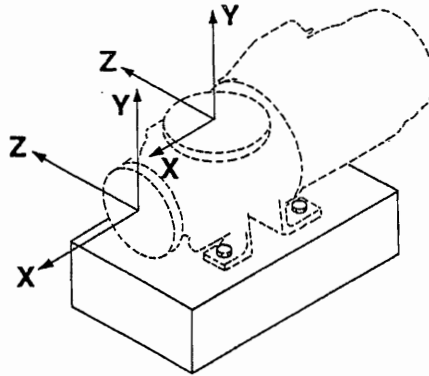


Table 9 : Piping loadings

Forces of discharge piping

Direction of load	Dia. of pipe (mm)	
	40, 50	65
	Load	
	kN·m	
Fx	0.71	1.07
Fy: compression	0.89	1.33
Fy: tension	0.44	0.67
Fz	0.58	0.89

Forces of suction piping

Direction of load	Dia. of pipe (mm)	
	50	65, 80
	Load	
	kN·m	kN·m
Fx	0.89	1.33
Fy	0.58	0.89
Fz	0.71	1.07

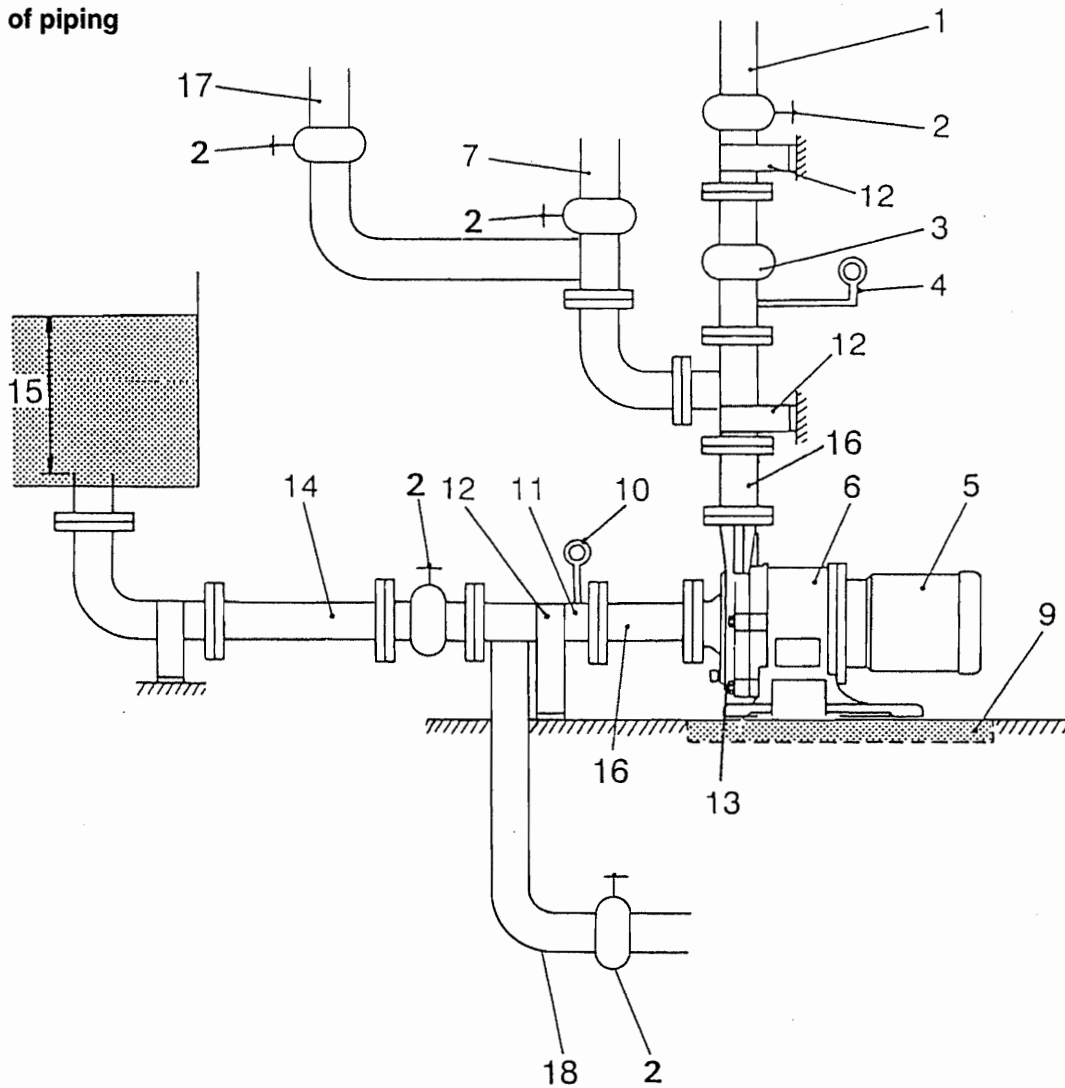
Moments of suction piping

Direction of load	Dia. of pipe (mm)	
	50	65, 80
	Load	
	kN·m	kN·m
Mx	0.46	0.95
My	0.35	0.72
Mz	0.23	0.47

Moments of discharge piping

Direction of load	Dia. of pipe (mm)	
	40, 50	65
	Load	
	kN·m	
Mx	0.35	0.72
My	0.46	0.95
Mz	0.23	0.47




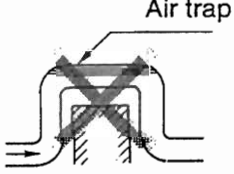
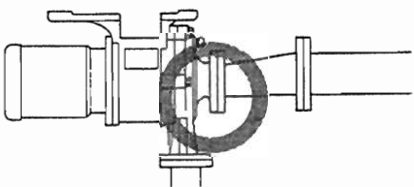
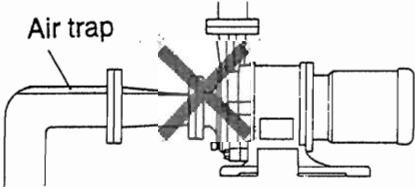
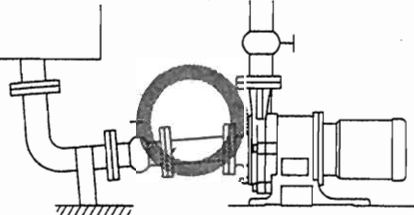
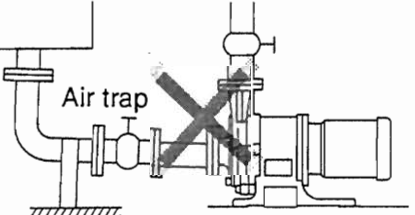
Example of piping



- | | |
|---|--|
| <ul style="list-style-type: none"> (1) Discharge pipe (Support the pump to keep the pump free of piping load.) (2) Valve (3) Check valve (4) Pressure gauge (5) Motor (6) Pump (7) Air vent pipe (9) Drain ditch (10) Vacuum gauge | <ul style="list-style-type: none"> (11) Suction pipe (pipe diameter: D)
(The horizontal section should be as short as possible and there should be an ascending gradient of 1/100 toward the pump.) (12) Pipe support (13) Pump drain (14) Suction pipe (pipe diameter: D) (15) 2D, 500 mm or above (16) Expansion joint (17) Piping for flushing (Discharge side) (18) Piping for flushing (Suction side) |
|---|--|

■ 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 used. Arrange a proper support under the suction pipe such as an expansion joint or the like so that the weight and thermal stress of the pipe are not applied to the pump.
- [2] Attach the coupling on the suction pipe carefully so as not to allow air inside the line. Air in the suction pipe may damage the system.
- [3] If suction is not good (e.g., the suction tank is a vacuum, the suction head is large, or the suction pipe is long), the condition $NPSHa > NPSHr + 0.5 \text{ m}$ should be established. For the $NPSHr$ level, refer to the standard performance curve.
- [4] When using a bent pipe on the suction side, install a straight pipe with a length of at least 500 mm or 8 times the suction port diameter before the pump suction port. Provide the largest radius possible for the R of 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 of 1/100 toward the pump.

Good conditions		Unacceptable conditions	
○ Good		✗ No Good	
○ Good		✗ No good	
○ Good		✗ No good	
○ Good		✗ No good	

-
-
- [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 so that the upper surface is level. In any case, never use a suction pipe with a diameter smaller than that of the suction port.
 - [7] It is also recommended, in the case of flooded suction, that a gate valve be installed on the suction pipe for easier overhaul inspection of the pump. Keep the gate valve fully open during ordinary pump operation; it is required to be closed only during an overhaul inspection.
 - [8] When circulating a dangerous liquid, arrange the flushing pipes so that internal cleaning is possible when disassembling the pump.
 - [9] The diameter of the suction pipe must be larger than that of the pump suction pipe.
 - [10] The end of the suction pipe should be located 500 mm or more below the surface of the liquid.
 - [11] A screen should be provided at the inlet in the suction tank to prevent the entry of foreign matter into the suction pipe. The end of the suction pipe should be 1~1.5 D (D: diameter of suction pipe) or more away from the bottom of the suction tank. Note that the entry of foreign matter may cause the pump to malfunction.
 - [12] In the case of the suction lift method, install a foot valve on the suction pipe.

Note: The items [10], [11], and [12] above are applied to the suction lift method.

■ Discharge piping

- [1] Use a support so that the weight of the pipe is not applied to the pump as load.
- [2] If a method other than flooded suction is employed, install a priming pipe.
- [3] If the pipe is too long, the piping resistance may increase, hampering the pump's performance. The diameter of the pipe should be determined by calculating the piping resistance.
- [4] A check valve should be installed if any one of the following conditions is present. When selecting the check valve, consider the check valve pressure limit (including the influence of water hammer or back flow onto the pump).
 - ① The discharge piping is very long
 - ② The discharge lift exceeds 15 m
 - ③ The end of the discharge pipe is 9 m higher than the surface of the suction tank
 - ④ Several pumps are connected parallel to one another on the same piping

-
-
- [5] It is recommended that a gate valve be installed on the discharge pipe for the adjustment of discharge volume and for the prevention of overload onto the motor. When installing both a check valve and a gate valve, the check valve should be positioned between the pump and the gate valve.
 - [6] Do not fail to install a pressure gauge on the discharge piping.
 - [7] Install an air vent valve if the discharge pipe is very long horizontally.
 - [8] Install a drain valve for the drainage of liquid if there is a chance that the liquid in the discharge pipe might freeze.

4. Wiring

Electrical connections

ATTENTION



The electrical connection should be carried out by an authorized electrician in accordance with local regulations. Please make sure that the electrical data on the nameplate of the motor correspond to the electricity supply on which it will be used. Motors must be connected to a motor protection switch.

- [1] Use an electromagnetic switch that conforms with the specifications (voltage, capacity, etc.) of the pump motor.
- [2] If using the pump outdoors, waterproof the wiring to protect the switches from rainwater.
- [3] Electromagnetic switches and push buttons should be installed reasonably distant from the pump.

5. Operation Step

■ Operation instructions

- [1] Never operate the pump dry or with the suction-side valve (gate valve) closed. Otherwise, the inside of the pump will be damaged.
- [2] In the event of cavitation, stop the pump within a minute.
In addition, do not continue pump operation with air mixed into the suction side.
- [3] If the magnet coupling disconnects, stop the pump within a minute. The power of the magnet coupling is reduced if operation is continued with the coupling disconnected.
- [4] The temperature fluctuation should not exceed 80 °C through the operation modes of starting, stopping, and operating the pump.
- [5] Before starting operation, close the discharge valve fully to prevent water hammer action upon start-up.
- [6] Note that pump operation with the discharge valve closed fully over a long time will raise the temperature of the liquid inside the pump and finally damage the pump.
- [7] In the event of a service power failure, turn off the power switch immediately and close the discharge valve.
- [8] Make sure that intolerable pressure levels are not applied to the pump. Refer to page 16 "[12] Tolerable pressure limit" in "1. Handling Instruction."
- [9] **Maximum pump surface temperature**
The max. pump surface temperature of each model is shown in the table. Arrange protective measures in accordance with the temperature levels.

Model	Liquid temp (for PFA version) (°C)	Maximum surface temperature when ambient temperature is at 40 °C. (°C)
MDE	120	110

[10] Sound generated by pump

The level of sound generated by each type of pump is shown in the table. Arrange muffling measures in accordance with the sound level. The procedure for sound measurement conforms to the EN 31201 (ISO11201).

(dB)

Model	MDE40	MDE50	MDE65
Sound Level	90	90	90

■ Preparation for start-up

Preparations should be made, as described below, in the case of initial operation after installation and in the case of restarting of operation after a long period of inactivity.

- [1] Thoroughly clean the inside of the pump and pipe. Then, supply liquid.
- [2] Tighten the flange connecting bolts and the installation bolts on the base.
- [3] After priming the pump, close the discharge valve fully.
Also, make sure the air-vent valve and flushing piping valve are closed.
- [4] Run the motor instantaneously to check for correct direction of motor rotation. The motor should run in the direction indicated with the arrow on the nameplate of the pump. If the direction is reversed, exchange any two wires of the three-phase power wires.

■ Operation

Operate the pump by following the steps given below.

No	Operation Step	Remarks
1	<ul style="list-style-type: none"> Close or open the valve. 	<ul style="list-style-type: none"> Suction valve—Fully opened Discharge valve—Fully closed
2	<ul style="list-style-type: none"> Prime the pump Preparation for start up 	<ul style="list-style-type: none"> Confirm pump is filled with liquid. If pump is not filled with liquid, fill it in accordance with steps [1] and [5] of 'Start-up preparation'. After priming completely, close the discharge valve fully.
3	<ul style="list-style-type: none"> Check the motor for correct rotating direction. Switch on the power and then immediately switch off the power. 	<ul style="list-style-type: none"> Supply power immediately to run the pump only when checking the rotating direction of the pump. (Correct direction of pump operation is indicated with arrow on the pump. Check the direction of motor fan by looking at the fan through the fan cover.) Observe carefully to see if the motor fan slowly and smoothly stops rotating when the power switch is turned off. <p>Note: If the motor fan does not stop smoothly, there are possible chances that the pump is locked inside. In this case, contact your Iwaki dealer.</p>
4	<ul style="list-style-type: none"> Turn on the power and start the pump. Then, adjust the discharge pressure and discharge volume. <p>Following discharge volumes should be noted during pump operation.</p> <p>▶ 50 l/min. or above</p> <ul style="list-style-type: none"> In case of automatic drive, too, close discharge valve before start-up and open valve slowly after start-up. <p>⚠ Caution Do not run pump longer than 1 minute against a fully closed discharge valve.</p>	<ul style="list-style-type: none"> Open valve carefully while paying attention to ampere meter, to prevent motor from being overloaded from excessive opening of valve. * Within 1 minute, open the discharge valve gradually and adjust the discharge pressure while checking the reading of the pressure gauge on the discharge side. (Otherwise, adjust the flow rate while checking the reading of the flowrate meter.) <p>⚠ Caution Total discharge pressure is increased to shut-off pressure after start of normal pump operation, open discharge valve gradually to set.</p>
5	<p>Points to be observed during operation.</p> <p>If pump enters continuous operation mode, check flow meter and confirm that pump operation is as per specifications.</p>	<ul style="list-style-type: none"> If flow meter is not available, check the values of discharge pressure, suction pressure, and electric current with reference to piping resistance.

■ Stoppage

	Check/Operation Step	Remarks
1	<ul style="list-style-type: none"> • Close discharge valve gradually. 	<ul style="list-style-type: none"> • Do not cause sudden closure with solenoid valve, etc., otherwise pump may be destroyed by water hammer action which is likely in case of long discharge piping.
2	<ul style="list-style-type: none"> • Turn off the power and stop pump operation. 	<ul style="list-style-type: none"> • Observe carefully whether the motor fan slowly and smoothly stops rotating. <p>⚠ Caution If not check inside of pump.</p>
3	<p>Points to be observed when stopping pump</p> <ul style="list-style-type: none"> • If the pump operation is stopped during cold weather, liquid in pump may freeze and damage pump. When circulating a dangerous liquid, carry out internal cleaning by using flushing piping. Then drain the liquid fully. • Be sure to remove all liquid after stopping pump. In case of short-term suspension of operation, which does not allow for removal of liquid, use band heater, etc., to prevent liquid inside from freezing. • In event of power failure, turn off power switch and close discharge valve. 	

MAINTENANCE

1. <i>Causes of Trouble and Troubleshooting</i>	<i>28</i>
2. <i>Maintenance and Inspection</i>	<i>31</i>
3. <i>Spare Parts</i>	<i>34</i>
4. <i>Disassembly and Assembly</i>	<i>35</i>

1. Causes of Trouble and Troubleshooting

Refer to "1 causes of Trouble and Troubleshooting" Consult supplier for more information. If you find any troubles, turn off the power supply immediately.

Problem	Symptom on pump		Causes	Inspection and Measures
	When Discharge Valve is Closed	When Discharge Valve is Opened		
Liquid is not lifted.		Pressure gauge and vacuum gauge indicate 'zero'.	<ul style="list-style-type: none"> ● Not enough priming water ● Dry operation. 	<ul style="list-style-type: none"> ○ Stop pump, feed sufficient priming water, and restart pump.
	Water goes down at once when priming is carried out.		<ul style="list-style-type: none"> ● Foreign matter is clogging foot valve. 	<ul style="list-style-type: none"> ○ Clean foot valve. ○ Check whether seat is clogged with foreign matter.
	Pressure is reduced if discharge valve is opened after start-up step.	Points of pressure gauge and vacuum gauge swing but return to zero at once.	<ul style="list-style-type: none"> ● Air enters through suction pipe or gasket section. ● Magnet coupling has disconnected. 	<ul style="list-style-type: none"> ○ Check again whether connecting flange in suction piping is sealed airtight. ○ Check whether suction liquid level is abnormally lowered. ○ Stop pump and use screwdriver to check for easy and smooth rotation of motor fan. ○ Measure current level to check for overload condition. ○ Check whether the voltage level is normal. ○ Check for foreign matter between impeller and magnet capsule.
	Pointer of pressure gauge never goes up.		<ul style="list-style-type: none"> ● Speed of pump is too low. ● Pump rotates in reverse direction. 	<ul style="list-style-type: none"> ○ Check wiring and motor and make necessary repairs. ○ Exchange wires.
Discharge volume is small.		Pointer of vacuum gauge indicates a 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"> ○ Eliminate the foreign matter in strainer.

Problem	Symptom		Causes	Inspection and Measures
	When Discharge Valve is Closed	When Discharge Valve is Opened		
Discharge volume is small.	Pointers of pressure gauge and vacuum gauge indicate normal values.	Pointer of vacuum gauge indicates extraordinarily high value.	● Air is trapped in suction pipe.	○ Inspect setup condition of suction pipe and modify it if necessary.
			● Inlet section of impeller unit is clogged with foreign matter.	○ Disassemble unit partially and eliminate foreign matter.
		Pointers of pressure gauge and vacuum gauge swing.	● Air enters through suction pipe or gasket section.	○ Check connecting section of suction pipe and tighten it if necessary.
			● Discharge side of pump is clogged with foreign matter.	○ Eliminate foreign matter in the pump. ○ Eliminate foreign matter or scale inside pipe.
		Pointer of vacuum gauge indicates a high value while that of pressure gauge indicates normal value.	● There is an air trap or resistance in suction pipe.	○ Check whether there is protruding section in suction pipe and take necessary measures.
		Pointer of pressure gauge indicates high value while that of vacuum gauge indicates normal value.	● There is a portion in discharge pipe that causes resistance, or actual head and loss of head are too high.	○ Check actual head and piping loss of discharge pipe and take necessary measures.
	Pointer of pressure gauge indicates low value and that of vacuum gauge indicates extraordinarily low value.	Pointers of pressure gauge and vacuum gauge indicate low values.	● Rotation direction is reversed.	○ Exchange wires.

Problem	Symptom		Cause	Inspection and Measures
	When Discharge Valve is Closed	When Discharge Valve is Opened		
Motor is overheated.			<ul style="list-style-type: none"> ● Voltage is lowered. ● Overload. ● Ambient temperature is high. 	<ul style="list-style-type: none"> ○ Check whether the voltage and frequency levels are adequate. ○ Check whether the specific gravity and viscosity of liquid are adequate. ○ Improve air ventilation.
Discharge volume is suddenly lowered.		Pointer of vacuum gauge indicates high value.	<ul style="list-style-type: none"> ● Strainer is clogged with foreign matter. 	<ul style="list-style-type: none"> ○ Eliminate foreign matter.
Pump vibrates.			<ul style="list-style-type: none"> ● Foundation is defective. ● Anchor bolt is loose. ● Suction pipe is closed. Cavitation is caused. ● Wear or melting of pump bearing. ● Magnet capsule or spindle is damaged. ● Dynamic balance of drive magnet assembly fluctuates. ● Impeller and/or magnet capsule is in contact with fixing section. ● Wear of motor bearing. 	<ul style="list-style-type: none"> ○ Reinstall. ○ Retighten bolts. ○ Clean, and eliminate cause of cavitation. ○ Replace. ○ Replace. ○ Eliminate cause or replace. ○ Replace. ○ Replace bearing or motor.

2. Maintenance and Inspection

■ Daily inspection

- [1] Check whether the pump operates smoothly, without generating any abnormal noise or vibration.
- [2] Check the level of the liquid in the suction tank and the suction pressure.
- [3] Compare the discharge pressure and electric current measured during operation with the values indicated on the motor nameplate for the verification of normal pump load.
 - * Note that the values indicated on the pressure gauge vary in proportion to the specific gravity of the liquid. The cock of the pressure gauge or vacuum gauge must be opened only when measurement is carried out. It must be closed upon the completion of each measurement. If the cock remains open during pump operation, the meter mechanism may be affected by abnormal pressure caused by water hammer action.
- [4] If a spare pump is available, activate it from time to time to keep it ready for use any time.
- [5] Check to be sure there is no liquid leakage in the pump before operating it. If leakage is detected, never try to operate the pump.
- [6] Check to be sure the discharge pressure, discharge flow rate, and motor power supply voltage do not fluctuate during pump operation. If considerable fluctuation of the respective values occurs, refer to “1. Causes of Trouble and Troubleshooting” for correct measures.

■ Periodic inspection

To ensure efficient and smooth operation of the pump, carry out periodic inspections by following the procedures described below. When inspection, overhauling, or repair work is necessary, stop the pump operation and contact the supplier.

The overhauling and repair work for Iwaki pumps must be performed by qualified personnel who have been trained and certified by the pump supplier. User's failure to observe this instruction exempts Iwaki from the responsibility for personal injury or damage to the equipment or facility which result from its misuse.

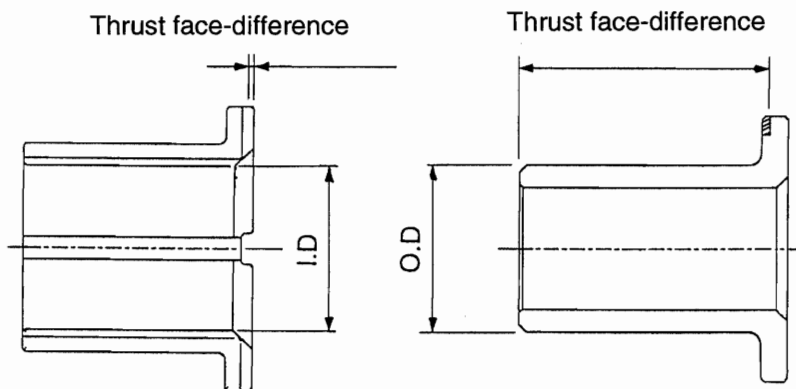
Inspection Timing	Part Name	Check Points
Every 6 months * Inspection record should be kept.	Drive magnet unit	<ul style="list-style-type: none"> ● Are there slide-scratches? ● Is housing fixed normally? Is hex socket set screw loose? ● Are inner perimeter of magnet and motor shaft coaxial? (Max. eccentricity: 1/10 mm)
	Rear casing, Rear casing cover	<ul style="list-style-type: none"> ● Are there slide-scratches? ● Are there cracks on liquid end part? ● Stains in rear casing. ● Expansion of gasket or cracks.
	Magnet capsule unit	<ul style="list-style-type: none"> ● Are there a slide-scratches in the rear section or in the cylindrical body? ● Are there cracks in resin of rear section or in cylindrical body? ● Wear of sleeve or cracks. (Measure dimensions.) ● Expansion of O ring or cracks.
	Impeller	<ul style="list-style-type: none"> ● Wear of thrust bearing. (Measure dimensions.) ● Are there cracks? ● Are there cavitation marks? ● Stains or clogging inside impeller. ● Dimensional change in impeller. ● Clogging balance hole.
	Front casing	<ul style="list-style-type: none"> ● Stains in liquid contacting part. ● Are there cracks? ● Is drain clogged? ● Are there expansion or cracks on gasket? ● Slide-scratches in unlikely position.
	Split plate	<ul style="list-style-type: none"> ● Stains in liquid contacting part. ● Are there cracks? ● Slide-scratches in unlikely position. ● Wear of bearing or cracks. (Measure dimensions) ● Wear of thrust bearing or cracks. (Measure dimensions)

■ Wear limits of bearing and sleeve

Unit: mm

Part Name		Model Dimension	MDE	
			New	Upon Replacement
Bearing	Inner diameter (I.D)	44	45	
	Thrust face-difference	2	1	
Sleeve	Outer diameter (O.D)	44	43	
	Thrust face-difference	65	66	

Note: If the difference between I.D of the bearing and O.D of the sleeve exceeds 1mm, replace either the bearing or the sleeve, whichever is worn out, with a new one regardless of the value specified in the table.



3. Spare Parts

Appropriate spare parts are necessary to ensure long, continuous operation of the pump. It is recommended that expendable parts be kept at hand constantly. When placing an order, supply the following information.

- ① Name of part and part number (in accordance with the drawings in this instruction manual)
- ② Pump model number and manufacturing number (as indicated on the pump nameplate)
- ③ Drawing number if you have received the Iwaki-approved drawing

■ MDE Type Part Number List

No.	Part Name	Material	MDE40-160 ^{*1}	MDE40-200 ^{*2}	MDE50-160 ^{*1}	MDE50-200 ^{*2}	MDE65-160 ^{*1}
400.1	Gasket	PTFE	MDE0112	MDE0112	MDE0112	MDE0112	MDE0112
400.2	Gasket	PTFE	MDE0112	MDE0171	MDE0112	MDE0171	MDE0171
400.4	Drain gasket	PTFE	MDE0149	MDE0149	MDE0149	MDE0149	MDE0149
412	O ring	KALREZ®	MDE0113	MDE0113	MDE0113	MDE0113	MDE0113
		FKM	MDE0577	MDE0577	MDE0577	MDE0577	MDE0577
		EPDM	MDE0578	MDE0578	MDE0578	MDE0578	MDE0578

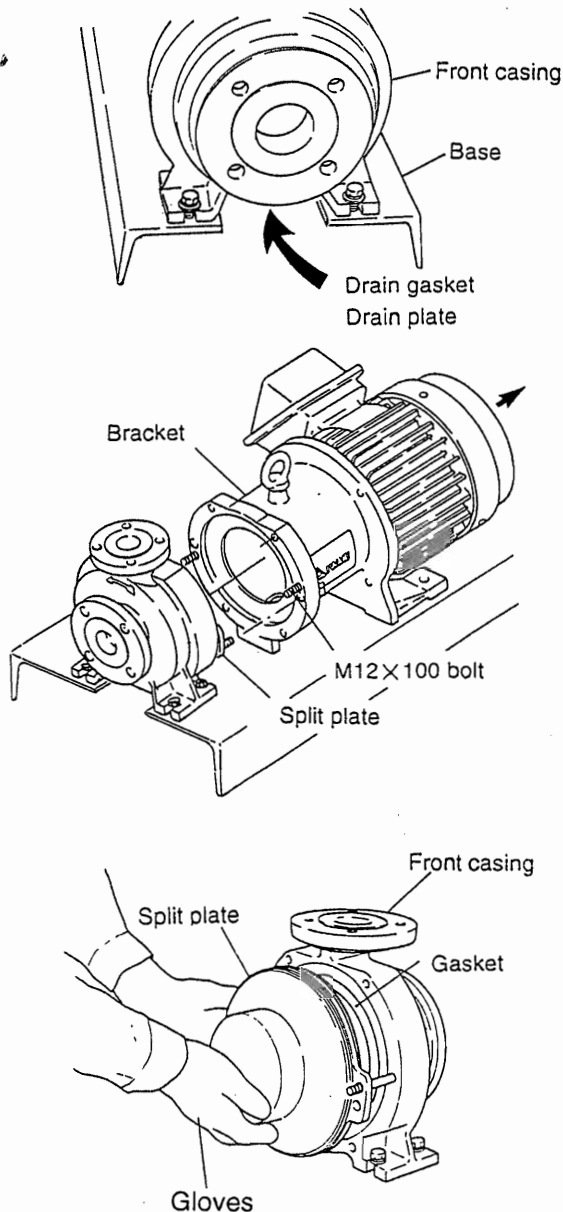
*1 Applicable to impellers with nominal diameters of 100, 110, 120, 130, 140, 150 and 160.

*2 Applicable to impellers with nominal diameters of 170, 180, 190 and 200.

4. Disassembly and Assembly (Flange mounted Motor type)

Caution

- Since the magnet used in the pump is very powerful, be careful not to get your fingers caught between the elements during the disassembly and assembly processes. Also, pay attention to prevent metal pieces or metal powder from adhering onto the pump.
- Do not bring any electronic device that may be impacted by strong magnetic power into the pump magnetic field.
- Prior to disassembly or assembly, close the suction valve and discharge valve.
- The piping and the pump often retain liquid. When a dangerous liquid is handled, wear protectors (goggles, rubber gloves, etc.) when disconnecting the pipes.



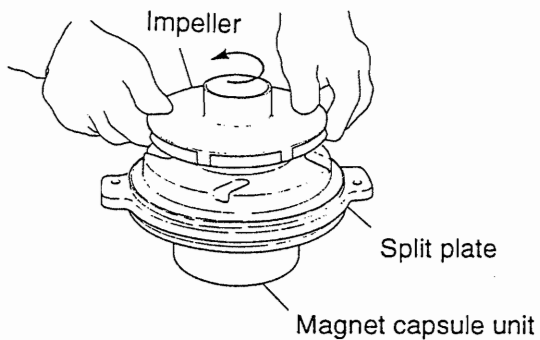
■ Disassembly

- [1] Disassemble only after thoroughly washing out the liquid inside the pump by use of flushing piping, if pump has drain port, remove the hex bolt (901.1) and drain plate (122) and drain the liquid out of the casing. Then, clean the inside of the pump.

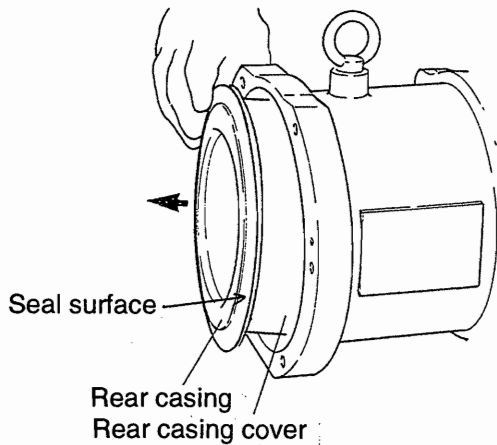
Warning

Wear protectors (goggles, rubber gloves, etc.). Certain liquids are dangerous. They may hurt your eyes and skin.

- [2] Remove the rear retaining hex bolt (901.3) on the bracket (330). Then, remove the hex bolt (901.8) on the front casing side as well as the nut (920).
- [3] Screw the two attached bolts (size is M12×100) from the motor side through the tapped hole on the bracket (330) to push out the split plate (337) so that the plate is separated from the bracket section.
 - * Turn the screws alternately. If the split plate (337) has been sufficiently driven out, hold it by hand and pull it toward the rear. Then, rotate the plate on the base.
 - * During disassembly, discharge the liquid from the casing and clean the inside of the pump.



- [4] Push a flat-head screwdriver into the engagement between the split plate (337) and the front casing (100.1) to open the jointed section. In this step, be careful not to damage the seal surface and gasket (400.1).



- [5] Remove the impeller (230) from the split plate and magnet capsule unit (858) by rotating it counterclockwise.

* Keep in mind the power of the magnet. Also, be careful not to damage the front casing, split plate, rear casing, bearing sleeve, thrust bearing impeller, etc. This part is fixed tightly with adhesive. If necessary, use belt wrench for loosening impeller from spindle.

- [6] Pull the rear casing (158) and rear casing cover (159) out of the bracket.

■ Assembly

The pump should be assembled by carrying out the steps of disassembly in reverse, as described below. Pay attention to the following points.

- Keep the sliding and sealed parts clean so that they are free of dust or scratches. When assembling these parts, be sure to attach them in the correct positions.

Fasten the various bolts evenly. Since the magnet is extremely powerful, make sure there is no metal powder adhered to it before installing it.

- **Replacement of O ring and gasket**

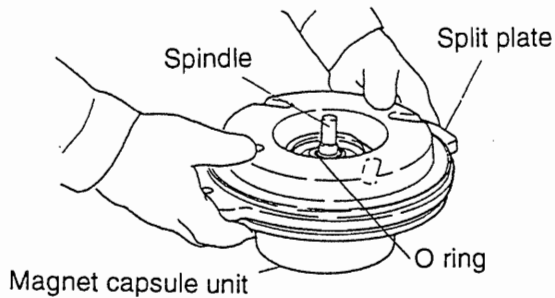
When replacing the O ring or gasket, be sure to install a new one. In addition, see that the O ring or gasket is not twisted or pressed by another part.

* The sealing section should be cleaned free of dust or scratches before installation

- **Fastening Bolts**

Fasten the bolts in diagonal order by applying the fastening torque shown in the following table. Apply an equal torque to each bolt.

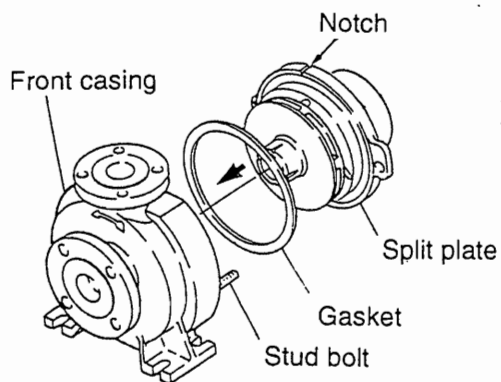
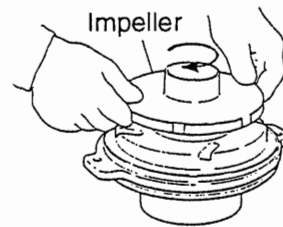
Model	Type	Fastening torque N·m	Size of bolts
MDE	Hex. head bolt	58.8	M12×65
	Hex. Nut	58.8	M12



- [1] Install the split plate from the spindle side of the magnet capsule unit (859). Be careful not to damage the sleeve or the sliding section of the bearing. Next, attach the O ring (412) to the magnet capsule unit (859) and after applying a proper quantity (just enough so as not to drip) of adhesive to the threaded portion (three peripheral threads in the threaded portion of the spindle), and screw the impeller (230) in firmly by using a belt wrench to fix it. Fastening torque: 38 N·m
Recommended adhesive: Locktight No. 242 (a product of Nihon Locktight) or equivalent.

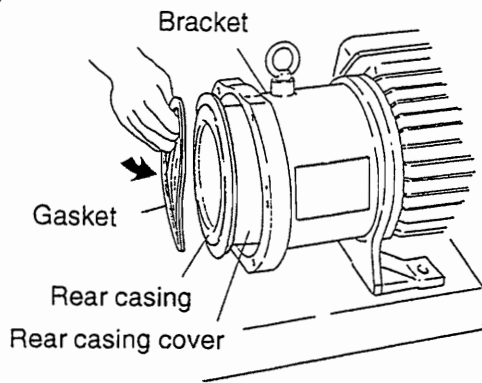
* If adhesive sticks to the O ring or O ring groove, wipe it off immediately.

* Confirm that there is a play of 1 to 2mm on the direction of thrust between the split plate and the impeller.



- [2] Insert the gasket (400.1) into the front casing and install the split plate (337).

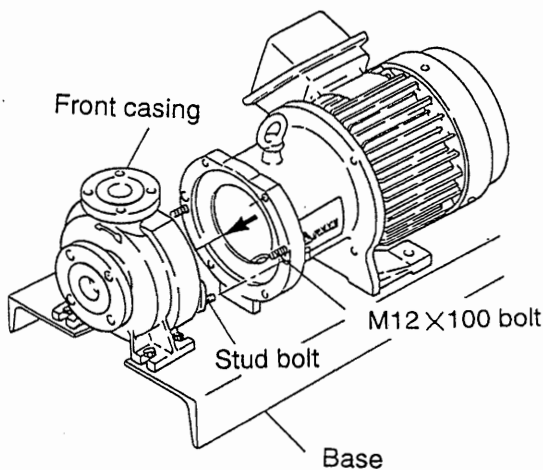
* Screw the stud bolts (902) into the two screw holes in the front casing. Then, insert the split plate along the stud bolt with the positioning notch of the split plate at the top.



- [3] Install the rear casing cover (159) and rear casing (158) onto the bracket (330). Next, insert the gasket (400.2) to be fixed on the front casing side.

* Previously fit the bolt $M12 \times 100$ provided for the bracket into it fully to its depth. If this bolt is not used, the magnetic capsule is abruptly attracted by the virtue of magnet and it sometimes causes ceramic and plastic the part to be broken.

In order to prevent this failure, it is necessary to put magnet capsule into rear casing gradually with using this $M12 \times 100$.

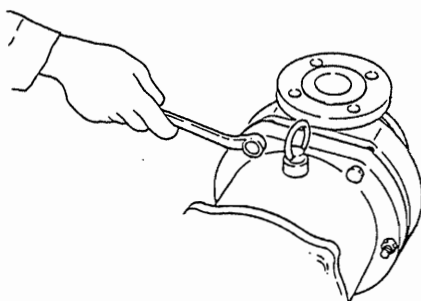


- [4] Direct the bracket precisely vertical to the front casing on the base and install it along the stud bolt (902).

Loosen the attached bolts ($M12 \times 100$) alternately to pull the bracket slowly backward, to install it finally onto the front casing.

* Note that the magnetic force of the magnet capsule is very strong.

* When assembling, be careful not to let your fingers or hand get caught.



- [5] Fix the bracket firmly with the front casing by tightening both the hex bolt (901.8) and hex nuts (920). Tighten these bolts diagonally to apply an even torque. Fastening torque: $58.8N \cdot m$

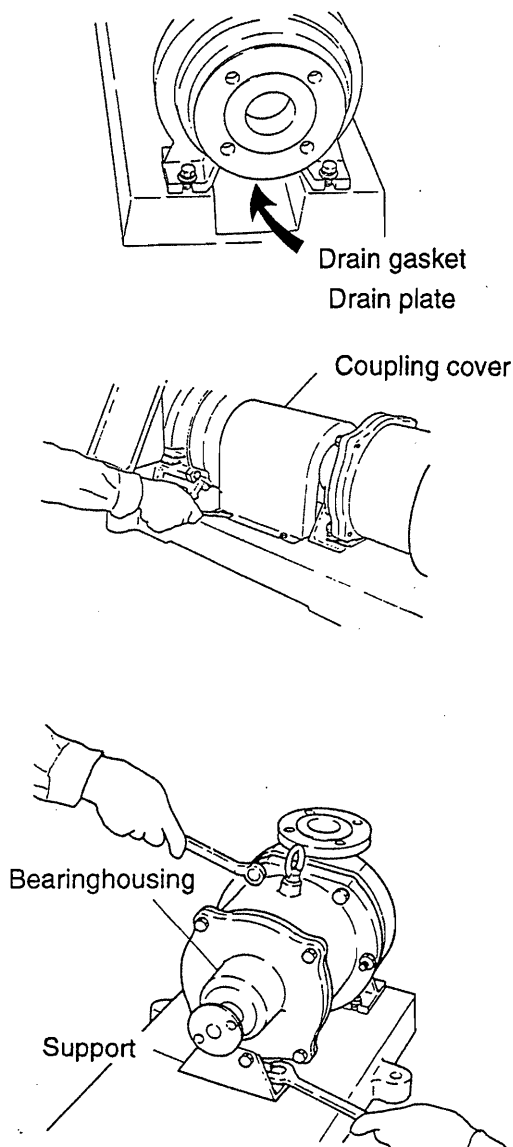
* At regular intervals, increase the fastening of the parts which fix the bracket to the front casing. Fasten them only after the hex head bolt (901.3) is loosened.

- [6] Install the drain plate and fasten the bolts.

4. Disassembly and Assembly (Foot mounted Motor type)

⚠ Caution

- Since the magnet used in the pump is very powerful, be careful not to get your fingers caught between the elements during the disassembly and assembly processes. Also, pay attention to prevent metal pieces or metal powder from adhering onto the pump.
- Do not bring any electronic device that may be impacted by strong magnetic power into the pump magnetic field.
- Prior to disassembly or assembly, close the suction valve and discharge valve fully.
- The piping and the pump often retain liquid. When a dangerous liquid is handled, wear protectors (goggles, rubber gloves, etc.) when disconnecting the pipes.



■ Disassembly

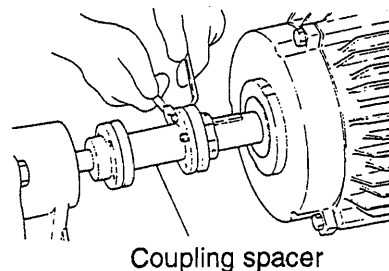
- [1] Disassemble only after thoroughly washing out the liquid inside the pump by use of flushing piping, if pump has drainport, remove the hex bolt (901.1) and drain plate (122) and drain the liquid out of the casing. Then, clean the inside of the pump.



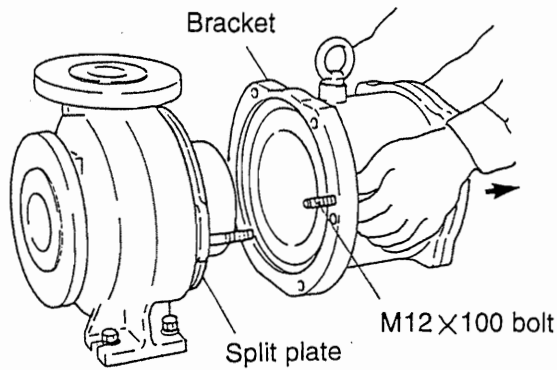
Warning

Wear protectors (goggles, rubber gloves, etc.).
Certain liquids are dangerous. They may hurt your eyes and skin.

- [2] Remove the coupling cover bolts (901.5) and detach the coupling cover (681). Next, remove the coupling bolt and coupling spacer.



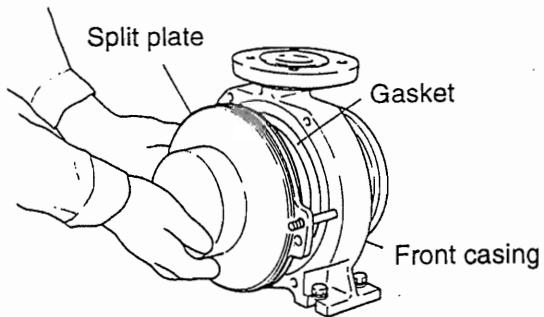
- [3] Remove the hex head bolt (901.3) which fastens the support (183) of the bearing housing (350). Then remove the hex head bolt (901.8) and the nuts (920) on the front casing side.



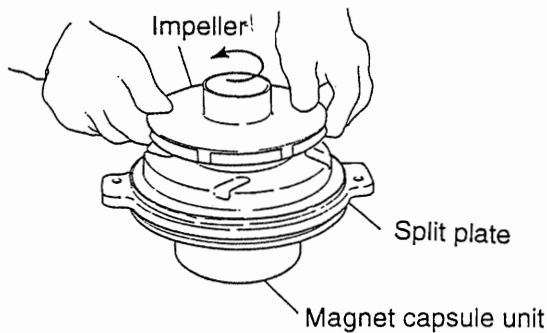
[4] Screw the two attached bolts (size is M12×100) from the motor side through the screw hole on the bracket (330) to push out the split plate (337) so that the plate will be separated from the bracket section.

* Turn the screws alternately. If the split plate (337) has been sufficiently driven out, hold the split plate by hand and pull it toward the rear. Then, rotate the plate on the base.

* During disassembly, discharge the liquid from the casing and clean the inside of the pump.



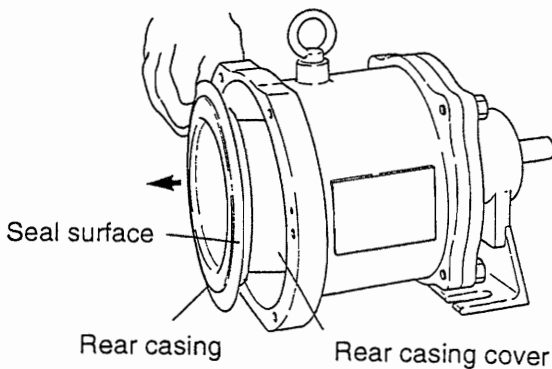
[5] Push a flat-head screwdriver into the joint between the split plate (337) and front casing (100.1) to open the jointed section. In this step, be careful not to damage the seal surface and gasket (400.1).



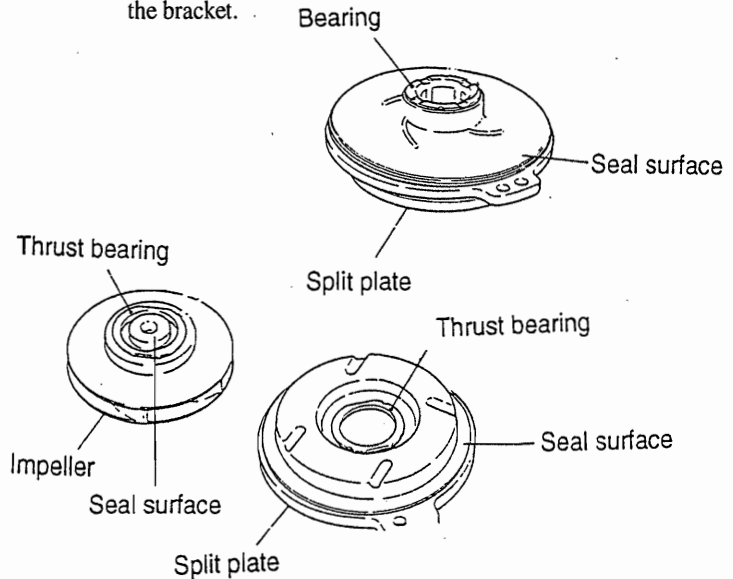
[6] Remove the impeller (230) from the split plate and magnet capsule unit (858) by rotating it counterclockwise. Detach the impeller by the use of a belt wrench after fixing the magnet capsule.

* Keep in mind the power of the magnet. Also, be careful not to damage the front casing, split plate, rear casing, bearing sleeve, thrust bearing, impeller, etc.

This part is fixed tightly with adhesive, if necessary, use belt wrench for loosening impeller from spindle.



[7] Pull the rear casing (158) and rear casing cover (159) out of the bracket.



■ Assembly

The pump should be assembled by carrying out the steps of disassembly in reverse, as described below. Pay attention to the following points.

- Keep the sliding and sealed parts clean so that they are free of dust or scratches. When assembling these parts, be sure to attach them in the correct positions.

Fasten the various bolts evenly. Since the magnet is extremely powerful, make sure there is no metal powder adhered to it before installing it.

- **Replacement of O ring and gasket**

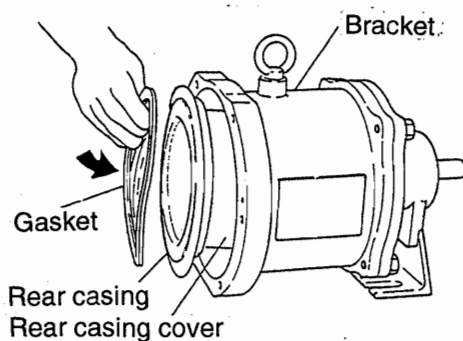
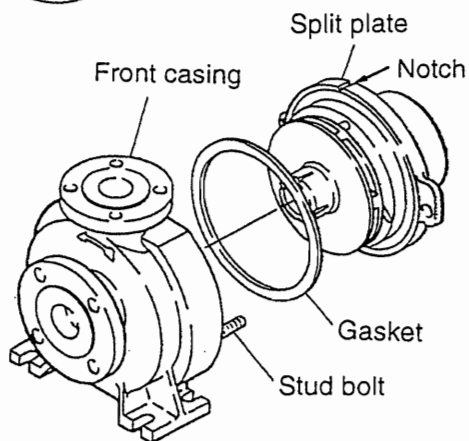
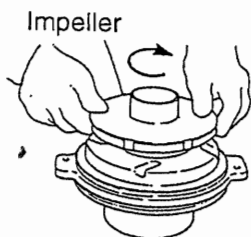
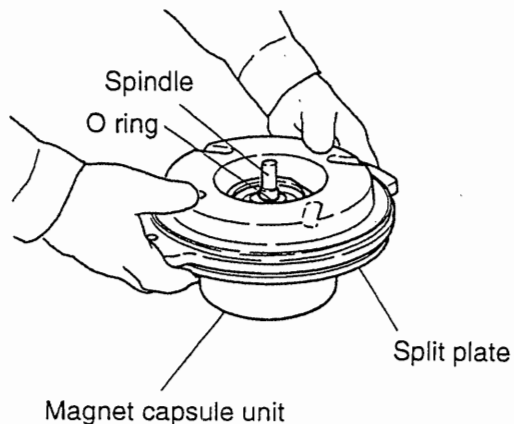
When replacing the O ring or gasket, be sure to install a new one. In addition, see that the O ring or gasket is not twisted or pressed by another part.

* The sealing section should be cleaned free of dust or scratches before installation

- **Fastening Bolts**

Fasten the bolts in diagonal order by applying the fastening torque shown in the following table. Apply an equal torque to each bolt.

Model	Type	Fastening torque N·m	Size of bolts
MDE	Hex. head bolt	58.8	M12×65
	Hex. Nut	58.8	M12



- [1] Install the split plate from the spindle side of the magnet capsule unit (859). Be careful not to damage the sleeve or the sliding section of the bearing. Next, attach the O ring (412) to the magnet capsule unit (859) and after applying a proper quantity (just enough so as not to drip) of adhesive to the threaded portion (three peripheral threads in the threaded portion of the spindle), and screw the impeller (230) in firmly by using a belt wrench to fix it. Fastening torque: 38 N·m Recommended adhesive: Locktight No. 242 (a product of Nihon Locktight) or equivalent.

* If adhesive sticks to the O ring or O ring groove, wipe it off immediately.

* Confirm that there is a play of 1 to 2mm on the direction of thrust between the split plate and the impeller.

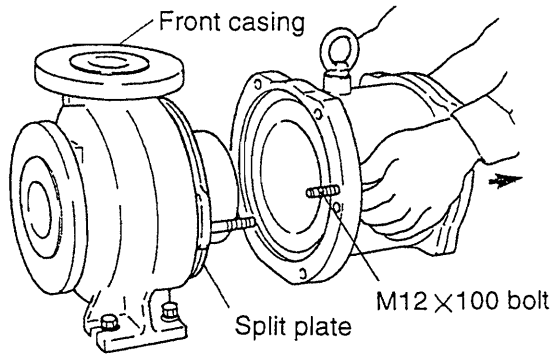
- [2] Insert the gasket (400.1) into the front casing and install the split plate (337).

* Screw the stud bolts (902) into the two screw holes in the front casing. Then, insert the split plate along the stud bolt with the positioning notch of the split plate at the top.

- [3] Install the rear casing cover (159) and rear casing (158) onto the bracket (330). Next, insert the gasket (400.2) to be fixed on the front casing side.

* Previously fit the bolt M12×100 provided for the bracket into it fully to its depth. If this bolt is not used, the magnet capsule is abruptly attracted by the virtue of magnet and it sometimes causes ceramic and prastic the part to be broken.

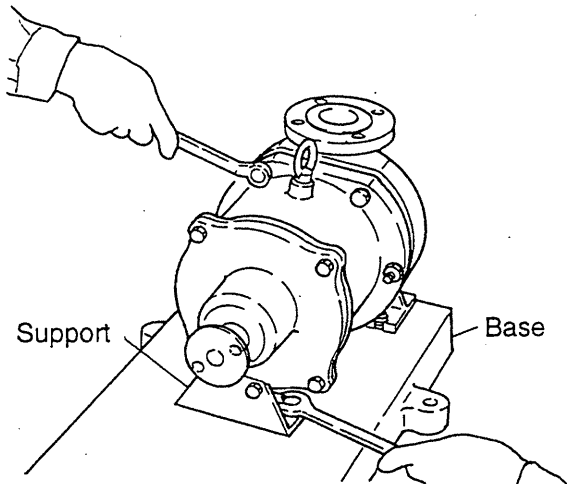
In order to prevent this failure, it is necessary to put magnet capsule into rear casing gradually with using this M12×100.



- [4] Direct the bracket precisely vertical to the front casing on the base and install it along the stud bolt (902). Loosen the attached bolts (M12 x 100) alternately to pull the bracket slowly backward, to install it finally onto the front casing.

* Note that the magnetic force of the magnet capsule is very strong.

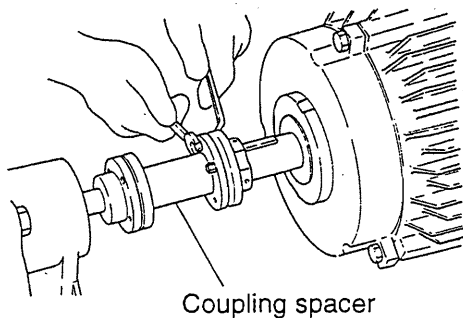
* When assembling, be careful not to let your fingers or hand get caught.



- [5] Fix the bracket with the front casing by tightening both the hex bolt (901.8) and hex nuts (920). Tighten them diagonally to apply an even torque.

Fastening torque: 58.8N·m

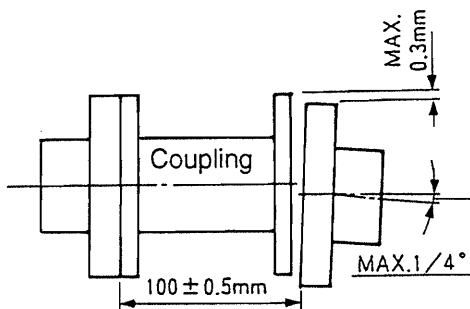
* At regular intervals, increase the fastening of the parts which fix the bracket to the front casing. Fasten them only after the hex head bolt (901.3) is loosened.



- [6] Install the drain plate and fasten the bolts.

- [7] After the support (183) is attached to the base, connect the pump unit to the motor by means of the coupling spacer.

- [8] Adjust the centering of the coupling so as to fall in the following ranges. (The nuts for the coupling and for fixing the coupling spacer cannot be reused more than 10 times.)



Coupling Fastening Torque	3.7kW ~ 7.5kW Motor	8.8N·m
	11kW ~ 18.5kW Motor 7.5kW safety-increased motor	21.5N·m

- [9] After centering adjustment, firmly mount the coupling cover.



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