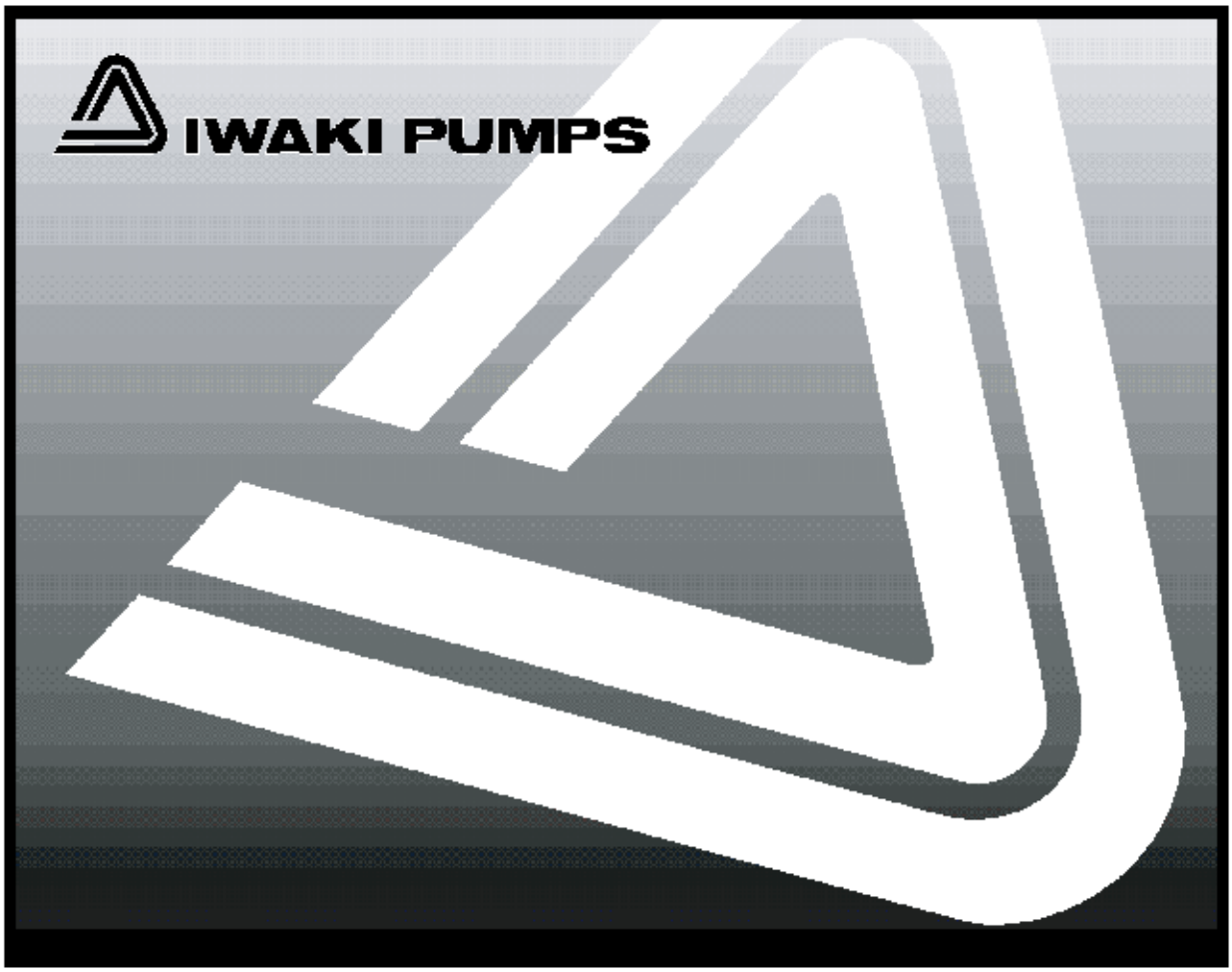

IWAKI
Self-priming Magnetic Drive Pump

SMX-F Series

Instruction Manual

⚠Read this manual before use of product

Thank you for selecting an Iwaki SMX-F Series Self-priming Magnetic Drive Pump. This instruction manual deals with *"Safety instructions"*, *"Outline"*, *"Installation"*, *"Operation"* and *"Maintenance"* sections. Please read through this manual carefully to ensure the optimum performance, safety and service of your pump.

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

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

Important instructions

For the Safe and Correct Handling of the Pump

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

⚠ **WARNING**	**Nonobservance or misapplication of "Warning" sections could lead to a serious accident which may result in death.**
⚠ **CAUTION**	**Nonobservance or misapplication of "Caution" sections could lead to personal injury or property damage.**

Types of Symbols

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

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

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

⚠ Export Restrictions

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

Safety instructions

⚠ WARNING

- **Access limitation**

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


Prohibition

- **Turn off power before service**

  Risk of electrical shock. Be sure to turn off power to stop the pump and related devices before service is performed. Working on the pump with power ON, any rotating part may catch the hand, finger, hair, or clothes, and it may result in serious injury. Let other people know about the situation by displaying a notice such as "POWER OFF (Maintenance)" near the power switch.


Turning off power

- **Wear protective clothing**

  Always wear protective clothing such as an eye protection, chemical resistant gloves, a mask and a face shield during disassembly, assembly or maintenance work. The specific solution will dictate the degree of protection. Refer to SDS precautions from the solution supplier.


Wear protectors

- **Do not modify the pump**

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

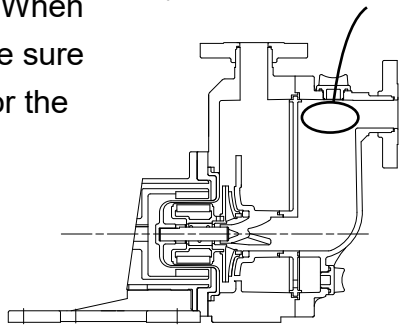

Do not remodel

- **When handling harmful liquid**

  Risk of personal injury, fire, or even explosion. When a harmful liquid as mentioned below is used, be sure to conduct daily inspection and maintenance for the prevention of chemical spray or leakage.

  1. Explosive or flammable liquid
  2. Corrosive or stimulus toxic liquid
  3. Health hazardous liquid

Pay extra attention. Gas can stay in the top of front casing.



- **Use the eye bolt (if provided)**

  Use the eye bolt when lifting the pump unit only. Use an overhead crane or any other proper transporting machine. Two or more operators may be needed for ensuring safe transport depending on the pump size and weight.

Safety instructions

⚠ CAUTION

- **Attention to magnetic force**
  A pair of strong magnets is mounted in the pump and its magnetic force may affect magnetic disks/cards or wrist watches. Do not bring them close to the pump.


Prohibition

- **Qualified personnel only**
  The pump should be handled or operated by qualified personnel with a full understanding of the pump. Any person not familiar with the product should not take part in the operation or management of the pump.


Prohibition

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


Prohibition

- **Use specified power only**
  Do not apply power other than that specified on the nameplate. Otherwise, failure or fire may result. Ensure the pump is properly grounded.


Prohibition

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

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

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


Prohibition

- **Do not operate the pump in a flammable atmosphere**
  Do not place explosive or flammable material near the pump.


Fire ban

- **Unpacking**
  Before unpacking, check the package is not placed upside down. Take care not to be injured by a box nail or a wood chip when taking apart the wooden box.


Caution

- **Do not lift the pump by gripping any plastic parts (pump unit, flange or base)**
  The pump can drop unintentionally as a plastic part breaks, resulting in serious injury. Rope or chain the motor to lift up the pump horizontally.


Prohibition

Safety instructions

⚠ CAUTION

- **Do not stand on the pump**
  Do not use the pump as a platform. Injury or damage may result when the pump turns over.


Prohibition

- **Do not touch the pump or pipe with bare hands**
  Risk of burning. The surface temperature of the pump or pipe rises high along with liquid temperature in or right after operation.


Prohibition

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


Earthing

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

- **Do not install/store the pump:**
  - Where ambient temperature can exceed 0-40°C.
  - Where ambient humidity exceeds 85%RH or falls below 35%RH.
  - In a flammable/explosive atmosphere (except explosion-proof type).
  - In a dusty/humid environment (except explosion-proof type).
  - In direct sunlight or wind & rain (except outdoor-use type).
  - Under mechanical vibrations.
  - In a corrosive atmosphere.


Prohibition

- **Foreign matter**
  Risk of failure. If foreign matters have entered the pump, turn off power immediately and remove them.


Caution

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

- **Disposal of a used pump**
  Remove a chemical and flush it out before the pump is disconnected from piping. Dispose of any used or damaged pump in accordance with local rules and regulations. If necessary, consult a licensed industrial waste disposal company.

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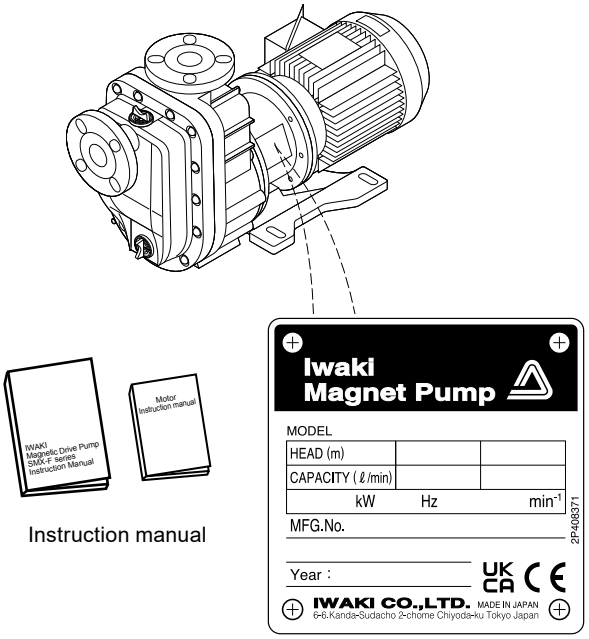
Outline

1. Unpacking & Inspection



Instruction manual

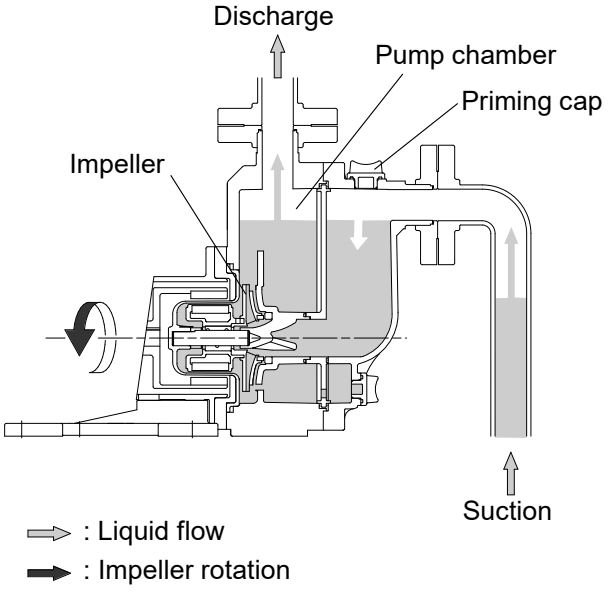
Open the package and check that the product conforms to your order. If any problem or inconsistency is found, immediately contact your distributor.

1. Check the nameplate to see if the information such as model codes, discharge capacity, discharge pressure and stroke rate are as ordered.
2. Check for transit damage, deformation, and loose bolts.

*The CE/UKCA markings on our product(s) are for us to market the product(s) into the European Union market / the Great Britain (England, Wales and Scotland) market, however, the CE/UKCA markings do not ensure any safety or conformity of the product(s) outside the EU/GB markets.
When the pump is incorporated into the equipment marketed in the EU/GB markets, such equipment must meet all the requirements of applicable directives/regulations. In such a case, any person who places the equipment on the markets must carry CE/UKCA marks on the equipment as a manufacturer.

2. Product outline

The SMX-F series pump is a self-priming centrifugal pump of a gas-liquid separation system. Fluoroplastic and fine ceramic wet ends are capable of handling a wide range of chemicals in various applications.



■ Principle of operation

a. Running the pump after priming, liquid and gas start to move into the pump chamber, where gas-liquid separation occurs.

b. Once all gas is expelled, normal centrifugal pump operation is resumed.

c. Sufficient liquid remains in the pump chamber for subsequent self-priming once the pump is stopped.

3. Model code

SMX - F 22 0 CF V V C

a b c d e f g

a. Series code

SMX-F: CFRETFE type (Wet end material)

b. Pump I.D. (Inlet × Outlet)

22: 25A × 25A
44: 40A × 40A
54: 50A × 40A

c. Motor output code

0: 0.4kW (0.37kW)
1: 0.75kW
2: 1.5kW
3: 2.2kW
5: 3.7kW (4.0kW)

d. Sliding parts code (Bearing/ Spindle/ Liner ring)

CF: High density carbon/ High purity alumina ceramic/ Alumina ceramic
RF: Filled PTFE/ High purity alumina ceramic/ Alumina ceramic
KK: SiC/ SiC/ SiC

e. O ring material

V: FKM
E: EPDM

f. Impeller code

T, V: 50Hz
X, Y, Z: 60Hz

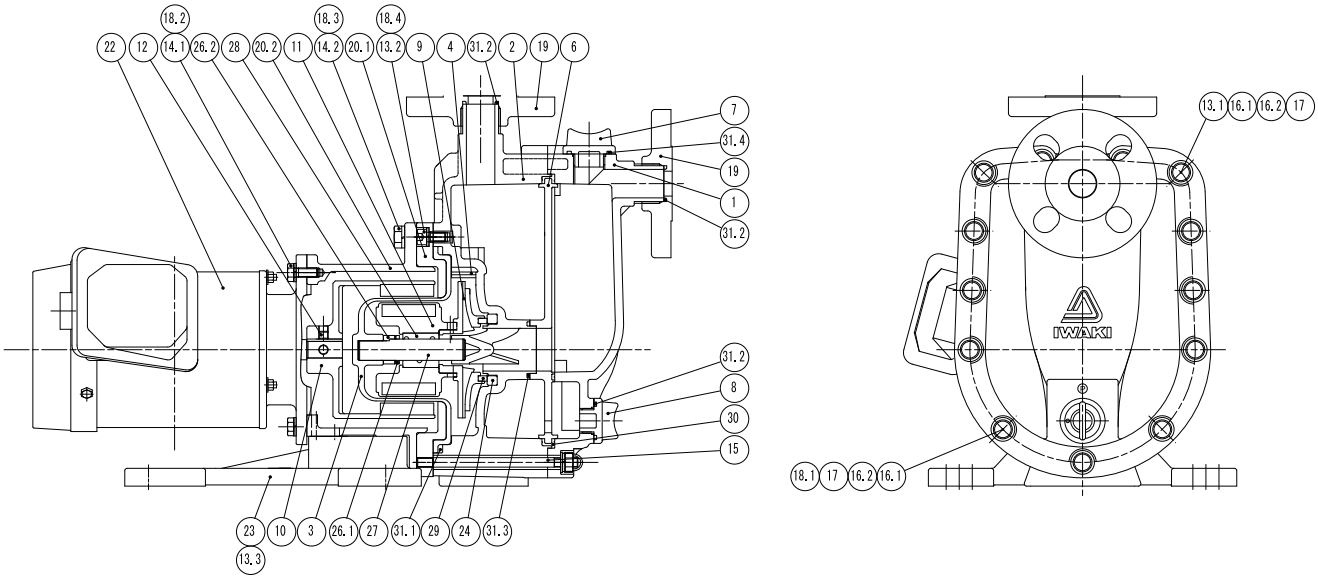
g. Motor type

No code: Totally-enclosed-fan-cooled motor for indoor use
C: Totally-enclosed-fan-cooled motor for outdoor use
A: Increased safety motor for outdoor use

There are limitations on some combinations. Contact us for details.

4. Part names

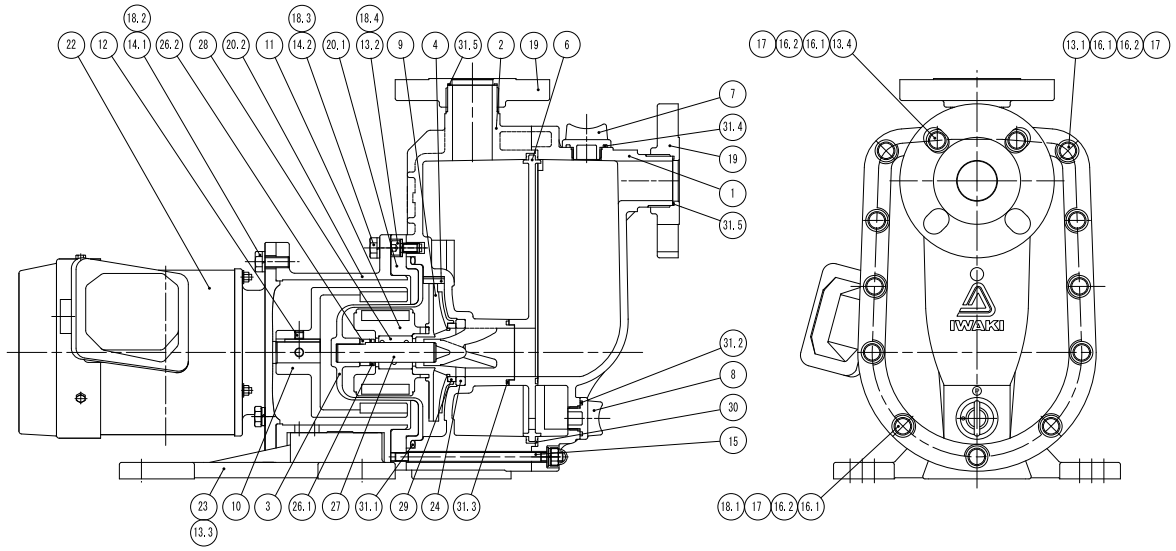
SMX-F22□



NO	PART NAMES	MATERIAL			Q'TY	REMARKS
		CF	RF	KK		
1	FRONT CASE	CFRETFE			1	
2	REAR CASE	CFRETFE			1	
3	REAR CASING	CFRETFE			1	
4	VOLUTE SPACER	CFRETFE			1	
6	PLATE	CFRETFE			1	
7	CAP	CFRETFE			1	
8	DRAIN CAP	CFRETFE			1	
9	IMPELLER	CFRETFE			1	
10	DRIVE MAGNET UNIT	SMX-F220: FERRITE MAGNET + ALUMINIUM ALLOY SMX-F221: FERRITE MAGNET + DUCTILE IRON SMX-F222: RARE EARTH MAGNET + DUCTILE IRON			1	
11	MAGNET CAPSULE	SMX-F220, 221: FERRITE MAGNET + CFRETFE SMX-F222: RARE EARTH MAGNET + CFRETFE			1	
12	HEX SOCKET SET SCREW	STEEL			2	
13.1	HEX SOCH HEAD BOLT	STNLS STL			8	M8×40 PW,SW
13.2	HEX SOCH HEAD BOLT	STNLS STL			3	M8×15
13.3	HEX SOCH HEAD BOLT	STEEL			4	M8×20 PW,SW
14.1	HEX HEAD BOLT	STNLS STL			4	220 type: M8×20 221, 222 type: M10×25
14.2	HEX HEAD BOLT	STNLS STL			4	M10×25
15	STUD BOLT	STNLS STL			5	
16.1	NUT	STNLS STL			13	M8
16.2	COVER CAP	PE			13	
17	PLAIN WASHER	STNLS STL			13	M8
18.1	SPRING WASHER	STNLS STL			5	M8
18.2	SPRING WASHER	STNLS STL			4	220 type:M8 221, 222type:M10
18.3	SPRING WASHER	STNLS STL			4	M10
18.4	SPRING WASHER	STNLS STL			3	M8
19	FLANGE	CFRETFE			2	
20.1	REAR CASING SUPPORT	DUCTILE IRON			1	
20.2	ADAPTER	DUCTILE IRON			1	
22	MOTOR	——			1	
23	BASE	GFRPP			1	
24	LINER RING	HIGH PURITY ALUMINA CERAMIC		SiC	1	
26.1	REAR THRUST RING	——	HIGH PURITY ALUMINA CERAMIC	——	1	ONLY RF TYPE
26.2	REAR THRUST	CFRETFE			1	
27	SPINDLE	HIGH PURITY ALUMINA CERAMIC		SiC	1	
28	BEARING	High density carbon	Filled PTFE	SiC	1	
29	MOUTH RING	Filled PTFE		SiC	1	
30	GASKET	V:FKM E:EPDM			1	
31.1	O RING (REAR CASING)				1	G-160
31.2	O RING (DRAIN CAP/FLANGE)				3	G-25
31.3	O RING (REAR CASE)				1	P-40
31.4	O RING (CAP)				1	G-30

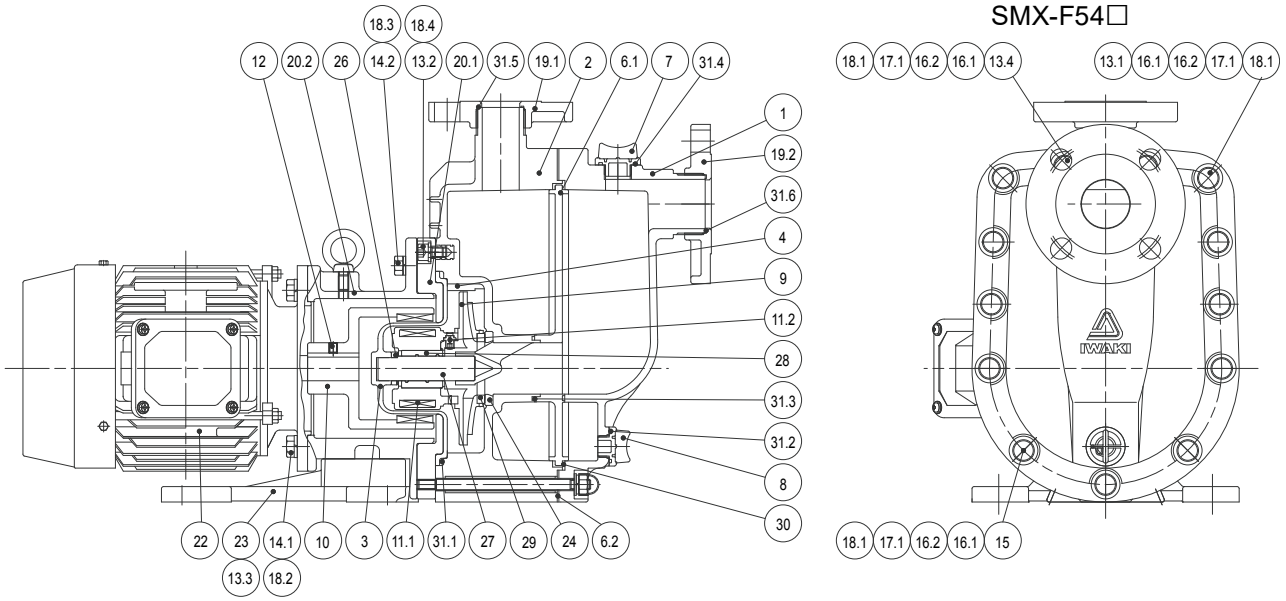
Outline

SMX-F44□



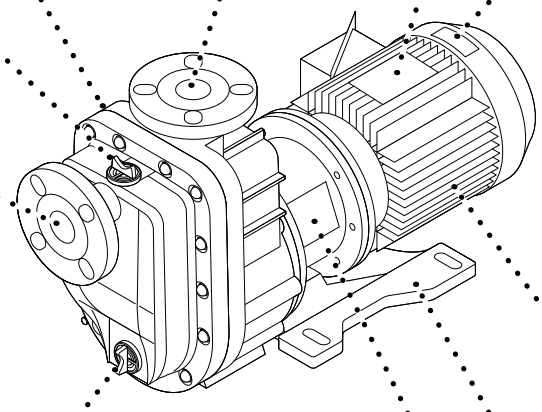
NO	PART NAMES	MATERIAL			Q'TY	REMARKS
		CF	RF	KK		
1	FRONT CASE	CFRETFE			1	
2	REAR CASE	CFRETFE			1	
3	REAR CASING	CFRETFE			1	
4	VOLUTE SPACER	CFRETFE			1	
6	PLATE	CFRETFE			1	
7	CAP	CFRETFE			1	
8	DRAIN CAP	CFRETFE			1	
9	IMPELLER	CFRETFE			1	
10	DRIVE MAGNET UNIT	SMX-F441: FERRITE MAGNET + DUCTILE IRON SMX-F442, 443: RARE EARTH MAGNET + DUCTILE IRON			1	
11	MAGNET CAPSULE	SMX-F441: FERRITE MAGNET + CFRETFE SMX-F442, 443: RARE EARTH MAGNET + CFRETFE			1	
12	HEX SOCKET SET SCREW	STEEL			2	
13.1	HEX SOCH HEAD BOLT	STNLS STL			6	M8×45
13.2	HEX SOCH HEAD BOLT	STNLS STL			3	M8×15
13.3	HEX SOCH HEAD BOLT	STEEL			4	M8×20 PW,SW
13.4	HEX SOCH HEAD BOLT	STNLS STL			2	M8×85
14.1	HEX HEAD BOLT	STNLS STL			4	M10×25
14.2	HEX HEAD BOLT	STNLS STL			4	M10×25
15	STUD BOLT	STNLS STL			5	
16.1	NUT	STNLS STL			13	M8
16.2	COVER CAP	PE			13	
17	PLAIN WASHER	STNLS STL			21	M8
18.1	SPRING WASHER	STNLS STL			13	M8
18.2	SPRING WASHER	STNLS STL			4	M10
18.3	SPRING WASHER	STNLS STL			4	M10
18.4	SPRING WASHER	STNLS STL			3	M8
19	FLANGE	CFRETFE			2	
20.1	REAR CASING SUPPORT	DUCTILE IRON			1	
20.2	ADAPTER	DUCTILE IRON			1	
22	MOTOR	——			1	
23	BASE	GFRPP			1	
24	LINER RING	HIGH PURITY ALUMINA CERAMIC		SiC	1	
26.1	REAR THRUST RING	——	HIGH PURITY ALUMINA CERAMIC	——	1	ONLY RF TYPE
26.2	REAR THRUST	CFRETFE			1	
27	SPINDLE	HIGH PURITY ALUMINA CERAMIC		SiC	1	
28	BEARING	High density carbon	Filled PTFE	SiC	1	
29	MOUTH RING	Filled PTFE		SiC	1	
30	GASKET	V:FKM E:EPDM			1	
31.1	O RING (REAR CASING)				1	G-160
31.2	O RING (DRAIN CAP)				1	G-25
31.3	O RING (REAR CASE)				1	P-50
31.4	O RING (CAP)				1	G-30
31.5	O RING (FLANGE)				2	AS568-129

Outline



NO	PART NAMES	MATERIAL			Q'TY	REMARKS
		CF	RF	KK		
1+6.2	FRONT CASE UNIT	CFRETFE + SM520B EQ			1	
2	REAR CASE	CFRETFE			1	
3	REAR CASING	CFRETFE			1	
4	VOLUTE SPACER	CFRETFE			1	
6.1	PLATE	CFRETFE			1	
7	CAP	CFRETFE			1	
8	DRAIN CAP	CFRETFE			1	
9	IMPELLER	CFRETFE			1	
10	DRIVE MAGNET UNIT	RARE EARTH MAGNET + DUCTILE IRON			1	
11.1	MAGNET CAPSULE	RARE EARTH MAGNET + CFRETFE			1	
11.2	LOCK PIN	CFRETFE			2	
12	HEX SOCKET SET SCREW	STEEL			2	M8×10
13.1	HEX SOCH HEAD BOLT	STNLS STL			6	M10×50
13.2	HEX SOCH HEAD BOLT	STNLS STL			3	M10×16
13.3	HEX SOCH HEAD BOLT	STEEL			4	M8×20 PW,SW
13.4	HEX SOCH HEAD BOLT	STNLS STL			2	M10×90
14.1	HEX HEAD BOLT	STNLS STL			4	M10×30
14.2	HEX HEAD BOLT	STNLS STL			4	M10×25
15	STUD BOLT	STNLS STL			5	
16.1	NUT	STNLS STL			13	M10
16.2	COVER CAP	PE			13	
17.1	PLAIN WASHER	STNLS STL			21	M10
18.1	SPRING WASHER	STNLS STL			13	M10
18.2	SPRING WASHER	STNLS STL			4	M10
18.3	SPRING WASHER	STNLS STL			4	M10
18.4	SPRING WASHER	STNLS STL			3	M10
19.1	FLANGE	CFRETFE			1	40A
19.2	FLANGE	CFRETFE			1	50A
20.1	REAR CASING SUPPORT	DUCTILE IRON			1	
20.2	ADAPTER	DUCTILE IRON			1	
22	MOTOR	——			1	
23	BASE	SMX-F542, 543: GFRPP			1	
		SMX-F545: SPCC			1	
24	LINER RING	HIGH PURITY ALUMINA CERAMIC		SiC	1	
26	REAR THRUST	HIGH PURITY ALUMINA CERAMIC		SiC	1	
27	SPINDLE	HIGH PURITY ALUMINA CERAMIC		SiC	1	
28	BEARING	High density carbon	Filled PTFE	SiC	1	
29	MOUTH RING	Filled PTFE		SiC	1	
30	GASKET	V:FKM E:EPDM			1	
31.1	O RING				1	G-180
31.2	O RING				1	G-25
31.3	O RING				1	G-55
31.4	O RING				1	G-30
31.5	O RING				1	AS568-129
31.6	O RING				1	AS568-136

5. Overview



Pump unit
Prime the pump through the priming port before operation.

Discharge port

Priming port

Suction port

Motor nameplate
Use the power voltage specified on the nameplate.
(Observe an applicable local power regulation.)

"Arrow" label
The arrow indicates a rotational direction of the motor. Make sure the motor runs in a correct direction. Refer to the "3. Preparation" section on page 23.

"Do not run pump dry" label
Operating the pump without liquid damages internal parts.

Motor (Drive unit)
The motor power is transmitted to the pump.

Base
Be sure to fix the base.

Pump nameplate
Operate the pump in accordance with specifications.

Drain cap
Loosen the drain cap to drain liquid.
(Liquid in the pump chamber can not be removed completely. Be careful with residual liquid.)

⚠CAUTION

- Do not clean the pump or nameplate with a solvent such as benzine or thinner. This may discolour the pump or erase printing. Use a dry or damp cloth or a neutral detergent.
- Turn off main power before cleaning. Be careful not to wet the motor (terminal box and fan cover) and wiring. Otherwise electrical shock or short circuit may result.

Installation

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3. Installation 14

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5. Wiring..... 18

Installation

1. Before installation

Precautions for electrical wiring and pipework

⚠ CAUTION

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

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

- The front case, rear case and base are plastics. Use measures to keep the plastic parts free from impact or stress.

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

• Install the pump according to a drawing and specification.

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

2. Installation location

Select an installation location under the following conditions for the prevention of damage and deformation.

1. Ambient temperature between 0 - 40ºC
2. A location free from water influx at any time of an accident or casualty
3. A location provided with plumbing equipment
4. Humidity between 35 - 85%RH (Keep good ventilation.)
5. A location free from wind & rain (Except outdoor use)
6. A clean atmosphere
7. Non freezing in winter

3. Installation

Check if installation doesn't adversely affect facility, surrounding equipment and the pump.
Install the pump according to the following instructions to ensure the optimum performance, safety and service.
If the pump unit is not anchored to the foundation and if the motor unit is heavier than the pump unit, the entire pump leans towards to the motor. See page 51 as well.

■ Installation location

• Keep a wide working area for convenience in installation and maintenance.
• Select a flat and a rigid floor/foundation where is free from vibration and contortion.
• Select a location free from the possibility of floods.
• Optimize layout for convenience in carrying in and out.
• Install a chemical protective barrier for unexpected chemical outflow.

■ Pump position

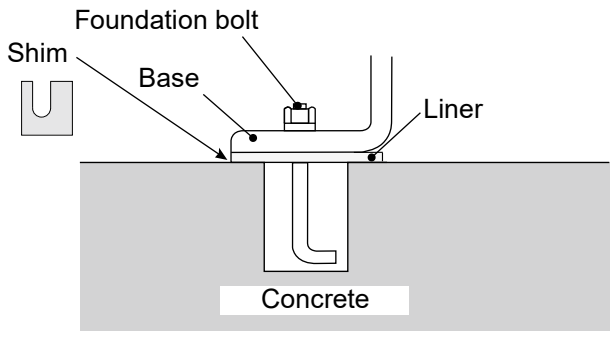
Install the pump according to the following instructions.

• Install the pump as close to a supply tank and a liquid level as possible.
• The maximum priming lift is 4m, however, try to keep a priming lift low as much as possible.

NOTE: The maximum priming lift varies with liquid characteristics, specific gravity, liquid temperature and suction line length. Contact us for detail.
See the "***4. Pipework***" section for more information on pipework. The pipework section describes a basic layout and precautions.

■ Foundation work

• Use a level to check if a foundation is flat. Securely fix the pump by foundation bolts.
• Insert a shim if there is a gap between the base bottom and foundation surface.
• Take account of not only the footprint of the pump but also the dimensions (pump size).
• See the diagram & instructions below for mounting the base on a foundation.

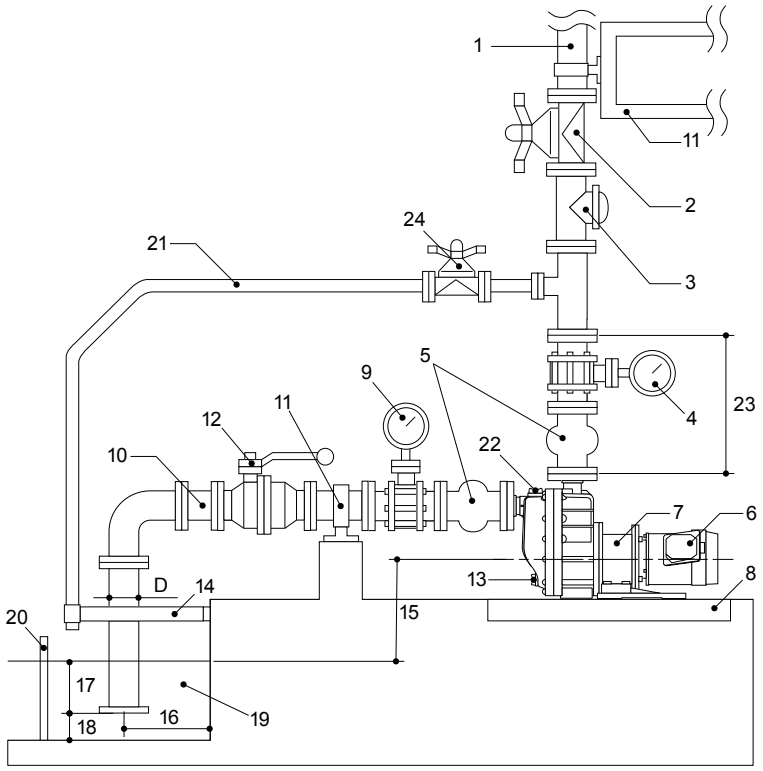


<Foundation work procedure>

a. Place the pump onto a foundation. Insert liners between the base bottom and foundation surface to keep a mortar injection space.
b. Screw nuts in foundation bolts until three threads appear after the nuts. And then insert the bolts in threaded holes.
c. Place a level on the pump base to see flatness. Inject cement mortar into the threaded holes and wait for three days until it has hardened.
d. Remove the liners after cement mortar has hardened and check flatness again. Then tighten the nuts on the foundation bolts. If there is a gap insert a shim.

4. Pipework

Foreign matters such as sand and scale may enter pipework while you are working. They may cause fatal damage to the pump. Be sure to blow them out before operation. Also, do not apply adhesive too much or leave a screw or nut. If pipework directory weighs on the pump, plastic parts may be deformed. Be sure to install pipe supports.



1. Discharge line
2. Shut off valve
3. Check valve
4. Pressure gauge
5. Flexible joint
6. Motor
7. Pump
8. Drain channel
9. Vacuum gauge
10. Suction pipe (Pipe diameter : D)
11. Pipe support
12. Suction valve
13. Drain cap
14. Pipe support
15. Suction lift (4m or less)
16. 1.5D or wider
17. 500 mm or higher
18. 1.5D or wider (500mm or wider if scale could build up in the supply tank)
19. Supply tank
20. Screen
21. Air vent line
22. Priming water cap
23. 500mm or longer straight pipe
24. Shutoff valve

■ Suction line

1. A suction pipe I.D. should be equal to the pump inlet I.D. (25A,40A or 50A)

If a suction pipe I.D. is larger than a pump inlet I.D., air volume in a suction line becomes so large that the pump can not make self-priming.

2. Suction line length should be within 4.7m in total (Horizontal and vertical pipe line)

Suction line length is the entire length from the pump inlet to the lowest pipe end, including horizontal parts. If a suction line is longer than 4.7m, air volume becomes large in the line. This prevents the pump from sucking liquid even if the priming lift is 4m or less (the maximum priming lift is 4m). Also, If a supply tank is too small, a liquid level can fluctuate significantly. Obtain a rough guide of the highest possible self-priming height at each liquid specific gravity by the following formula.

The highest possible self-priming height [m] = Self-priming height with clean water [m] / Liquid specific gravity

3. End of a suction line

- The end of a suction line should be at least 500mm below a liquid level for the prevention of air ingress.
- The distance from the lowest pipe end to a tank bottom should be 1.5 times longer than a suction pipe I.D.
- Provide a screen in a supply tank for the prevention of foreign matter interfusion (Clean the screen periodically.).

4. A suction gate valve should be installed

In a flooded suction system, install a gate valve on a suction line for easier overhaul & inspection.

5. Make sure joints on a suction line are secure and air doesn't come in. Try to reduce the number of joints. If air is entrained into a suction line, liquid may not be pumped or the pump may break at its worst.

6. Do not make an arched line in order to prevent air from being trapped. A suction line right before the pump inlet should be laid on a rising gradient of 1/100 toward the pump.

■ Discharge line

1. A discharge pipe I.D. is related to pipe resistance

Pipe resistance rises too high to obtain an intended flow if a discharge pipe I.D. is too narrow. Degassing efficiency and priming lift will be affected as well. Install a 500mm straight pipe right after the pump outlet.

2. A discharge gate valve should be installed

Install a gate valve on a discharge line not only for adjusting a discharge flow but also smooth operation, inspection and maintenance. Make sure that a discharge or an air vent line is open during self-priming operation.

3. A check valve should be installed

When selecting a check valve, check its maximum operating pressure to make sure it tolerates a possible pressure rise due to water hammer or backflow.

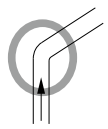
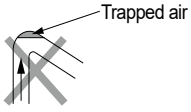
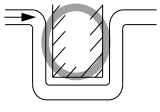
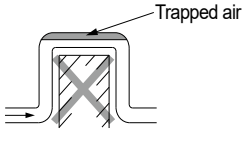
- A discharge line is too long.
- Actual discharge head (static discharge head plus discharge pipe resistance) is more than 15m.
- The end of a discharge line is 9m higher than a liquid level in a supply tank.
- Several pumps are running in parallel.

4. An air vent line should be arranged in the following cases

- A horizontal discharge line is 10m or more.
- A check valve is installed. Otherwise self-priming can not be performed.
- A discharge line is not at atmospheric pressure. Otherwise self-priming can not be performed.

5. A pressure gauge should be installed

Install a pressure gauge on a discharge line for monitoring operating conditions.

Good conditions	Unacceptable conditions
 Ascension	 Declination
 Inverted arch piping	 Arched piping

■ Tightening torque between the pump and pipework

• Flush the inside of pipes before connection.

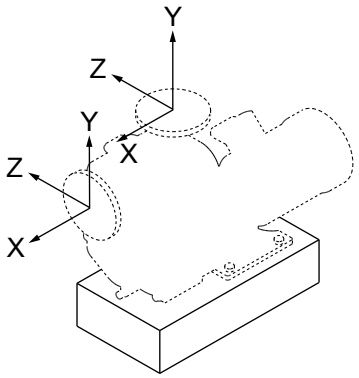
• Connect the pump to pipework via inlet and outlet flanges according to the table below.
(This table is based on use of metal pipe flanges with rubber gaskets.)

Bolt size	Tightening torque (N•m)
M16	20

• Tighten bolts diagonally at even torque.

■ Piping load and momentum

Try not to apply a heavy load to the inlet and outlet flanges. Permissible piping weight and moment to the pump are as below.



Permissible stress to outlet flange

	Pipe dia. (mm)	
	25	40
	Load	
Load direction	kN	
Fx	0.10	0.15
Fy: compression	0.15	0.20
Fy: tension	0.10	0.10
Fz	0.10	0.15

Permissible stress to inlet flange

	Pipe dia. (mm)	
	25	40,50
	Load	
Load direction	kN	
Fx	0.10	0.10
Fy	0.10	0.15
Fz	0.10	0.15

Permissible moment to outlet flange

	Pipe dia. (mm)	
	25	40
	Moment	
Load direction	kN·m	
Mx	0.02	0.05
My	0.05	0.10
Mz	0.05	0.10

Permissible moment to inlet flange

	Pipe dia. (mm)	
	25	40, 50
	Moment	
Load direction	kN·m	
Mx	0.05	0.10
My	0.02	0.05
Mz	0.05	0.10

5. Wiring

1. Electrical work should be performed by a qualified electrician (Contact us as necessary.). Otherwise, personal injury or property damage may result. It is not the manufacturer's responsibility for any failure or injury resulting from noncompliance with this notice.
2. Install an electromagnetic switch according to motor specifications (voltage, capacity, etc.).
3. The pump and motor do not have protection equipment. Install an overcurrent protection or earth leakage breaker according to motor specification.
4. Electromagnetic switches and push buttons should be installed away from the pump.
5. If the pump is used out of doors, protect switches from rainwater.
6. Outdoor use motors (Indoor use motors can not be installed out of doors).
   Outdoor use motors can also be used in doors. Protect the motor and electrical power distribution equipment from possible damage, taking account of act of providence.

■ Electrical motor

1. Check/adjust the motor as well as pump before operation.
2. Read through a motor instruction manual before operation.
3. Check the rotational direction of the motor after wiring.
4. Be sure to earth the motor.

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Operation

1. Operational precautions

⚠ CAUTION

- Never run the pump dry or shut off a suction valve during operation. This may damage internal parts.

- Stop the pump immediately when it is running under cavitation*1. An abnormal sound of water flowing through a pipe or a significant pressure change (see a pressure gauge) is a sign of cavitation. Also do not continue to run the pump when air is sucked from a suction line.

- Stop the pump immediately when the magnet coupling*2 is decoupled*3. The impeller does not rotate while the motor keeps rotating in this condition. Thus, liquid is not pumped.

- Keep liquid temperature change within 80ºC at any time during operation or stop.

- (In a flooded suction system,) Start the pump in closed-discharge operation (close a discharge gate valve), and then gradually open a discharge gate valve to adjust a flow in order to avoid water hammer.

- Do not keep the closed-discharge operation for one minute or longer. Otherwise, liquid temperature rises in the pump and damages internal parts.

- If the power is interrupted while the pump is running, switch off the pump immediately and close a discharge valve. Otherwise, water hammer may occur and damage the pump.

- Take extra care for a discharge pressure not to exceed the pump limit. Refer to page 22 for the maximum operating pressure at each model.

- The surface temperature of the pump or pipe rises high along with liquid temperature in or right after operation. Take preventive measures.

- Noise level

Model	SMX-F22	SMX-F44	SMX-F55
Noise level	80dB		

In case the pump noise affects human health or communication to secure a safety, provide a noise reduction cover. Be careful not to reduce cooling effect by a motor fan.

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

*2 A pair of the drive magnet and the magnet capsule

*3 A state that the combination of the impeller and magnet capsule units does not rotate in sync with the drive magnet.

Operation

⚠ WARNING

- **Do not modify the pump**

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

⚠ CAUTION

- **Be sure to prime the pump before operation**

  Always prime the pump when the pump is empty or when the pump is used for the first time or after disassembly/assembly. If the pump is run without priming water, internal parts are excessively worn by friction heat and fatal pump damage results.

- **Do not run pump dry**

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

  * If the pump runs dry by mistake, turn off power and leave it for more than one hour to cool it down. Quick cooling can give rise to cracks on parts.
  * An Iwaki DRN pump protector is recommended for the prevention of dry running.

- **Do not operate the pump in a flammable atmosphere**

  Do not place explosive or flammable material near the pump.

2. Before operation

Confirm pump performance and specifications prior to operation.

1. Do not run the pump in closed-discharge operation. Always keep the rated minimum flow rate. Also, do not send any medium other than fluid.

Minimum flow rate

SMX-F22, -F44	10L/min
SMX-F54	20L/min

2. Prime the pump before self-priming operation

The SMX-F is a self-priming pump, however, the pump needs to be primed to a certain liquid level before operation. Once the pump is primed, generally the pump doesn't need to be primed at each operation because the pump keeps a needed liquid level for the next self-priming. But then the pump still needs to be primed after a long period of storage (one day or more) or when the self-priming operation was not completed (when the pump stops running before liquid was discharged.).

Minimum liquid volume

SMX-F22□	3.0L
SMX-F44□	4.2L
SMX-F54□	5.4L

NOTE: Do not pour liquid rapidly. Otherwise liquid may overflow.

3. ON-OFF operation

Frequent ON-OFF operation damages the pump, especially in self-priming operation. Do not make ON-OFF operation more than six times per hour.

4. Handled liquid - Observe the next points

1. Slurry :Slurry can not be handled.
2. Liquid viscosity :Allowable up to 30mPa•s. Ask us for detail.
3. Liquid temperature :0-80ºC (Clean water, Non freezing)
   Self-priming performance reduces as liquid temperature increases. Allowable liquid temperature varies with chemicals.

NOTE: The pump may not send a bubbly liquid or a liquid with a high vapour pressure.

NOTE: Performance curves on catalogue are based on pumping clean water at a room temperature in a flooded suction system. Contact us for detail.

5. If the magnet coupling (the drive and driven magnets) is disconnected...

Stop the pump immediately. Liquid can not be pumped at all in this state. Magnetic force reduces if the pump keeps on running in this condition. Solve problems first and then resume operation. See the troubleshooting section on page 27.

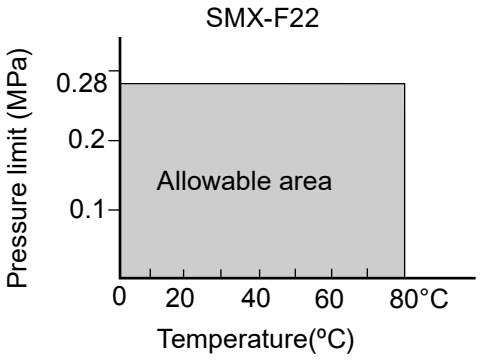
6. Environmental conditions

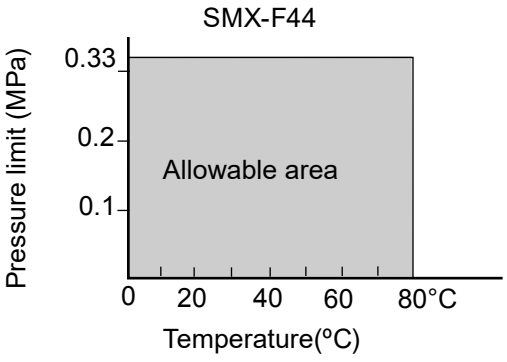
Ambient temperature range: 0-40ºC

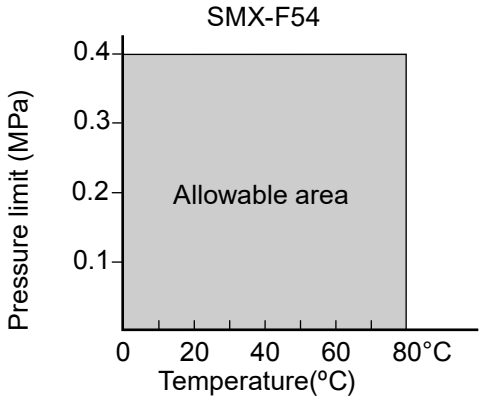
Ambient humidity range: 35-85%

7. Maximum operating pressure

See the table below for the maximum operating pressure at each model. Do not run the pump over the limit. Note liquid of high specific gravity can easily exceed the limit during operation.







3. Preparation

■ Preparations for operation

1. Check the pump and pipework before operation.

a. Check there are no foreign matters in the supply tank and pipework. If foreign matters are stuck in a suction line, the pump may break. Do not leave any waste of bond, sealing materials and screws/nuts as well.

b. Check pipework joints are tight enough so that air does not enter pipework. Take extra care to a suction line because of negative pressure in it.

c. Check the bolts on the pump unit and retighten them as necessary.

2. Follow the procedures below to start the pump at the first operation or after a long period of storage.

a. Detach the cap on the self-priming port. Fill the pump with liquid.

⚠CAUTION
Do not prime the pump rapidly. Liquid may flow out of the pump.

b. Tighten the cap securely in order to prevent entrained air.

c. Run the motor for a moment in order to check if the motor rotates according to the arrow label*[1] (Clockwise seen from the motor fan). If the motor rotates in reverse, interchange two of 3-phase power.

■ Precautions for starting/stopping the pump (In case the pump is in a flooded suction system.)

Follow the procedures below when starting/stopping the pump for the prevention of water hammer[2].*
Take extra care when a discharge line is long.

a. When starting the pump

First, prime the pump. Then turn on power to start operation with a discharge valve fully closed.
And then gradually open the discharge valve and adjust a flow rate to a specified point.

b. When stopping the pump

Gradually close a discharge valve. Turn off power and stop the pump after the valve is fully closed.

NOTE: When using a solenoid valve, set it to close slowly.

Word & Terms: *[1] An arrow label is placed on the upside of the motor fan cover.

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

4. Operation

■ Starting process

Operate the pump by the following procedure.

No.	Operation Procedure	Remarks
1	• Close or open valves.	• Open suction valves fully. • Close a discharge valve fully (in a flooded suction system). • Open discharge valves fully (in a suction lift system).
2	• Prime the pump.	• Check that the pump is filled with liquid. If not, fill the pump with liquid. • After priming, close a discharge valve fully (in a flooded suction system). • After priming, open discharge valves fully (in a suction lift system).
3	• Check the motor for correct rotating direction. Turn on power and then immediately switch off the power.	• Supply power to run the pump only for checking a rotational direction. (The correct direction is indicated with an arrow on the motor.) • Check if the motor fan smoothly stops after the power is turned off. **⚠CAUTION** ● The pump can be damaged when running in reverse rotation for a long time. ● If the motor fan does not stop smoothly, internal parts may contact each other. Check the inside of the pump. ● If the pump runs in reverse rotation for a long time, the primed liquid may flow back. In this case prime the pump again.
4	• Turn on power and start the pump to adjust discharge pressure and capacity. Observer the minimum discharge capacity. See below.	• In a flooded suction system Run the pump with a discharge valve closed. Once a pressure gauge points the max discharge pressure, open the discharge valve gradually to obtain a specified discharge pressure (or discharge capacity). NOTE: Start to open/close a discharge valve gradually to adjust discharge pressure within one minute after the pump starts to run. Always check a discharge pressure gauge (or adjust discharge capacity by checking a flow meter). • In a suction lift system Start the pump with discharge valves full open. When air is expelled, start to close a discharge valve gradually to obtain a specified discharge pressure. Note that it takes a while to completely expel air out of the pump and a suction line. **⚠CAUTION** Do not open the valve sharply. The motor may be overloaded. Always open a valve while checking ammeters.
	Do not operate the pump below the minimum discharge capacity. ►Minimum discharge capacity: 10L/min for SMX-F22/-F44, 20L/min for SMX-F54 • Observe the minimum discharge capacity for the prevention of continuous closed-discharge operation. This rule holds true to not only manual operation but also automatic operation. **⚠CAUTION** Do not run the pump longer than one minute with a discharge valve fully closed.	

No.	Operation Procedure	Remarks
5	<Points to be checked> Check a flow meter and confirm that pump operation is as per specifications during operation.	• Use a flow meter to see if the pump runs at a specified point. • If a flow meter is not available, check a specified point from discharge pressure, suction pressure and current value, taking account of pipe resistance.

⚠CAUTION

- In case of trouble, turn off power immediately and solve problems. See the "*1. Troubleshooting*" section.
- If the power is interrupted while the pump is running, switch off the pump immediately and close a discharge valve.

■ Stopping process

No.	Operation Procedure	Remarks
1	• Close a discharge valve gradually.	• Do not close a discharge valve sharply whether manually or automatically. Otherwise, the pump may be damaged by water hammer action which tends to occur with a long a discharge line. When using a solenoid valve set it to close slowly.
2	• Turn off power and stop pump operation.	• Check that the motor stops slowly and smoothly. If it does not stop smoothly, inspect the inside of the pump. • The pump is designed to keep enough liquid for the next self-priming operation by siphon cut. So generally the pump needs to be primed only once at the initial operation stage, however, check a liquid level in the pump after a long period of stoppage. • If the pump stops before self-priming is completed (before liquid is discharged.), the pump needs to be primed again for next self-priming operation.
3	<Leaving the pump stop> • A liquid level in the pump may decrease if the pump is not operated for a long period (a day or more). In such a case, prime the pump before operation. • Liquid in the pump may freeze and consequently damage the pump in winter. Drain liquid before storage. When draining harmful liquid, be sure to flush the inside of the pump and piping afterwards. • Use a heater to prevent liquid from freezing when the pump is stopped for a while in an extremely cold region. • We recommend covering the pump while the pump is not operated for a long period or during storage.	

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Maintenance

1. Troubleshooting

If you can not find out the root cause of failure, contact us.

Trouble	Cause	Troubleshooting
Self-priming is not performed (No liquid discharge) or too slow. The pump does not perform subsequent self-priming operation (No liquid discharge).	● Priming liquid level is too low. ● The pump is running dry.	○ Stop the pump and fill the pump unit. Then restart the pump.
	● A discharge valve is closed. ● An air vent line is closed.	○ Open the valves fully and start the pump.
	● Air enters the pump from suction line connections. ● Supply tank liquid level is too low.	○ Check connections on a suction line. ○ Fill the supply tank.
	● Discharge line is not at atmospheric pressure.	○ Install an air vent line. ○ Reconsider discharge line layout.
	● The magnet coupling is disconnected.* (The impeller unit does not rotate.)	○ Check amperage to see if the pump is not overloaded. ○ Check any foreign matters are not stuck between the impeller and the magnet capsule units. ○ Check for a viscosity or load change. ○ Check voltage and resume operation. NOTE: Contact us if disconnection often occurs.
	● Stroke speed is insufficient. ● The pump rotates in reverse.	○ Check wiring & the motor. ○ Correct motor wiring.
	● The pump is positioned too high.	○ Install the pump within the max priming lift. ○ Check that a liquid level is not too low.
	● Specific gravity or viscosity is not suitable. ● Liquid temperature is too high.	○ Check liquid temperature, SG and viscosity. ○ Reduce liquid temperature or shorten priming lift.
	● A suction line is too long.	○ Shorten the line.
	● Frequency mismatch	○ Match frequency to the pump.
	● A suction line is blocked with foreign matters. ● A discharge line is blocked with foreign matters.	○ Remove foreign matters. ○ Take measures against foreign matter interfusion.
	● A suction line is crushed or deformed.	○ Correct deformation or use a rigid pipe.
	● A discharge line end and an air vent line end are submerged.	○ Take the line ends up from a liquid level.
	● A suction flange or the cap is loose.	○ Check O ring and tighten flange/cap.
Discharge rate is too low.	● A suction line or the pump inlet are blocked with foreign matters.	○ Remove foreign matters from the pump inlet. ○ Take measures against foreign matter interfusion.
	● An air pocket is in a suction line.	○ Check and adjust the line as necessary.
	● The impeller inlet is blocked with foreign matters.	○ Remove foreign matters.
	● Air enters the pump from a suction line.	○ Check the line and retighten connections as necessary.
	● A discharge line or the pump outlet is blocked with foreign matters.	○ Remove foreign matters/scale. ○ Take measures against foreign matter interfusion.
	● Pipe resistance is increased due to an air pocket in pipework.	○ Reconsider pipework layout to remove arched line.
	● Actual head & head loss are too high.	○ Check actual head and head loss, and take necessary measures.
	● The motor rotates in reverse direction.	○ Exchange connected wires.

*A state that the combination of the impeller & magnet capsule units does not rotate in sync with the drive magnet.

Trouble	Cause	Troubleshooting
The motor is overheated.	● Voltage has dropped greatly. ● Overload ● Ambient temperature is too high.	○ Check voltage and frequency. ○ Check that specific gravity and viscosity are suitable. ○ Keep ventilation around the motor.
The discharge rate has dropped suddenly.	● The pump inlet is blocked with foreign matters.	○ Remove the foreign matters.
The pump vibrates excessively, accompanied by noise.	● The base is not anchored firmly. ● Installation bolts are loosened. ● A suction line is blocked and this is causing cavitation. ● The pump bearing and hubs are worn or melted. ● The magnet capsule or the spindle is damaged. ● Dynamic balance of the driving magnet has changed. ● Rotating parts come in contact with stationary parts. ● Wear or less lubricant on the motor bearing.	○ Fix the base. ○ Retighten the bolts. ○ Get rid of blockage. ○ Replace as necessary. ○ Replace as necessary. ○ Remove the cause or replace the part. ○ Replace as necessary. ○ Replace the motor bearing or motor.

2. Maintenance & Inspection

⚠WARNING

● Access limitation

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


Prohibition

● Turn off power before service

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


Turning off power

● Wear protective clothing

Always wear protective clothing such as an eye protection, chemical resistant gloves, a mask and a face shield during disassembly, assembly or maintenance work. The specific solution will dictate the degree of protection. Refer to SDS precautions from the solution supplier.


Wear protectors

⚠CAUTION

● Do not catch the finger

The magnetic force of the pump is powerful. Take care not to catch the finger in the adapter.


Caution

- ► Mark each wire so that the wires can be connected correctly to the motor.
- ► Do not disassemble the pump beyond the extent shown on this manual.
- ► Make sure to close the suction and discharge lines before the pump is demounted(/mounted) from piping. Remove a residual liquid from the pump/piping and clean the inside.
- ► Magnetic force of the pump is strong. Be careful not to catch the finger in parts. Do not allow iron pieces or powders to stick to a drive and a driven magnet.
- ► The pump and piping temperature may be too high right after operation with a hot liquid. Wait until the pump cools down before it is taken apart for maintenance.

■ Daily inspection

1. Always check for leakage before pump operation. Do not run the pump when liquid leaks.

⚠CAUTION

The pump unit mounting bolts/nuts may loosen in the initial operation phase or under an operating condition where the temperature fluctuates greatly. Check the bolts/nuts periodically and tighten them as necessary.
Tightening torque for the pump unit mounting bolts/nuts are shown on page 41. Tighten the bolts by applying equal torque.

2. Check whether the pump operates smoothly without abnormal noise or vibration.
3. Check a liquid level in a supply tank and a suction pressure.
4. Check that discharge capacity and a motor current value are as per specifications on the nameplate during operation.

NOTE A discharge pressure is in proportion to the specific gravity of liquid. The cock of a pressure gauge or a vacuum gauge should be opened only when measurement is carried out. Close it right after measurement. If the cock remains open during pump operation, its meter mechanism may be adversely affected by the abnormal pressure rise caused by water hammer action.

5. If a spare pump is stored, run it from time to time to keep it ready for operation at any time when needed.
6. Check discharge pressure, discharge capacity, and motor power supply voltage to see if they do not fluctuate during pump operation. See the "***1. Troubleshooting***" section as necessary.

Maintenance

■ Periodic inspection

To ensure efficient and smooth operation, perform periodic inspection. Be careful not to damage internal sliding parts and plastic parts when dismantling the pump.

• Inspect the pump every six months, logging inspection records.

• For 24-hour continuous operation, inspect the pump every two months.

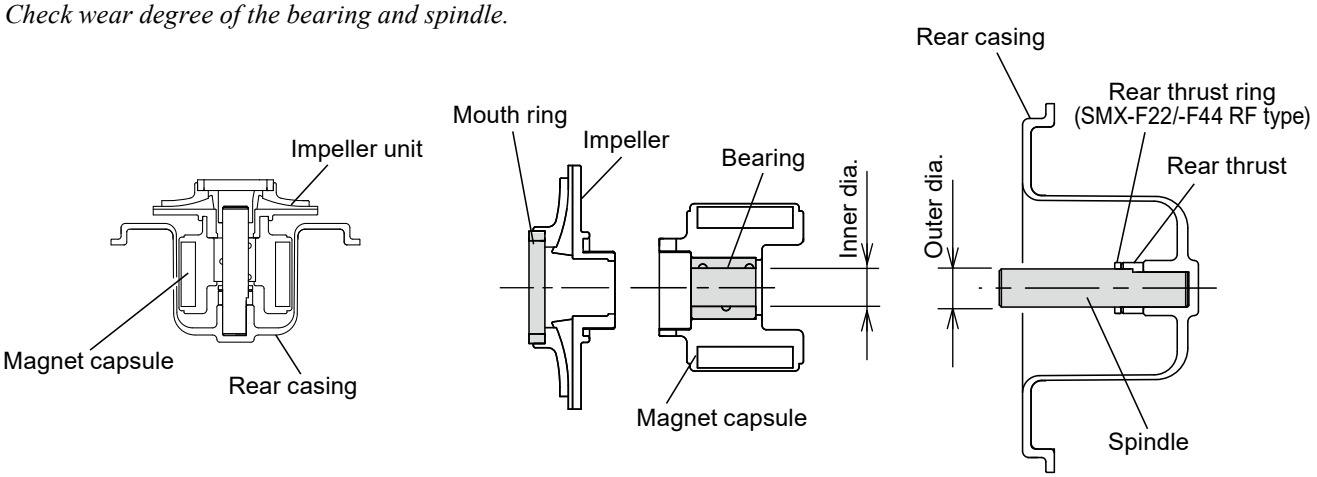
• Be sure to turn off power before dismantling the pump. Replace wear parts according to estimated parts lives.

The magnetic force of a drive and a driven magnet is strong. Be careful not to catch the finger. Do not put electrical devices such as a watch and a mag card close to those magnets.

Interval	Part names	Inspection items	Measures
Every six months (Maintain an inspection record)	(Drive magnet unit) Drive magnet Hex. socket set screw	● Wear trace ● If the drive magnet is correctly mounted by hex. socket set screws and they are not loose. ● Decentering of magnet and motor shaft (Max.1/10mm)	○ Finding wear trace, contact us. ○ Reset the drive magnet to the motor shaft and retighten the screws. ○ Retighten the hex. socket set screws or replace the drive magnet (Contact us).
	Rear casing Rear thrust	● Wear tracks on an inner surface ● Cracks ● Wear of the rear thrust ● Contamination in rear casing	○ Contact us. ○ Replace as necessary. ○ Contact us. ○ Remove contamination.
	(Magnet capsule unit) Magnet capsule Bearing	● Wear tracks on the rear end or side face of the magnet capsule ● Cracks on the rear end or side face of the magnet capsule ● Wear of the bearing ● Loose fit of the impeller unit	○ Contact us. ○ Contact us. ○ Replace as necessary. ○ Replace or contact us.
	(Impeller unit) Impeller Mouth ring	● Wear of the mouth ring ● Cracks ● Contamination in the impeller ● Impeller deformation	○ Replace as necessary. ○ Replace as necessary. ○ Remove contamination. ○ Replace as necessary.
	Front case Rear case Liner ring	● Contamination ● Cracks ● Wear, cracks and wear tracks on a liner ring ● Swelling or a crack on O ring ● Wear tracks on an unlikely portion	○ Remove contamination. ○ Replace as necessary. ○ Contact us. ○ Replace as necessary. ○ Contact us.
	Spindle	● Cracks ● Wear	○ Replace as necessary. ○ Replace as necessary.

■ Wear limit of the bearing and spindle

Check wear degree of the bearing and spindle.



Model / Parts	SMX-F22,44			SMX-F54		
	Dia. at shipment	Wear limit	Wear depth	Dia. at shipment	Wear limit	Wear depth
Bearing inner dia.	ø18.0mm	ø19.0mm	1.0mm	ø24.0mm	ø25.0mm	1.0mm
Spindle outer dia	ø18.0mm	ø17.0mm	1.0mm	ø24.0mm	ø23.0mm	1.0mm

1. Above values show wear limit of the bearing and spindle.

2. If the clearance between the bearing and the spindle exceeds 1 mm, either of them, whichever has greater wear, should be replaced regardless of the wear limit.

   <Example>

   Inner diameter of bearing is Ø18.7 — Wear depth is 0.7mm (Within wear limit)

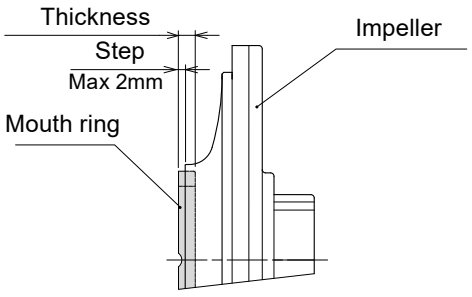
   Outer diameter of spindle is Ø17.5 — Wear depth is 0.5mm (Within wear limit)

   Clearance is 1.2mm. In this case replace the bearing, 'cause its wear is deeper than the spindle.

3. Sliding parts may suffer initial wear in an initial operation phase but this is not abnormal. Initial wear stops within approximately 100 hours.

■ Wear limit of mouth ring

Check wear degree of the mouth ring.



Initial thickness	Wear limit
7.5 mm	5.5 mm

NOTE: The mouth ring is 2 mm forward from the impeller when shipped. Before the step has reduced to 0 mm, replace the impeller unit.

3. Spare & Wear parts

Appropriate spare parts are necessary for a long period of continuous operation. We recommend that wear parts be always in stock. Place an order for spares with the following information.

1. Part names and part number (See page 8, 9 & 10 for the part names section.)
2. Pump model identification code and manufacturing number (See pump nameplate.)
3. Drawing number if you have our approval drawing

■ Spare parts list (SMX-F22)

No	Part names			Material	Part codes		
					SMX-F220	SMX-F221	SMX-F222
1	Front case			CFRETFE	SMF0001		
2	Rear case (for CF•RF)	Impeller code	V	CFRETFE	SMF0002		——
			Y	CFRETFE	SMF0003		——
			T	CFRETFE	——	SMF0052	
			X	CFRETFE	——	SMF0052	
	Rear case (for KK)	Impeller code	V	CFRETFE	SMF0004		——
			Y	CFRETFE	SMF0005		——
			T	CFRETFE	——	SMF0053	
			X	CFRETFE	——	SMF0053	
3	Rear casing			CFRETFE	SMF0006		
4	Volute spacer	Impeller code	V	CFRETFE	SMF0007		——
			Y	CFRETFE	SMF0008		——
			T	CFRETFE	——	SMF0054	
			X	CFRETFE	——	SMF0007	
6	Plate			CFRETFE	SMF0009		
7	Cap			CFRETFE	SMF0010		
8	Drain cap			CFRETFE	SMF0011		
9+29	Impeller UNIT (for CF•RF)	Impeller code	V	CFRETFE	SMF0012		——
			Y	CFRETFE	SMF0013		——
			T	CFRETFE	——	SMF0055	
			X	CFRETFE	——	SMF0098	
	Impeller UNIT (for KK)	Impeller code	V	CFRETFE	SMF0014		——
			Y	CFRETFE	SMF0015		——
			T	CFRETFE	——	SMF0056	
			X	CFRETFE	——	SMF0099	
11	Magnet capsule UNIT		CF	——	SMF0017	SMF0058	SMF0066
			RF	——	SMF0018	SMF0059	SMF0067
			KK	——	SMF0019	SMF0060	SMF0068
19	Flange			CFRETFE	SMF0031		
26.1	Rear thrust ring (for RF)			Alumina ceramic	SMF0037		
26.2	Rear thrust	For CF•KK		CFRETFE	SMF0038		
		For RF		CFRETFE	SMF0039		
27	Spindle	For CF•RF		Alumina ceramic	SMF0040		
		For KK		SiC	SMF0041		
30	Gasket		V	FKM	SMF0042		
			E	EPDM	SMF0043		
31.1	O ring (for Rear casing)		V	FKM	SMF0044		
			E	EPDM	SMF0045		
31.2	O ring (for Drain cap/ Flange)		V	FKM	SMF0046		
			E	EPDM	SMF0047		
31.3	O ring (for Rear case)		V	FKM	SMF0048		
			E	EPDM	SMF0064		
31.4	O ring (for Cap)		V	FKM	SMF0050		
			E	EPDM	SMF0051		

(SMX-F44)

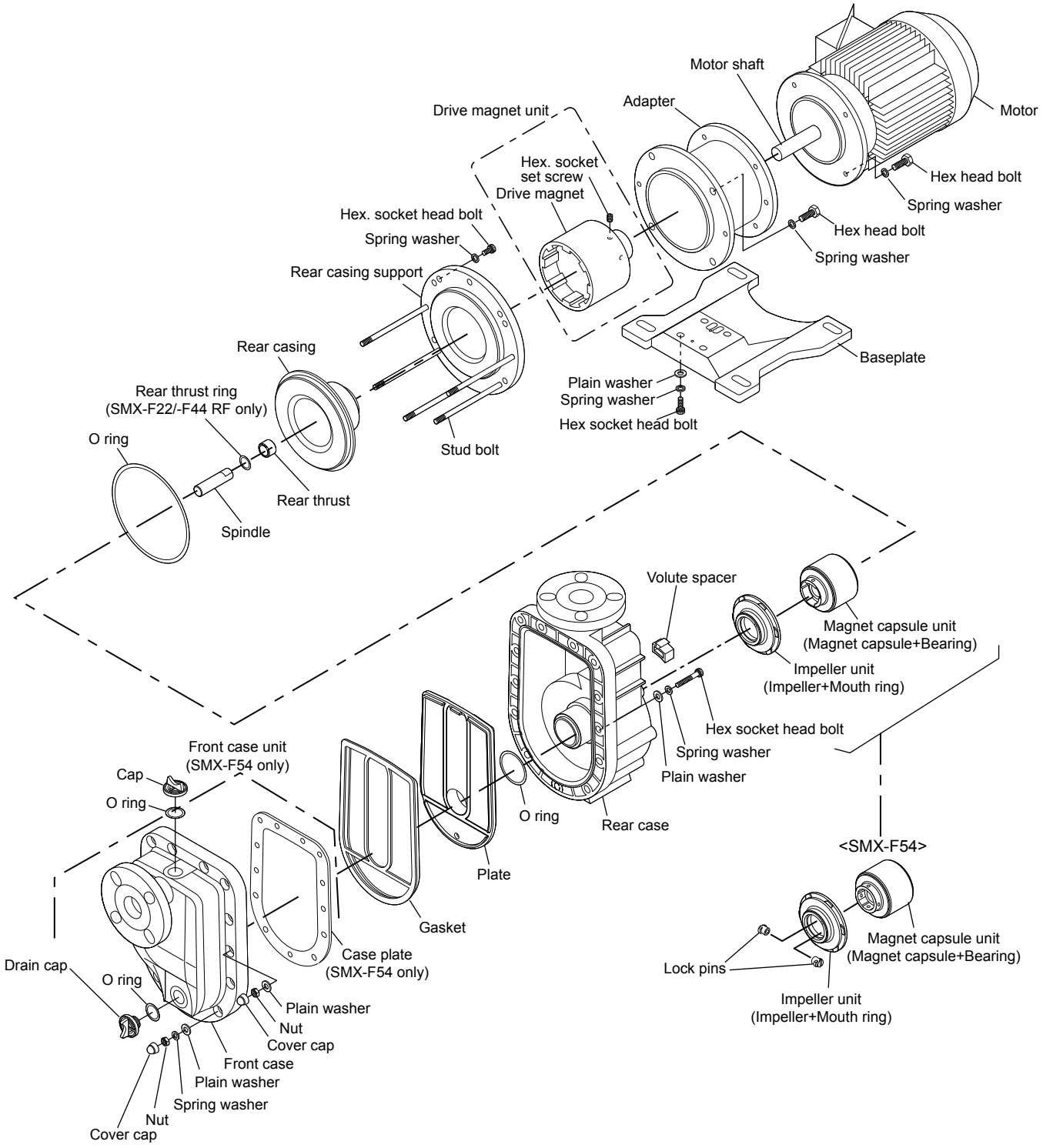
No	Part names			Material	Part code		
					SMX-F441	SMX-F442	SMX-F443
1	Front case			CFRETFE	SMF0072		
2	Rear case (for CF•RF)			CFRETFE	SMF0073		
	Rear case (for KK)			CFRETFE	SMF0074		
3	Rear casing			CFRETFE	SMF0006		
4	Volute spacer	Impeller code	T	CFRETFE	SMF0075		——
			Y	CFRETFE	SMF0076		——
			X	CFRETFE	——	SMF0092	
6	Plate			CFRETFE	SMF0077		
7	Cap			CFRETFE	SMF0010		
8	Drain cap			CFRETFE	SMF0011		
9+29	Impeller UNIT (for CF•RF)	Impeller code	T	CFRETFE	SMF0078		——
			Y	CFRETFE	SMF0079		——
			X	CFRETFE	——	SMF0093	
	Impeller UNIT (for KK)	Impeller code	T	CFRETFE	SMF0080		——
			Y	CFRETFE	SMF0081		——
			X	CFRETFE	——	SMF0094	
11	Magnet capsule UNIT		CF	——	SMF0058	SMF0066	
			RF	——	SMF0059	SMF0067	
			KK	——	SMF0060	SMF0068	
19	Flange			CFRETFE	SMF0085		
26.1	Rear thrust ring (for RF)			Alumina ceramic	SMF0037		
26.2	Rear thrust	for CF•KK		CFRETFE	SMF0038		
		for RF		CFRETFE	SMF0039		
27	Spindle	for CF•RF		Alumina ceramic	SMF0040		
		for KK		SiC	SMF0041		
30	Gasket		V	FKM	SMF0086		
			E	EPDM	SMF0087		
31.1	O ring (for Rear casing)		V	FKM	SMF0044		
			E	EPDM	SMF0045		
31.2	O ring (for Drain cap)		V	FKM	SMF0046		
			E	EPDM	SMF0047		
31.3	O ring (for Rear case)		V	FKM	SMF0088		
			E	EPDM	SMF0089		
31.4	O ring (for Cap)		V	FKM	SMF0050		
			E	EPDM	SMF0051		
31.5	O ring (for Flange)		V	FKM	SMF0090		
			E	EPDM	SMF0091		

(SMX-F54)

No	Part names			Material	Part code		
					SMX-F542	SMX-F543	SMX-F545
1+6.2	Front case UNIT			CFRETFE	SMF0163		
2	Rear case (for CF•RF)			CFRETFE	SMF0107		
	Rear case (for KK)			CFRETFE	SMF0108		
3	Rear casing			CFRETFE	SMF0109		
4	Volute spacer	Impeller code	Z	CFRETFE	——	SMF0143	
			V	CFRETFE	SMF0110		
			T	CFRETFE	——	——	SMF0110
			Y	CFRETFE	——	SMF0144	
			X	CFRETFE	——	——	SMF0144
6.1	Plate			CFRETFE	SMF0111		
7	Cap			CFRETFE	SMF0010		
8	Drain cap			CFRETFE	SMF0011		
9+29	Impeller UNIT (for CF•RF)	Impeller code	Z	CFRETFE	——	SMF0145	
			V	CFRETFE	SMF0113		
			Y	CFRETFE	——	——	SMF0113
			T	CFRETFE	——	SMF0146	
			X	CFRETFE	——	——	SMF0146
	Impeller UNIT (for KK)	Impeller code	Z	CFRETFE	——	SMF0147	
			V	CFRETFE	SMF0114		
			Y	CFRETFE	——	——	SMF0114
			T	CFRETFE	——	SMF0148	
			X	CFRETFE	——	——	SMF0148
11.1	Magnet capsule UNIT		CF	——	SMF0115	SMF0149	
			RF	——	SMF0116	SMF0150	
			KK	——	SMF0117	SMF0151	
11.2	Lock pin			CFRETFE	SMF0118		
19.1	Flange 40A			CFRETFE	SMF0085		
19.2	Flange 50A			CFRETFE	SMF0119		
26	Rear thrust	for CF•RF		Alumina ceramic	SMF0120		
		for KK		SiC	SMF0121		
27	Spindle	for CF•RF		Alumina ceramic	SMF0122		
		for KK		SiC	SMF0123		
30	Gasket		V	FKM	SMF0124		
			E	EPDM	SMF0125		
31.1	O ring (for Rear casing)		V	FKM	SMF0126		
			E	EPDM	SMF0127		
31.2	O ring (for Drain cap)		V	FKM	SMF0046		
			E	EPDM	SMF0047		
31.3	O ring (for Rear case)		V	FKM	SMF0128		
			E	EPDM	SMF0129		
31.4	O ring (for Cap)		V	FKM	SMF0050		
			E	EPDM	SMF0051		
31.5	O ring (for Flange 40A)		V	FKM	SMF0090		
			E	EPDM	SMF0091		
31.6	O ring (for Flange 50A)		V	FKM	SMF0130		
			E	EPDM	SMF0131		

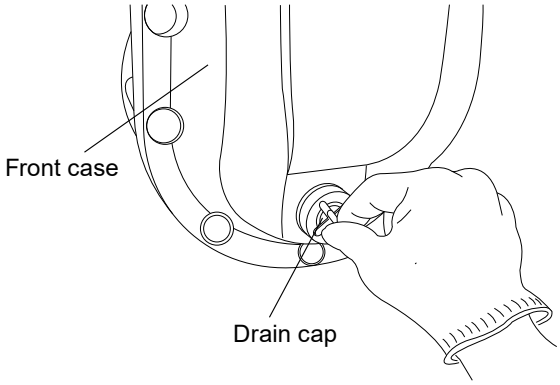
4. Disassembly & Assembly

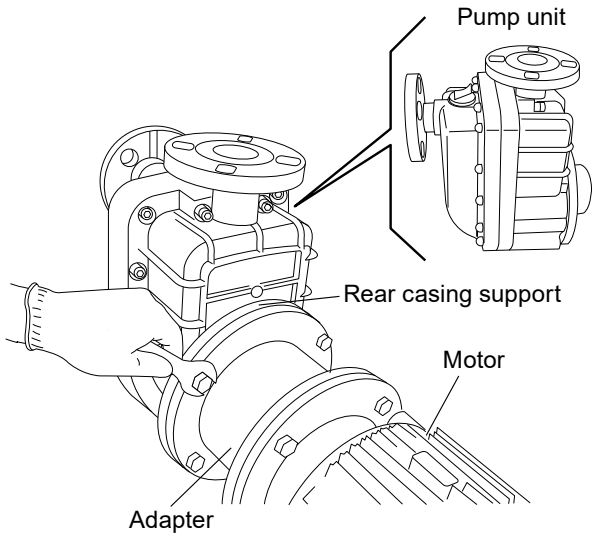
See this exploded view when dismantling/assembling the pump. Do not dismantle the pump beyond the extent of instructions in this manual.

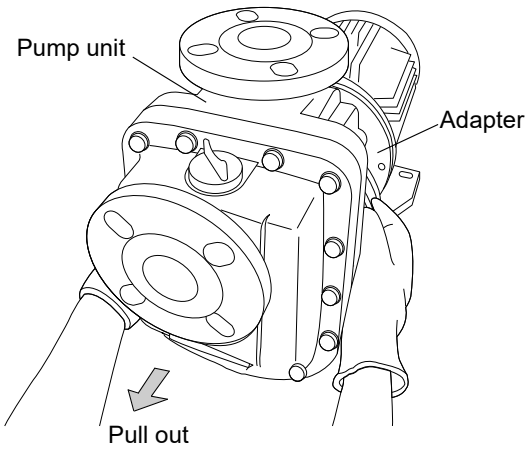


■ Tool list

Name	SMX-22/-44	SMX-54	Remarks
1. Spanner	13mm,17mm	17mm, 19mm	One each
2. Hex wrench	6mm	4mm, 8mm	One each
3. T Shaped wrench	13mm	17mm	
4. Flathead screw driver	×1		
5. Longnose pliers	×1		
6. Plastic hammer	×1		







■ Disassembly

1. Remove the drain cap and drain liquid from the pump unit. (Liquid can not be drained completely. Some liquid remains in the pump unit.)

NOTE: Do not open the drain cap fully at once. Otherwise liquid may blow out.

⚠CAUTION

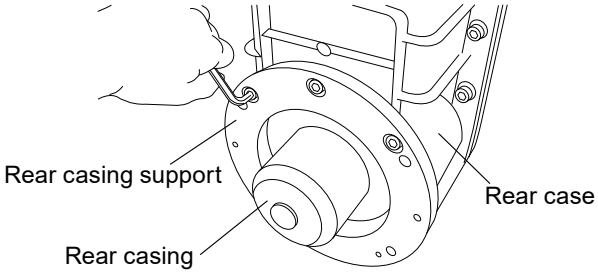
- Always wear protective clothing such as an eye protection, chemical resistant gloves, a mask and a face shield during disassembly, assembly or maintenance work.
- Solution in the discharge line may be under pressure. Release the pressure from the discharge line before disconnecting plumbing or disassembly of the pump to avoid solution spray.

2. Unscrew the adapter/pump unit fixing bolts and pull out the pump unit straight from the motor (then drain all the residual liquid).

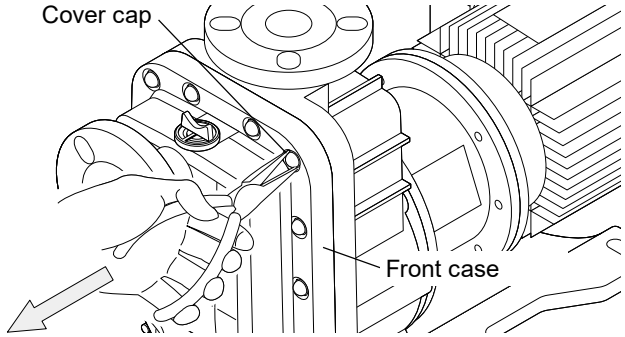
NOTE: Do not tilt the unit to the axis, or the unit may be stuck in the adapter. Push it back into the adapter and try again once it has been stuck.

⚠CAUTION

Be careful not to catch the finger. The pump unit is always pulled strongly to the motor by magnet force. Fix the motor in advance so it won't move toward the pump unit. Do not remove the adapter from the motor.

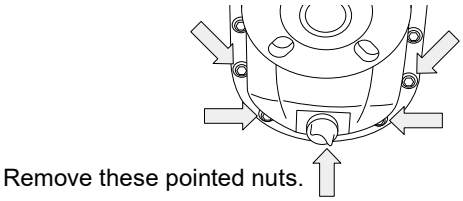


3. Remove three hex. socket head bolts which are fixing the rear casing support to rear case.



4. Remove all cover caps by using nippers.

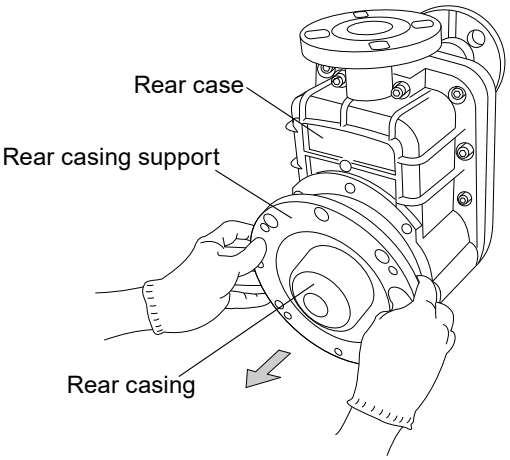
NOTE: Pinch the cylindrical body of the cap and pull it straight.



5. Loosen the five nuts on the front case (pointed by arrows).

⚠CAUTION

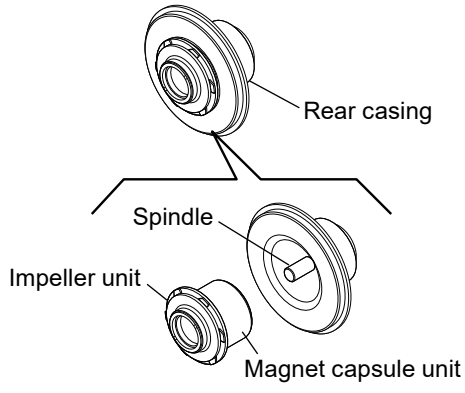
Be careful. Residual liquid can start to leak at this point.



6. Pull out the rear casing support with stud bolts on it.

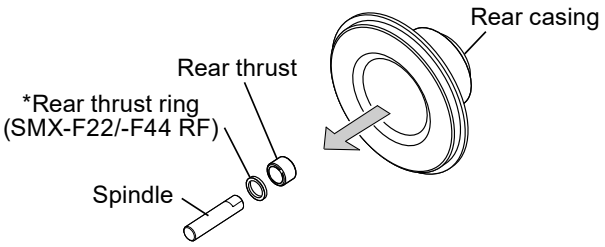
7. Remove the rear casing and the combination of the impeller & magnet capsule units.

NOTE: Do not drop the impeller & magnet capsule units from the rear casing.



8. Pull out straight the combination of the impeller & magnet capsule units from the rear casing.

NOTE: Do not separate the both units when removing from the casing.

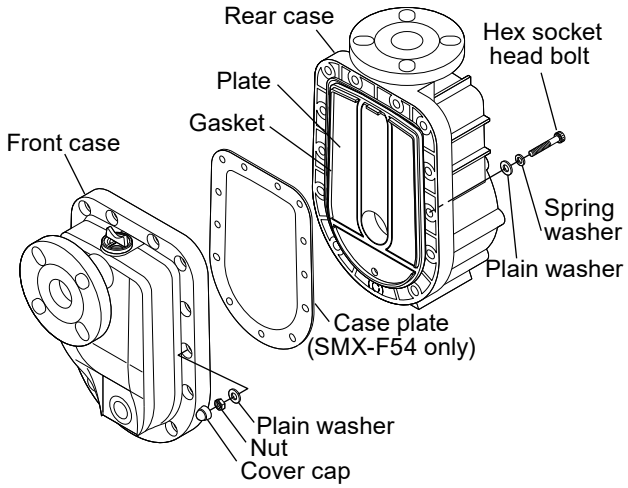


9. Immerse the rear casing in hot water for five minutes in order to soften it. And then remove a spindle and a rear thrust.

NOTE: A rear thrust ring is attached only to the SMX-F22/-F44 RF type. Do not forget to attach it.

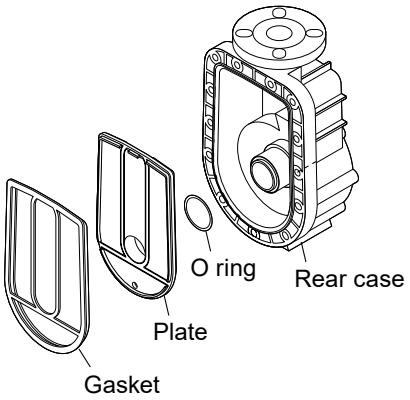
⚠CAUTION

Be careful not to get scaled with hot water.

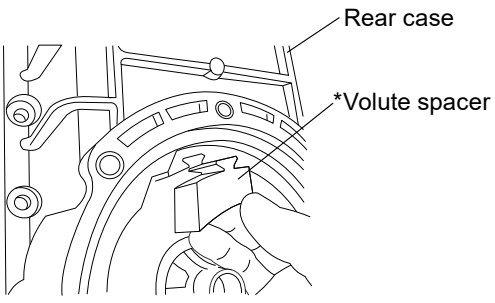


10. Loosen all hex. socket head bolts from the front case and separate the front case and rear case.

NOTE: Remove a case plate for the SMX-F54.



11. Remove a plate, a gasket and an O ring.



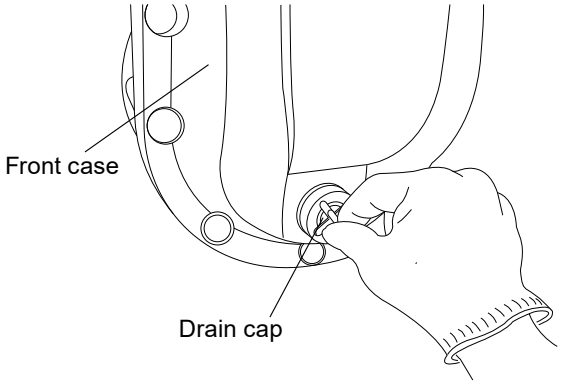
12. Remove a volute spacer (if necessary).

NOTE: The volute spacer is placed for efficient degassing and contributes to faster self priming completion. Keep it in place.

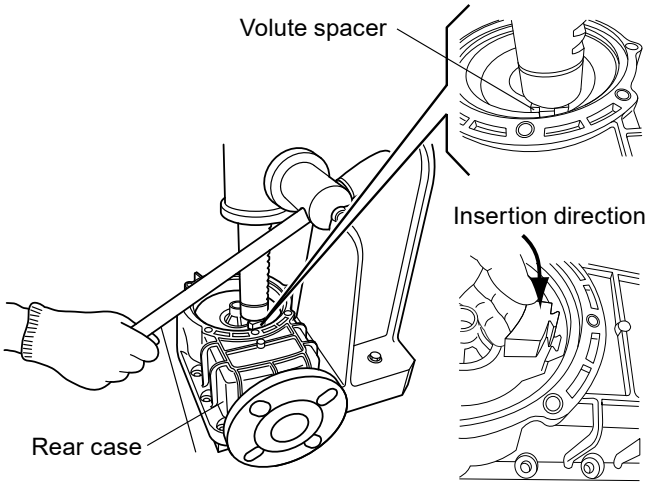
■ **Assembly**

INSPECTION
Make sure the magnet capsule is clean and no metal debris is there in advance.

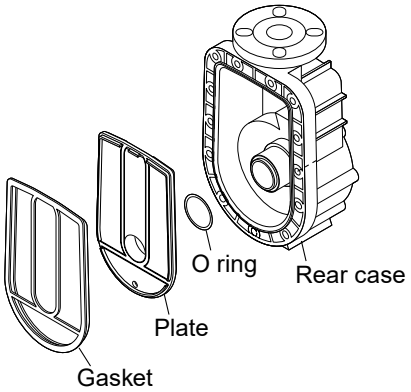
CAUTION
Make sure the O ring and the gasket are clean and no debris or damage is there in advance. Use new parts as necessary.



1. Fit an O ring to the drain cap and screw the cap into the drain port on the front case.

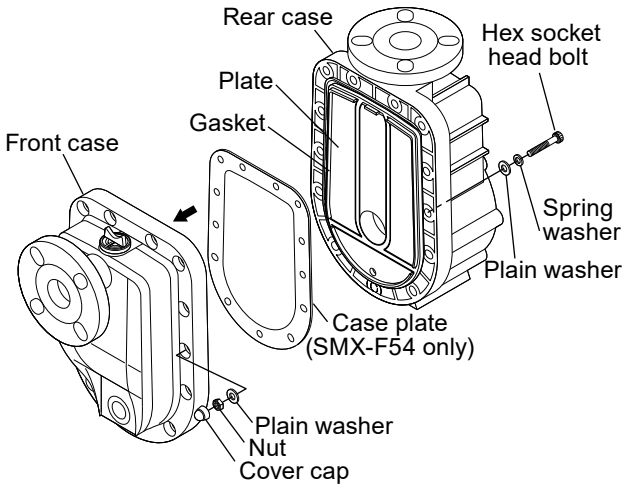


2. Press fit the volute spacer by a handpress if it was detached. Pay attention to an insertion direction.



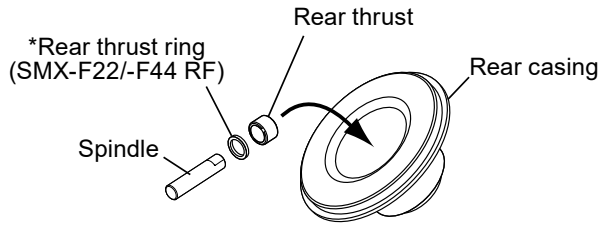
3. Fit a gasket to the plate (Make sure the gasket is completely fitted in the groove.).

4. Mount the O ring and the plate to the rear case.



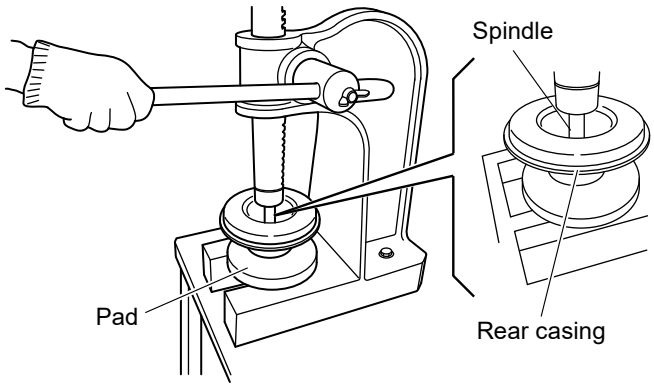
5. Combine the front case, rear case and case plate (SMX-F54 only), and temporary tighten them by the hex. socket head bolts for preventing O ring and plate from moving.

NOTE: Fit the case plate into the front case, and then combine the front case and the rear case while holding the front case.



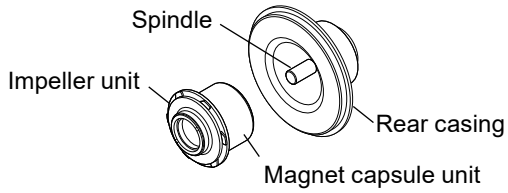
6. Insert the rear thrust to the spindle end. And then fit the spindle to the rear casing by hand, mating joint surfaces.

NOTE: A rear thrust ring is attached only to the SMX-F22/-F44 RF type. Do not forget to attach it.

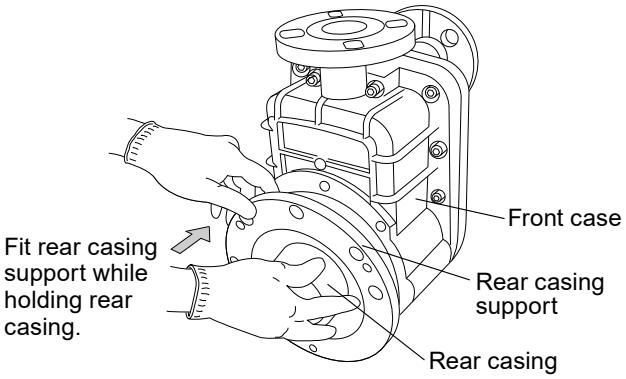


7. Press the spindle into the rear casing by a handpress.

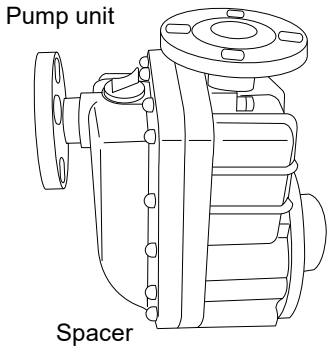
NOTE: Keep the spindle upright during insertion.



8. Combine the impeller and magnet capsule units (See page 42 & 45 for impeller unit mounting.) and insert the combination into the rear casing via the spindle.



9. Fit the rear casing support while holding the rear casing on the rear case. Temporarily tighten three hex. socket head bolts on the rear casing support and five stud bolts.



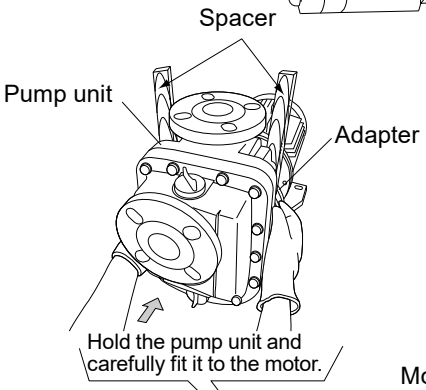
10. Tighten all bolts on tightening torque below. Attach cover caps afterwards.

⚠CAUTION

Stainless bolts/nuts are easy to be stuck.

<Tightening torque>

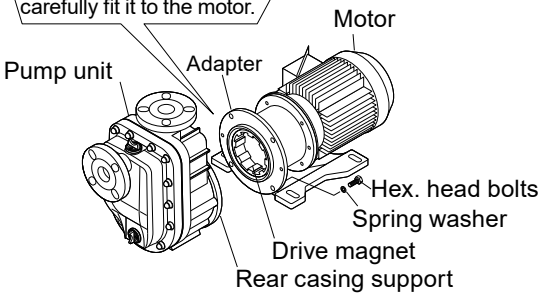
Bolt size	Tightening torque
M8	11.8 N•m
M10	14.7 N•m



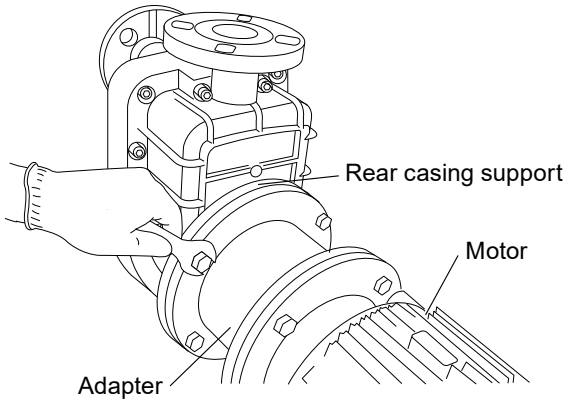
11. Apply spacers between the pump unit and adapter to secure a space for preventing the finger from being caught. Carefully place the pump unit in the adapter while holding the pump unit.

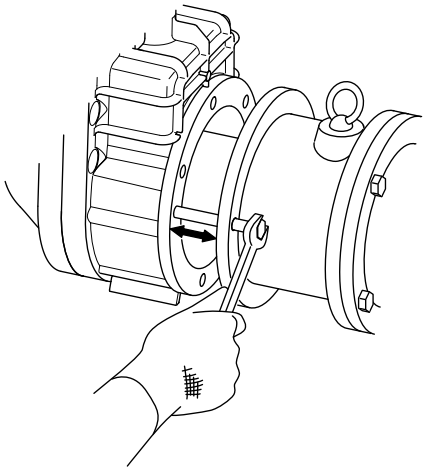
⚠CAUTION

Be careful not to catch the finger. The pump unit is always pulled strongly to the motor by magnet force. Fix the motor in advance so it won't move toward the pump unit.

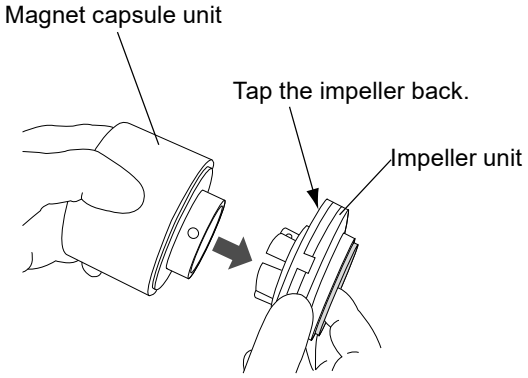


12. Tighten four hex. head bolts on the adapter in order to combine the motor and the pump unit.





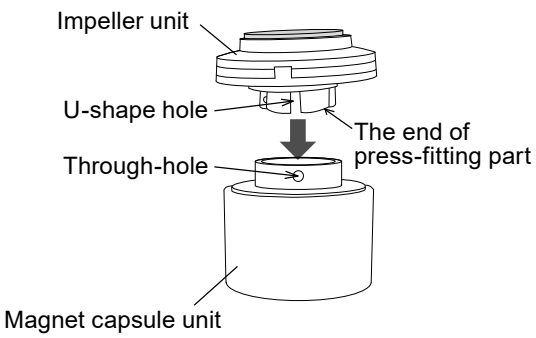
NOTE: Screw two M10×50 bolts into the adapter holes until they come out about 45mm forward, mating the screw ends with the holes on rear casing support. Then start screwing down the bolts evenly in order to move the pump unit closer to the motor and finally put these components together. Reverse this procedure when removing the pump unit. Be careful not to catch the finger in the unit. There is strong magnetic force between them.
For the SMX-F54, use the attached back pullout bolts. For other models, purchase two M10×50 bolts separately.



■ Impeller unit removal (SMX-F22/-F44)

1. Immerse and warm the combination of the impeller and magnet capsule units in hot water of 90°C for five minutes.
2. Tap the back side of the impeller by a plastic hammer to detach it.

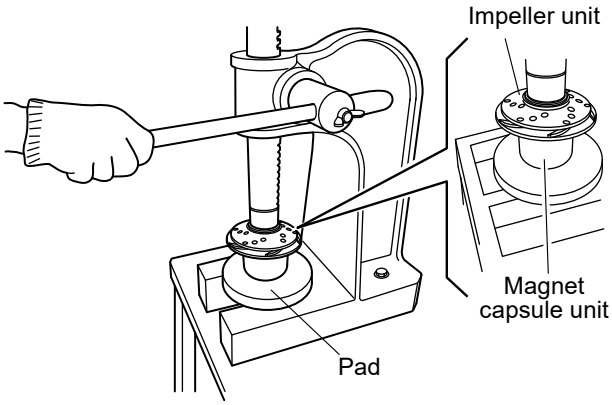
⚠CAUTION
Be careful not to get scalded with hot water.



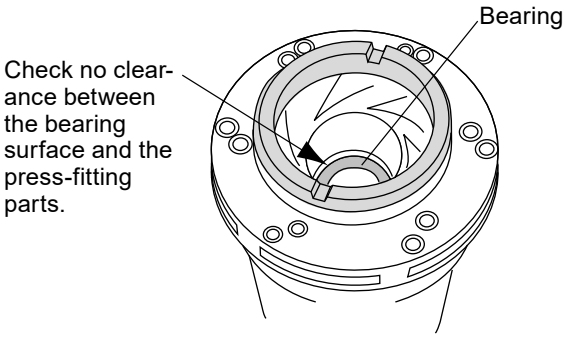
■ Impeller unit mounting (SMX-F22/-F44)

1. Immerse and warm the magnet capsule unit in hot water of 90°C for five minutes.

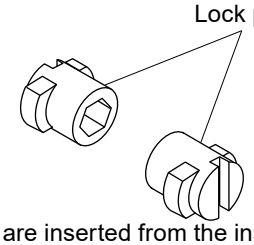
NOTE: If the impeller unit is hardly fitted to the magnet capsule unit, always warm the magnet capsule unit in hot water for softening.



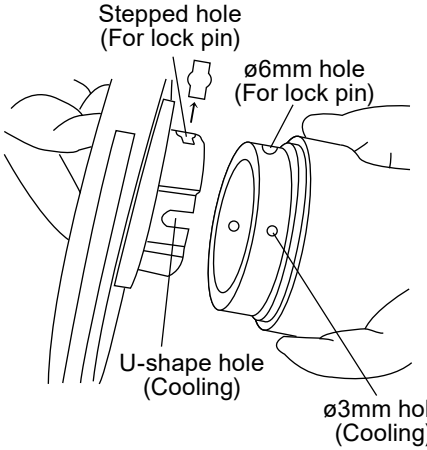
2. Press the impeller unit into the magnet capsule unit by a handpress. At this time make sure that the through-holes on the magnet capsule comes under the U-shape holes of the impeller unit.



NOTE: Check that the end of press-fitting parts has come at a bearing surface.

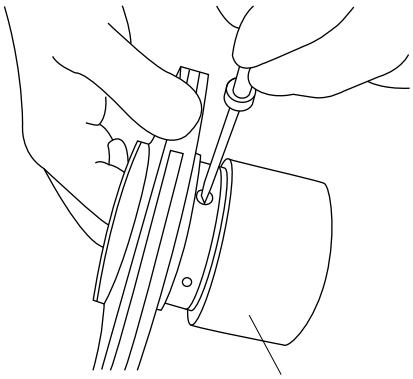


Lock pins are inserted from the inside of the magnet capsule assembly to catch the impeller unit.

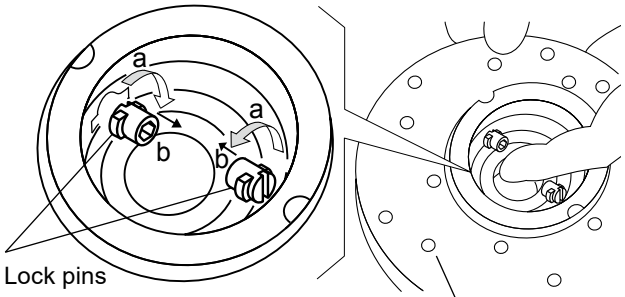


■ Impeller unit removal (SMX-F54)

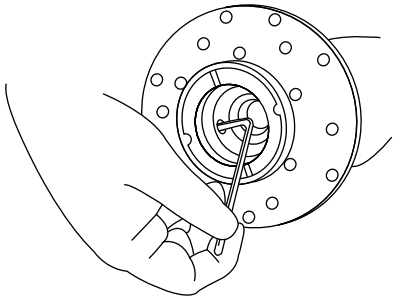
The impeller unit can not be separated from the magnet capsule assembly unless the lock pins are removed. The mating surface on the magnet capsule assembly has two hole sizes. The large hole (6mm dia) is for the lock pins and the small hole (3mm dia.) is for cooling. To attach the impeller unit to the magnet capsule assembly, press the unit into the assembly with U-shape holes under the smaller holes (3 mm dia.).



1. Turn the lock pins 90 degrees anticlockwise using a flathead screwdriver and then push them off. Slightly tap the end of driver handle to make it easier.

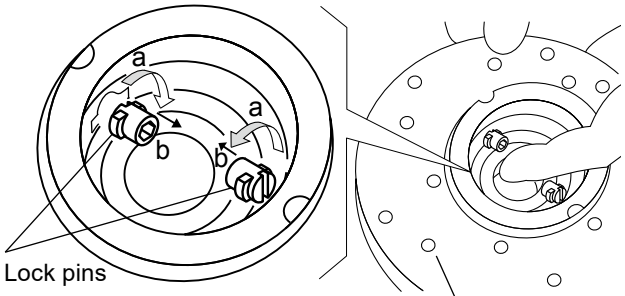


a. Rotate in the direction of an arrow.
b. Push off inwards.

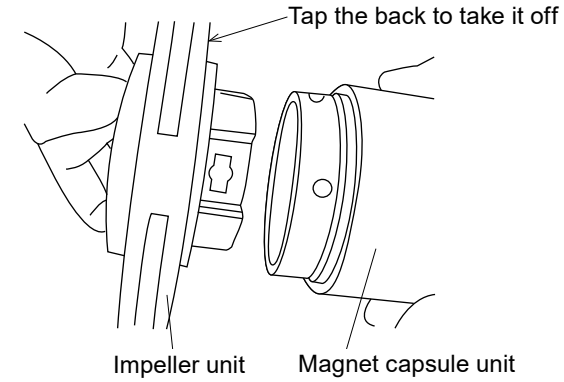


2. The lock pins can also be turned by using the 4mm hex. wrench from the inside of magnet capsule assembly. Turn the wrench 90 degrees in the direction of an arrow. Then push the pins off from the outside by using a bar.

NOTE: Always turn the lock pins in a correct direction, or the lock pins may be damaged.



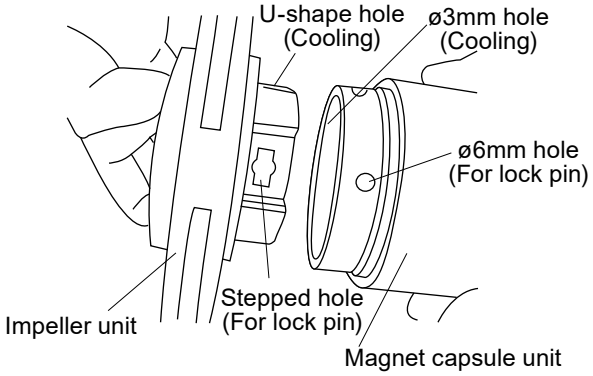
a. Rotate in the direction of an arrow.
b. Push off inwards.

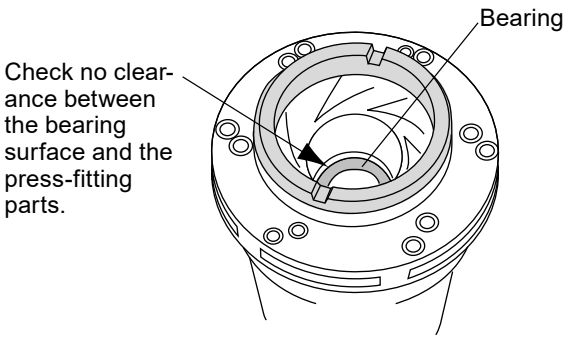


3. After the lock pins are removed, detach the impeller unit from the magnet capsule assembly by slightly tapping the back of the impeller unit with a plastic hammer.

NOTE: If the impeller unit is hardly removed, warm it in hot water (approx. 90°C) for 5 minutes and tap it slightly, again.

⚠CAUTION
Be careful not to get scalded with hot water.





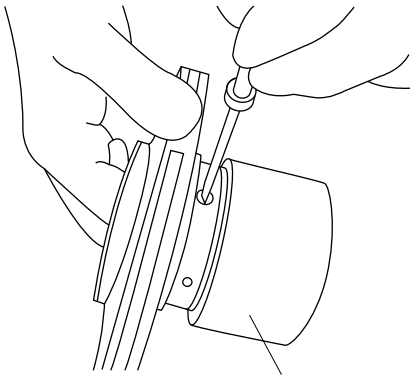
■ Impeller unit mounting (SMX-F54)

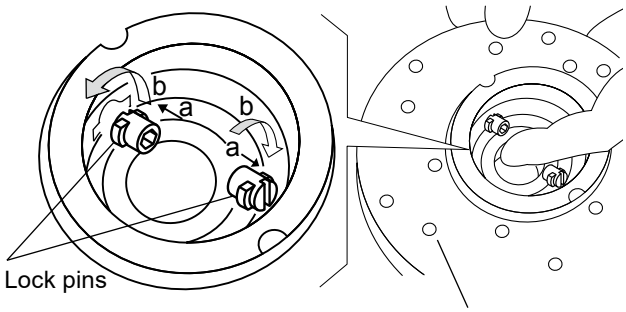
1. Press and fit the impeller unit into the magnet capsule assembly with the stepped holes under the large holes (6mm dia.).

NOTE: If the impeller unit is hardly fitted to the magnet capsule assembly, warm it in hot water (about 90°C for 5 minutes) for softening.

⚠CAUTION
Be careful not to get scalded with hot water.

2. After fitting the impeller unit, push the lock pins into the lock pin holes from the inside as far as it will go. Use a flat-head screwdriver to turn the pins 90 degrees clockwise from the outside while holding the pins from the inside. Once it clicks, the impeller unit is secured.

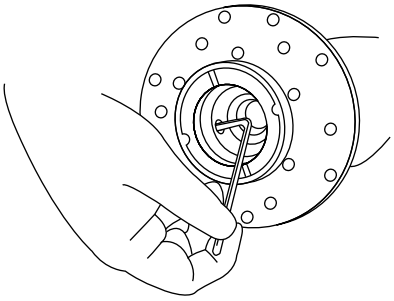


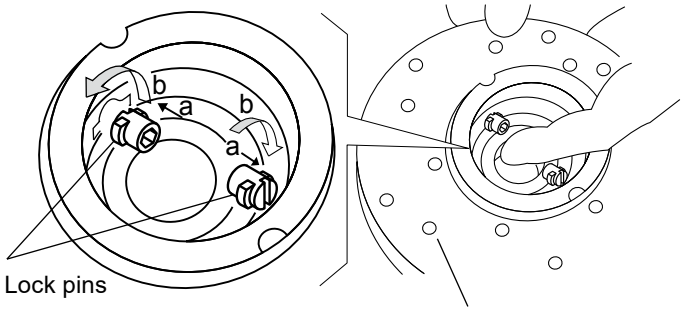


a. Push outwards.
b. Rotate by 90° in the direction of an arrow.

3. The lock pins can also be turned by using the 4mm hex. wrench from the inside of magnet capsule assembly. Push the pins into the lock pin holes from the inside and turn the wrench 90 degrees in the direction of an arrow until it clicks.

NOTE: Always turn the the lock pins in a correct direction, or the lock pins may be damaged.





a. Push outwards.
b. Rotate by 90° in the direction of an arrow.

■ Drive magnet demounting

Take the following steps to demount the drive magnet from the motor.

<Pumps with a 0.75, 1.5, 2.2, 3.7 or 4.0kW motor>
- Remove the front casing from the adapter
- Remove the adapter from the motor.
- Demount the drive magnet from the motor shaft.

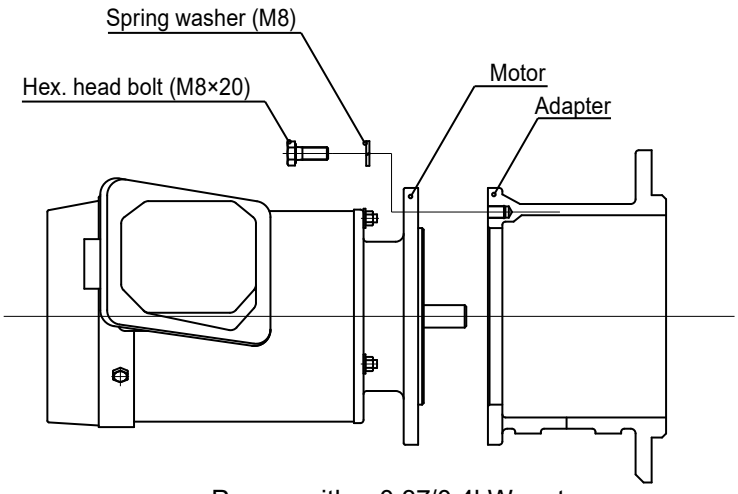
<Pumps with a 0.37, or 0.4kW motor>
- Remove the front casing from the adapter
- Demount the drive magnet from the motor shaft.
- Remove the adapter from the motor.

■ Drive magnet mounting

1. Make sure the motor is electrically-disconnected in advance. If the motor were to run in this process, personal injury would result.

2. Clean the motor shaft surface and the shaft hole of the drive magnet. Use a sand paper or sand blaster to remove burrs if necessary. Be careful not to drop the drive magnet, or it may break.

3. For the pumps with a 0.75, 1.5, 2.2, 3.7 or 4.0kW motor, first fit the drive magnet to the motor shaft, and then the adapter to the motor through the later steps (4 to 11).
   For the pumps with a 0.37 or 0.4kW motor (SMX-F220), first fit the adapter to the motor with four M8×20 hexagon bolts and M8 washers, and then mount the drive magnet to the motor shaft through the later steps (4 to 10).



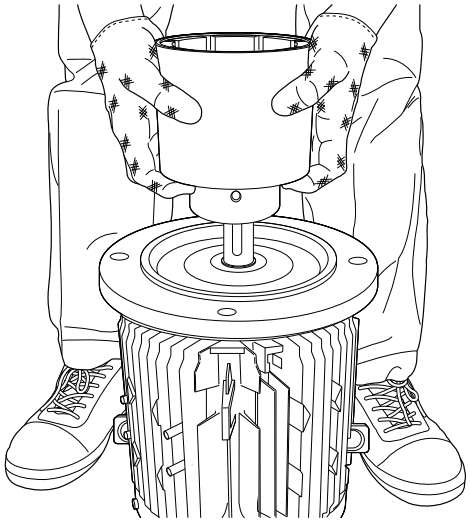
Pumps with a 0.37/0.4kW motor

4. Clean the motor shaft surface and the shaft hole of the drive magnet. Use a sand paper or sand blaster to remove burrs if necessary. Be careful not to drop the drive magnet, or it may break.

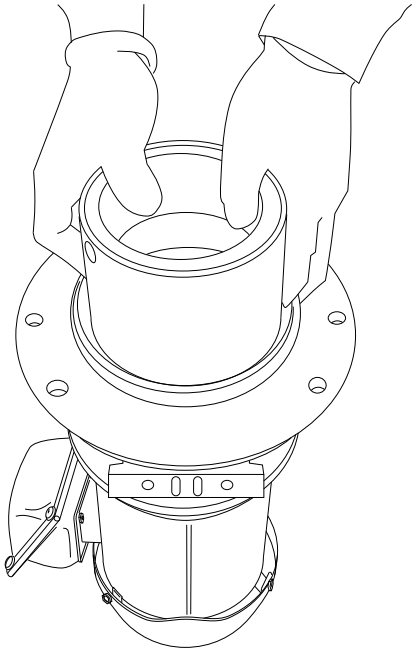
5. Adjust the depth of the hex. socket set screws in the drive magnet, so they will not hinder the insertion of the magnet to the motor shaft.

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

7. Slide the drive magnet down to the motor shaft until it bottoms out. If burrs or debris disturbs insertion, remove the drive magnet once and remove them. Also, adjust the key position if necessary.

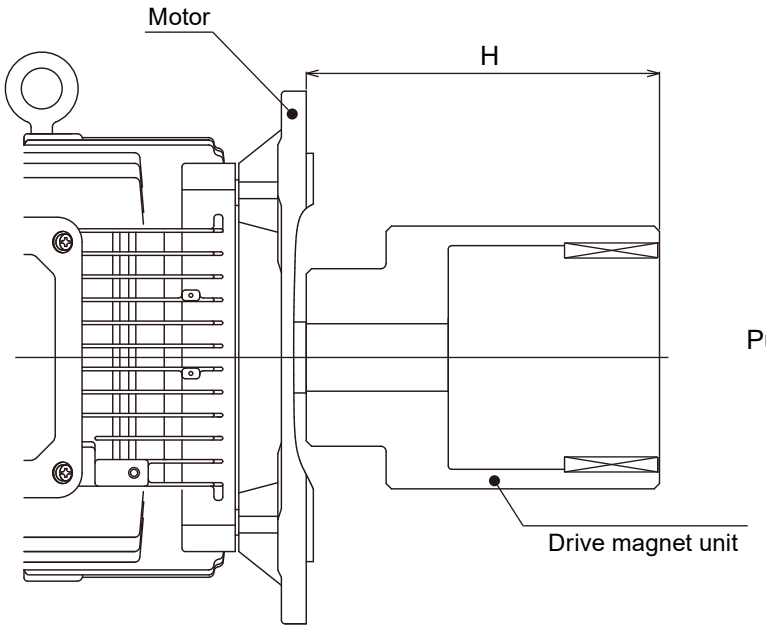


Pumps with 0.75, 1.5, 2.2, 3.7 or 4.0kW motor



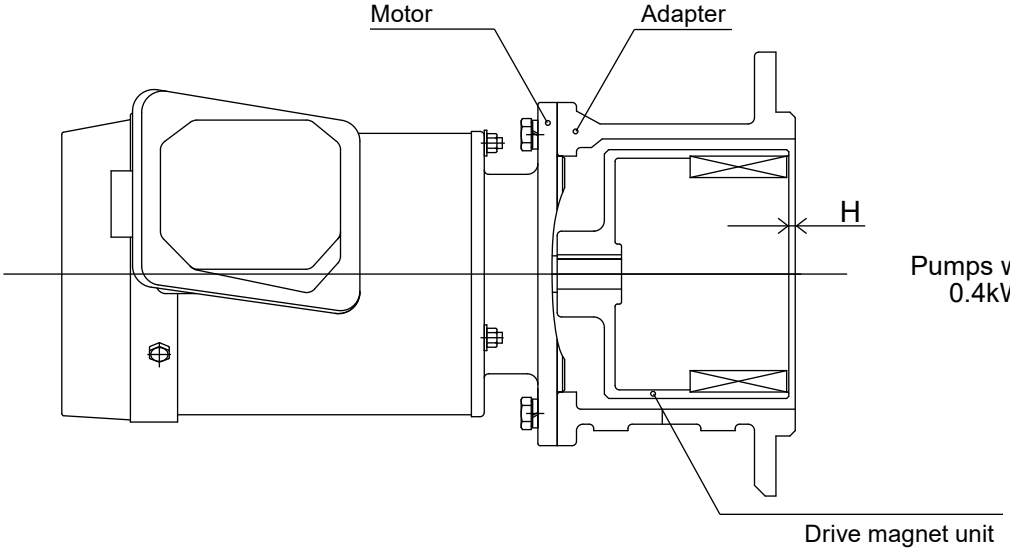
Pumps with 0.37 or 0.4kW motor

8. Check the dimension “H” is proper at each motor. Adjust the position of the drive magnet if necessary.



Pumps with 0.75, 1.5, 2.2, 3.7 or 4.0kW motor

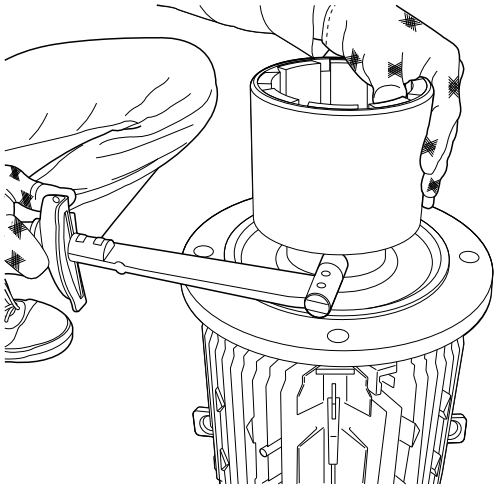
Model		Motor output [kW]	Poles	H [mm]
SMX-F	221	0.75		119
	222	1.5		123
	441	0.75		119
	442	1.5		123
	443	2.2		123
	542	1.5		123
	543	2.2		123
	545	3.7/4.0		143



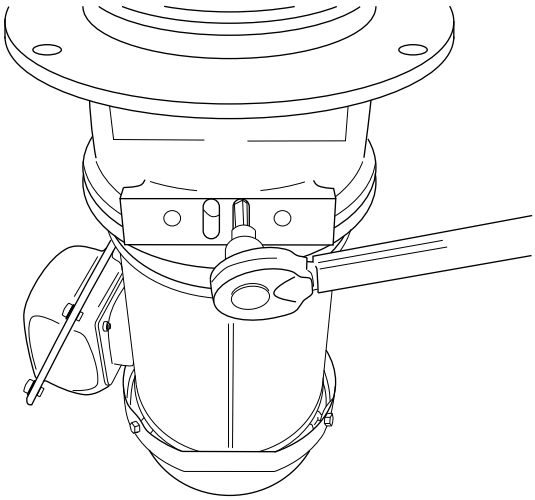
Pumps with 0.37 or 0.4kW motor

Model		Motor output [kW]	Poles	H [mm]
SMX-F	220	0.37/0.4	2	0

9. Use a torque wrench and tighten the hex. socket set screws by 12N·m to fix the drive magnet position. For the pumps with a 0.37 or 0.4kW motor (SMX-F220), the set screws are accessible through the bottom adapter hole as shown below.



Pumps with 0.75, 1.5, 2.2, 3.7 or 4.0kW motor



Pumps with 0.37 or 0.4kW motor

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

11. Remount the adapter to the motor (Pumps with 0.75, 1.5, 2.2, 3.7 or 4.0kW motor).

NOTE: Always fit the "single" adapter part to the motor, not the combination of the adapter and the front casing (driven magnet). There is a very strong magnetic force between the drive magnet and the driven magnet. To reduce the risk of personal injury which could happen when both parts are unexpectedly and strongly pulled together, be sure to mount the adapter first to the motor, and then the front casing (driven magnet) to the adapter, on the step by step basis!

5. Mass of pumps

The table below shows the pump weight at each model. The motor weight is not included.

Model code	Motor output	Pump weight
SMX-F220	0.37kW	14.0kg
SMX-F221	0.75kW	17.0kg
SMX-F222	1.5kW	17.5kg
SMX-F441	0.75kW	18.5kg
SMX-F442/-F443	1.5kW/2.2kW	19.0kg
SMX-F542/-F543	1.5kW/2.2kW	28.0kg
SMX-F545	4.0kW	36.0kg

*The pump weights represent the pump unit only and do not include the motor weight.
*See our approval drawing of the pump plus motor as well for total weight information.

EC DECLARATION OF CONFORMITY

A copy of the original Declaration of Conformity

(SUPPLIER'S NAME)

WE

IWAKI CO.,LTD.

(ADDRESS)

6-6 2-CHOME KANDA-SUDACHO CHIYODA-KU TOKYO JAPAN

(PRODUCT)

DECLARE UNDER OUR SOLE RESPONSIBILITY THAT THE PRODUCTS

SELF-PRIMING MAGNETIC DRIVE PUMP

(MODEL NAME)

SMX/ SMX-F SERIES

TO WHICH THIS DECLARATION RELATES ARE IN CONFORMITY

WITH THE FOLLOWING STANDARDS OR DIRECTIVES AS FAR AS APPLICABLE

(DIRECTIVES)

MACHINERY DIRECTIVE 2006/42/EC (ANNEX IIA)
RoHS DIRECTIVE 2011/65/EU

(STANDARDS)

EN ISO12100: 2010 EN809: 1998 + A1: 2009 EN IEC63000: 2018

(A PERSON WHO IS AUTHORISED TO COMPILE THE TECHNICAL FILE IN THE COMMUNITY)

IWAKI EUROPE GMBH
SIEMENSRING 115 D-47877 WILLICH GERMANY

NOTE: THIS DECLARATION BECOMES INVALID IF TECHNICAL OR OPERATIONAL MODIFICATIONS ARE INTRODUCED WITHOUT THE MANUFACTURER'S CONSENT.

T. Sawada.

TSUTOMU SAWADA

DEPUTY SENIOR GENERAL MANAGER,

QUALITY ASSURANCE HEAD OFFICE

Tokyo, Sep. 2, 2021

(PLACE AND DATE OF ISSUE) **(NAME AND SIGNATURE OR EQUIVALENT MARKING OF AUTHORIZED PERSON)**

DOCUMENT NO. IS-51K-337-5

UK DECLARATION OF CONFORMITY

A copy of the original Declaration of Conformity

(SUPPLIER'S NAME)

WE

IWAKI CO.,LTD.

(ADDRESS)

6-6 2-CHOME KANDA-SUDACHO CHIYODA-KU TOKYO JAPAN

(PRODUCT)

DECLARE UNDER OUR SOLE RESPONSIBILITY THAT THE PRODUCTS

SELF-PRIMING MAGNETIC DRIVE PUMP

(MODEL NAME)

SMX/ SMX-F SERIES

TO WHICH THIS DECLARATION RELATES ARE IN CONFORMITY WITH THE FOLLOWING REGULATIONS OR STANDARDS AS FAR AS APPLICABLE

(REGULATIONS)

S.I. 2008/1597 SUPPLY OF MACHINERY (SAFETY)
S.I. 2012/3032 RESTRICTION OF HAZARDOUS SUBSTANCES

(STANDARDS)

EN ISO12100: 2010 EN809: 1998 + A1: 2009 EN IEC63000: 2018

(A PERSON WHO IS AUTHORISED TO COMPILE THE TECHNICAL FILE IN THE GB MARKET)

SENSYS LIMITED
UNIT 9 POND CLOSE WALKERN ROAD
STEVENAGE HERTS SG1 3QP UK

NOTE: THIS DECLARATION BECOMES INVALID IF TECHNICAL OR OPERATIONAL MODIFICATIONS ARE INTRODUCED WITHOUT THE MANUFACTURER'S CONSENT.

T. Sawada.

TSUTOMU SAWADA

SENIOR GENERAL MANAGER,

QUALITY ASSURANCE HEAD OFFICE

Tokyo, Jun. 6, 2023

(PLACE AND DATE OF ISSUE) **(NAME AND SIGNATURE OR EQUIVALENT MARKING OF AUTHORIZED PERSON)**

DOCUMENT NO. IS-51K-593-1

Information on CE/UKCA conformity

■ Information on CE/UKCA conformity of pump units when the motor is fitted by the customer (dealer/operator)

We hereby confirm the CE/UKCA conformity of our pump unit provided that the following criteria about intended use are satisfied as described in this instruction manual:

- Motor conformity in accordance with any relevant EC directives/UKCA regulations which are currently effective.
- The dimensions of a required motor flange and shaft must fit the specified pump.
- The motor must be installed to the pump according to this instruction manual.
- Guaranteed grounding
- The pump must not be repainted over our original upper coating.

Any reseller or dealer who connects the pump with a motor and markets it as a complete unit must conform to all relevant EC directives/UKCA regulations. In such cases, the reseller or dealer then becomes the manufacturer.

IWAKI

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T665-7 '23/07