IWAKI PUMPS

IWAKI
Self-priming Magnetic Drive Pump

SMX Series

Instruction Manual

⚠Read this manual before use of product

Thank you for selecting an Iwaki SMX 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.

Contents

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

- **Keep medical electronics away from the magnetic field**

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


Prohibited

- Be sure to turn off all the related power supplies prior to any inspection/ maintenance and installation works. 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.


Turning off power

- **Wear protective clothing**

  When arranging piping or dismantling the pump, wear protective clothing such as eye protection as protective gloves.


Wear protective gear

- **Do not remodel pump**

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


No Remodeling

- **When handling dangerous liquid**

  For the transfer of the dangerous liquids mentioned as below, be sure to conduct daily inspection and maintenance for the prevention of liquid/gas leakage or other related failure.

  1. Explosive or flammable liquid
  2. Highly corrosive liquid
  3. Harmful liquid to human health

  Pay extra attention. The front casing of the SMX has space where gas can stay.

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.


Prohibited

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


Prohibited

- **Specified application only**
  Use of the pump in any application other than those clearly specified may result in personal injury or property damage.


Prohibited

- **Specified power only**
  Do not apply any voltage other than the specified one on the motor name-plate. Otherwise, damage or fire may result.


Prohibited

- **Ventilation**
  Poisoning may result when handling a harmful liquid. Keep good ventilation in a work area.

- **Countermeasure against efflux**
  Take protective measures against accidental chemical efflux and splash at pump or piping breakage. Do not allow an outflow to directly soak into the ground.

- **Do not run pump dry (Operation without liquid)**
  Friction heart builds up during dry running operation and damages internal parts. If the pump is operated with a suction side valve closed or without priming, the pump runs dry.


Prohibited

- **Do not bring the pump close to a flammable substance**
  Keep the pump away from a flammable substance for the prevention of fire.


Fire ban

- **Unpacking**
  Before unpacking, check the package is not put upside down. Take care not to be scratched by a nail or a piece of wood at unpackage.


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.


Prohibited

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.


Prohibited

- **Do not touch the pump or a pipe**

  Hot surface temperature. Do not touch the pump or a pipe with bare hands during or right after hot liquid transfer. Take preventative measures against burn.


Prohibited

- **Earthing**

  Risk of electrical shock. Do not run the pump without earthing. Secure earth protection to reduce the risk.


Grounding

- **Install an earth leakage breaker**

  Risk of electrical shock. Do not run the pump without a leakage breaker. Secure a leakage breaker to reduce the risk.

- **Limitations on working and storage areas**

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

  1. Where ambient temperature exceeds 40°C or falls below 0°C.
  2. Where ambient humidity exceeds 85%RH or falls below 35%RH.
  3. Under a flammable/explosive atmosphere or in a dusty place (Except explosion-proof type).
  4. Where the pump is exposed to wind and rain (Except outdoor-use type).
  5. Where the pump is subject to vibration.
  6. Under a corrosive atmosphere such as chlorine gas.


Prohibited

- **Foreign matter**

  When foreign matters enter the pump, turn off power at once and remove them. Using the pump with foreign matters may result in failure.


Caution

- **Static electricity**

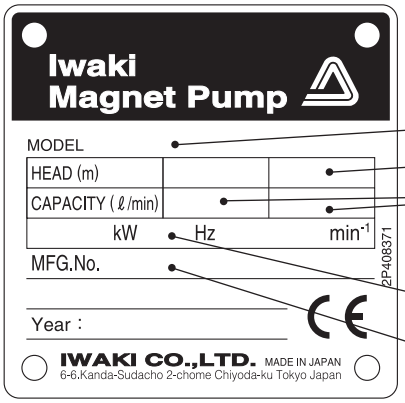
  When low electric conductivity liquids such as ultra-pure water and fluor inactive liquid (e.g. Fluorinert™) are handled, static electricity may generate in the pump and may cause static discharge. Take countermeasures to remove static electricity.

- **Pump disposal**

  Dispose of any used or damaged pump in accordance with local laws and regulations as an incombustible (Consult a licensed industrial waste products disposing company.).

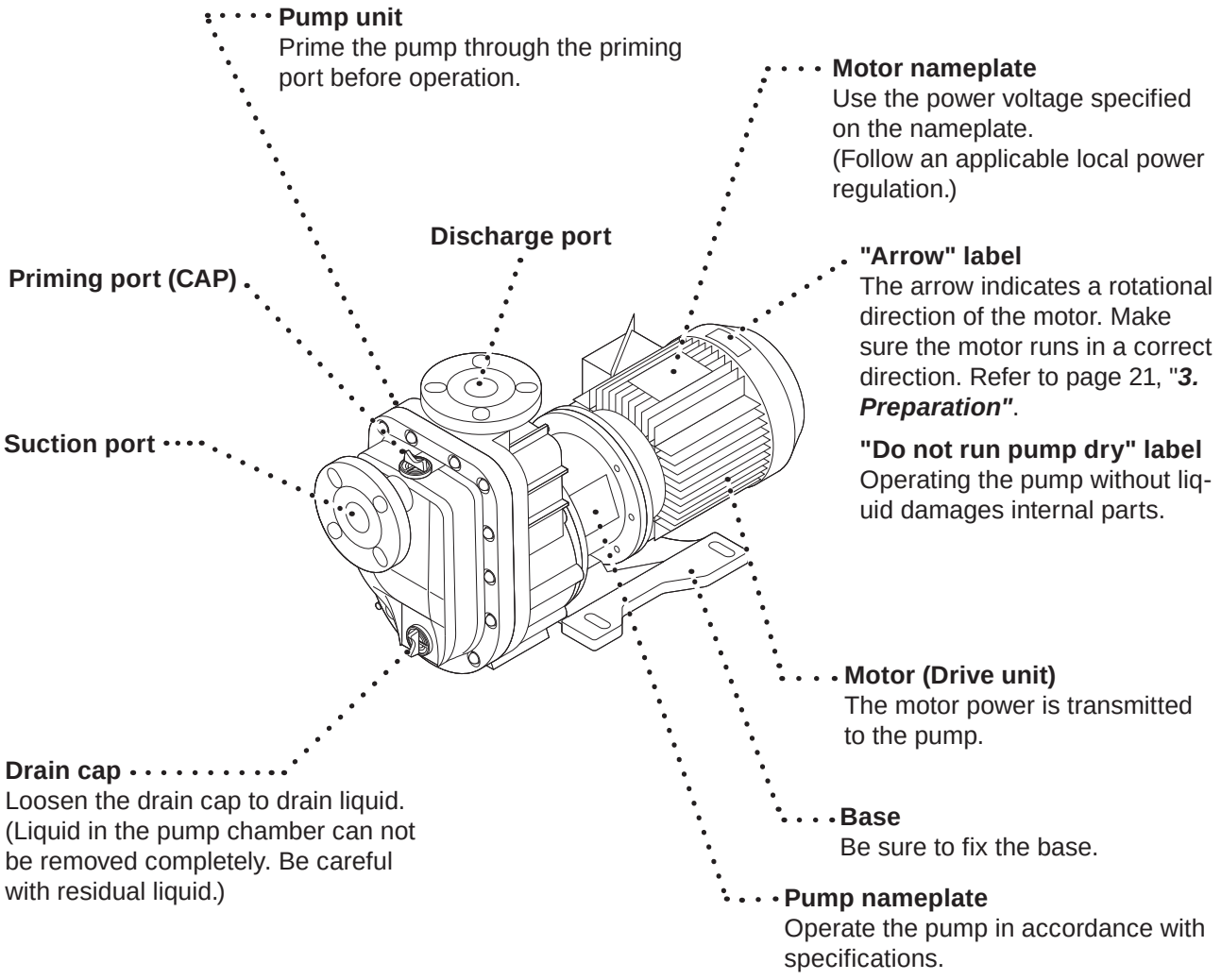
Outline

1. Unpacking & Inspection



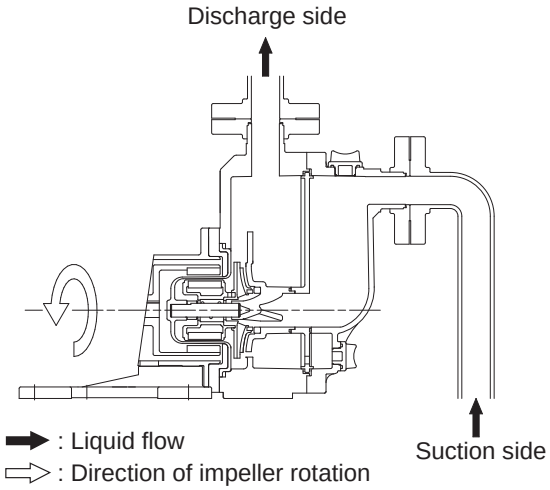
On unpacking the product, check the following points. If you find any problems, contact your nearest distributor.

1. Check the information on nameplate (model code, flow rate, head and voltage) to see if the product is delivered as per order.
2. Check for transit damage, deformation and loose bolts.



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

2. Product outline



The SMX series pump is a self-priming centrifugal pump and is driven by magnetic force. Magnetic force rotates an impeller unit in the rear case in order to transfer liquid.

3. Model code

SMX - 44 2 CA V V C
a b c d e f g

a. Series
SMX: Wet end material: GFRPP

b. Pump bore (Inlet × Outlet bore)
22: 25A × 25A
44: 40A × 40A
54: 50A × 40A

c. Motor output
0: 0.4kW (0.37kW)
1: 0.75kW
2: 1.5kW
3: 2.2kW
5: 3.7kW

d. Bearing/ Spindle/ Liner ring
CA: Carbon/ High purity alumina ceramic/ Alumina ceramic
RA: Filled PTFE/ High purity alumina ceramic/ Alumina ceramic
KA: SiC/ SiC/ Alumina ceramic

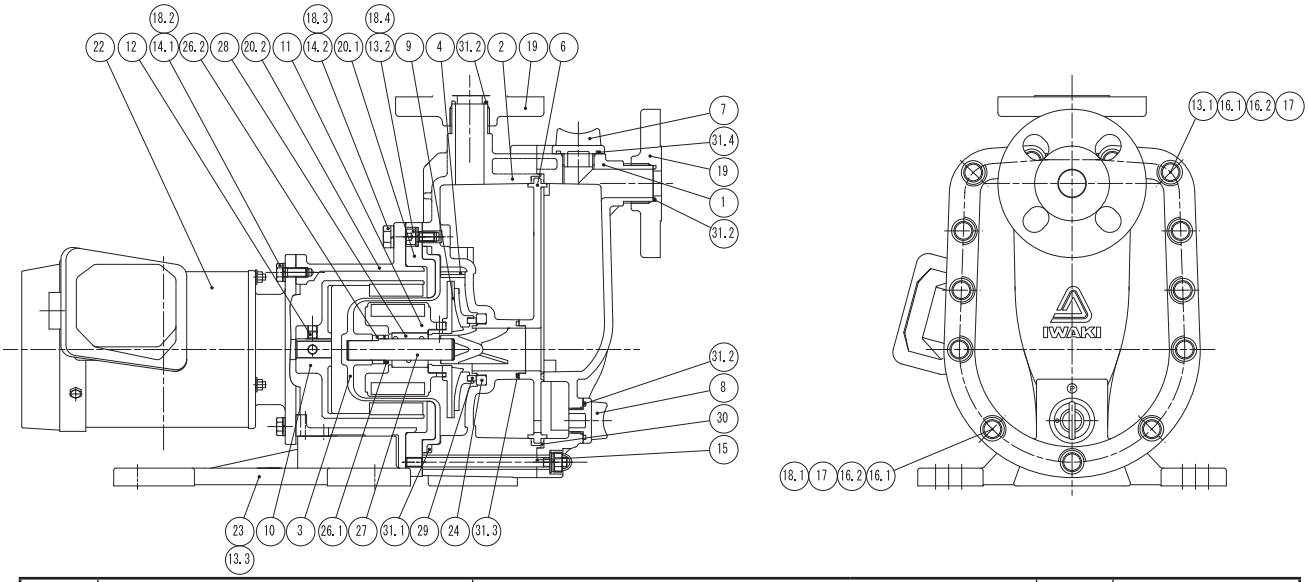
e. O ring and Gasket material
V: FKM
E: EPDM

f. Impeller
T, V : 50Hz
X, Y, Z: 60Hz

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

4. Part names

SMX-22□

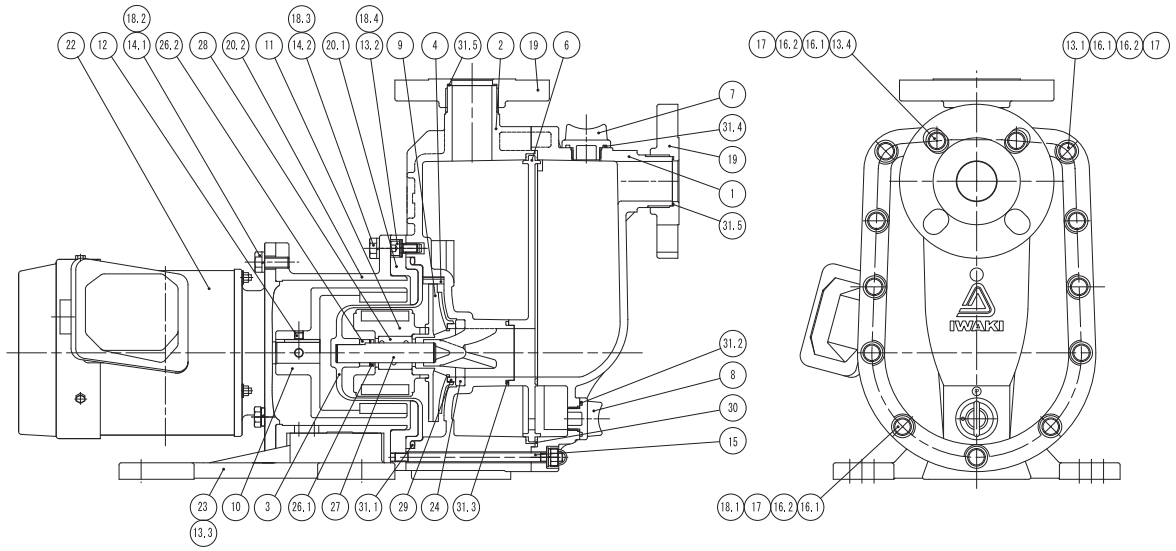


NO	PART NAMES	MATERIAL			Q'TY	REMARKS
		CA	RA	KA		
1	FRONT CASE	GFRPP			1	
2	REAR CASE	GFRPP			1	
3	REAR CASING	GFRPP			1	
4	VOLUTE SPACER	GFRPP			1	
6	PLATE	GFRPP			1	
7	CAP	GFRPP			1	
8	DRAIN CAP	GFRPP			1	
9	IMPELLER UNIT	GFRPP			1	
10	DRIVE MAGNET UNIT	SMX220: FERRITE MAGNET + ALUMINIUM ALLOY SMX221: FERRITE MAGNET + DUCTILE IRON SMX222: REAR EARTH MAGNET + DUCTILE IRON			1	
11	MAGNET CAPSULE UNIT	SMX220, 221: FERRITE MAGNET + PP SMX222: REAR EARTH MAGNET + PP			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, 222 type:M10
18.3	SPRING WASHER	STNLS STL			4	M10
18.4	SPRING WASHER	STNLS STL			3	M8
19	FLANGE	GFRPP			2	
20.1	REAR CASING SUPPORT	DUCTILE IRON			1	
20.2	BRACKET	DUCTILE IRON			1	
22	MOTOR	——			1	
23	BASE	GFRPP			1	
24	LINER RING	ALUMINA CERAMIC 99%			1	
26.1	REAR THRUST RING	——	ALUMINA CERAMIC 99.5%	——	1	ONLY RA TYPE
26.2	REAR THRUST	CFRPPS			1	
27	SPINDLE	ALUMINA CERAMIC 99.5%		SiC	1	
28	BEARING	Carbon	Filled PTFE	SiC	1	
29	MOUTH RING	Filled PTFE			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	G-40
31.4	O RING (CAP)				1	G-30

The diagram is of the SMX-220.

Outline

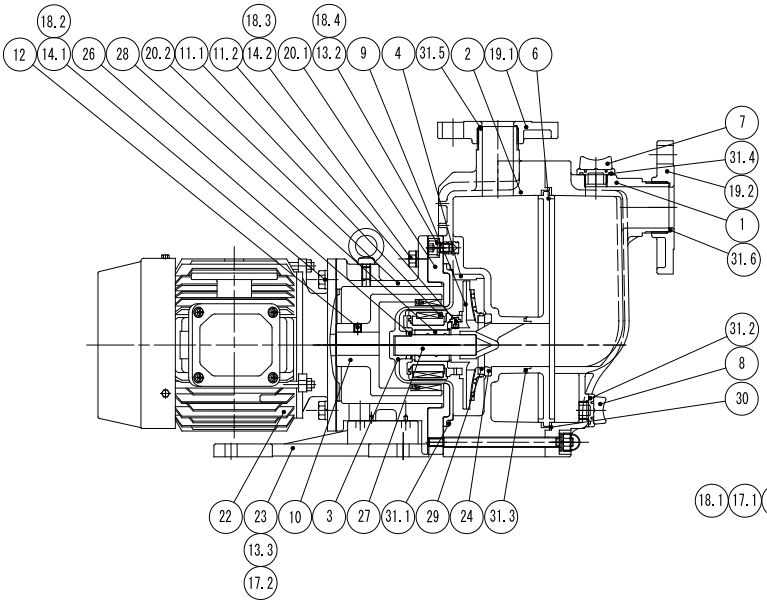
SMX-44□



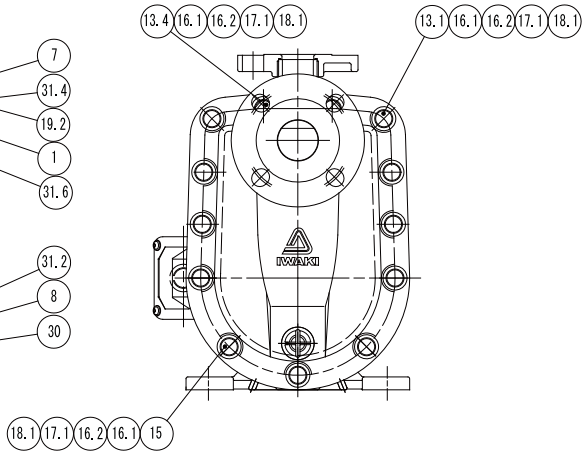
NO	PART NAMES	MATERIAL			Q'TY	REMARKS
		CA	RA	KA		
1	FRONT CASE	GFRPP			1	
2	REAR CASE	GFRPP			1	
3	REAR CASING	GFRPP			1	
4	VOLUTE SPACER	GFRPP			1	
6	PLATE	GFRPP			1	
7	CAP	GFRPP			1	
8	DRAIN CAP	GFRPP			1	
9	IMPELLER UNIT	GFRPP			1	
10	DRIVE MAGNET UNIT	SMX441: FERRITE MAGNET + DUCTILE IRON SMX442, 443: REAR EARTH MAGNET + DUCTILE IRON			1	
11	MAGNET CAPSULE UNIT	SMX441: FERRITE MAGNET + PP SMX442, 443: REAR EARTH MAGNET + PP			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	GFRPP			2	
20.1	REAR CASING SUPPORT	DUCTILE IRON			1	
20.2	BRACKET	DUCTILE IRON			1	
22	MOTOR	——			1	
23	BASE	GFRPP			1	
24	LINER RING	ALUMINA CERAMIC 99%			1	
26.1	REAR THRUST RING	——	ALUMINA CERAMIC 99.5%	——	1	ONLY RA TYPE
26.2	REAR THRUST	CFRPPS			1	
27	SPINDLE	ALUMINA CERAMIC 99.5%		SiC	1	
28	BEARING	High density carbon	Filled PTFE	SiC	1	
29	MOUTH RING	Filled PTFE			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

The diagram is of the SMX-441.

Outline



SMX-54□



NO	PART NAMES	MATERIAL			Q'TY	REMARKS
		CA	RA	KA		
1	FRONT CASE	GFRPP			1	
2	REAR CASE	GFRPP			1	
3	REAR CASING	GFRPP			1	
4	VOLUTE SPACER	GFRPP			1	
6	PLATE	GFRPP			1	
7	CAP	GFRPP			1	
8	DRAIN CAP	GFRPP			1	
9	IMPELLER UNIT	GFRPP			1	
10	DRIVE MAGNET UNIT	REAR EARTH MAGNET + DUCTILE IRON			1	
11.1	MAGNET CAPSULE UNIT	REAR EARTH MAGNET + PP			1	
11.2	LOCK PIN	GFRPPS			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	STNLS STL			4	542, 543: M8×20 PW, SW 545: M10×16
13.4	HEX SOCH HEAD BOLT	STNLS STL			2	M10×90
14.1	HEX HEAD BOLT	STNLS STL			4	542, 543: M10×30 545: M12×40
14.2	HEX HEAD BOLT	STNLS STL			4	542, 543: M10×25 545: M10×30
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
17.2	PLAIN WASHER	STNLS STL			4	M10 ONLY 545 TYPE
18.1	SPRING WASHER	STNLS STL			13	M10
18.2	SPRING WASHER	STNLS STL			4	542, 543: M10 545: M12
18.3	SPRING WASHER	STNLS STL			4	M10
18.4	SPRING WASHER	STNLS STL			3	M10
18.5	SPRING WASHER	STNLS STL			4	M10 ONLY 545 TYPE
19.1	FLANGE	GFRPP			1	40A
19.2	FLANGE	GFRPP			1	50A
20.1	REAR CASING SUPPORT	DUCTILE IRON			1	
20.2	BRACKET	DUCTILE IRON			1	
22	MOTOR	——			1	
23	BASE	542, 543: GFRPP			1	
		545: SPCC			2	
24	LINER RING	Alumina ceramic 99.5%			1	
26	REAR THRUST RING	Alumina ceramic 99.5%		SiC	1	
27	SPINDLE	Alumina ceramic 99.5%		SiC	1	
28	BEARING	Carbon	Filled PTFE	SiC	1	
29	MOUTH RING	Filled PTFE			1	
30	GASKET	V: FKM E:EPDM			1	
31.1	O RING (REAR CASING)				1	G-180
31.2	O RING (DRAIN CAP)				1	G-25
31.3	O RING (REAR CASE)				1	G-55
31.4	O RING (CAP)				1	G-30
31.5	O RING (FLANGE 40A)				1	AS568-129
31.6	O RING (FLANGE 50A)				1	AS568-136

The diagram is of the SMX-542.

Installation

Installation

⚠WARNING

- **Do not remodel the pump**
  A remodelled pump will not be warranted. Also, we are not responsible for personal injury or property damage due to any modification.


Prohibited

⚠CAUTION

- **Do not run pump dry**
  Be sure to prime the pump when the pump is empty, for example, before running the pump for the first time or right after assembly. Running the pump without priming water, 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.


Prohibited

- **Do not bring the pump close to a flammable substance**
  Keep the pump away from a flammable substance for the prevention of fire.


Prohibited

1. Before installation

In a flooded suction system, follow the next steps when starting/stopping the pump for the prevention of water hammer. Take extra care when a discharge line is long.

When starting the pump

Check that the pump is primed. 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).

When stopping the pump

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

*Never close a discharge line suddenly with a solenoid valve. Shutting the line rapidly causes water hammer and the pump may be damaged by excessive pressure.

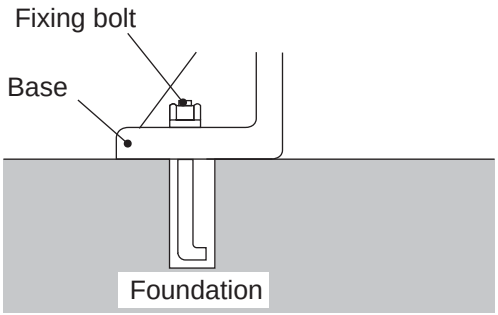
2. Installation location

Select a location where meets the following conditions.

1. A flat and rigid foundation
2. Free from vibration
3. Ambient temperature is between 0-40ºC.
4. Humidity is between 35-85%RH.
5. A dry atmosphere (Except outdoor use)
6. A clean atmosphere
7. A location free from water influx in case of an accident or casualty

3. Installation

1. Install the pump as close to the suction tank and its liquid level as possible. Allowable priming lift is up to 4m, however, try to keep the shortest priming lift.
   *A priming lift varies with liquid characteristics, temperature and suction line length. Contact us for detail information.
2. Secure maintenance space around the pump.
3. The figure below shows a foundation.
   • Installation area should be larger than the footprint of the pump.
   • If piping vibrates sympathetically with the pump in operation, provide an expansion joint between the pump and the piping to reduce vibration.

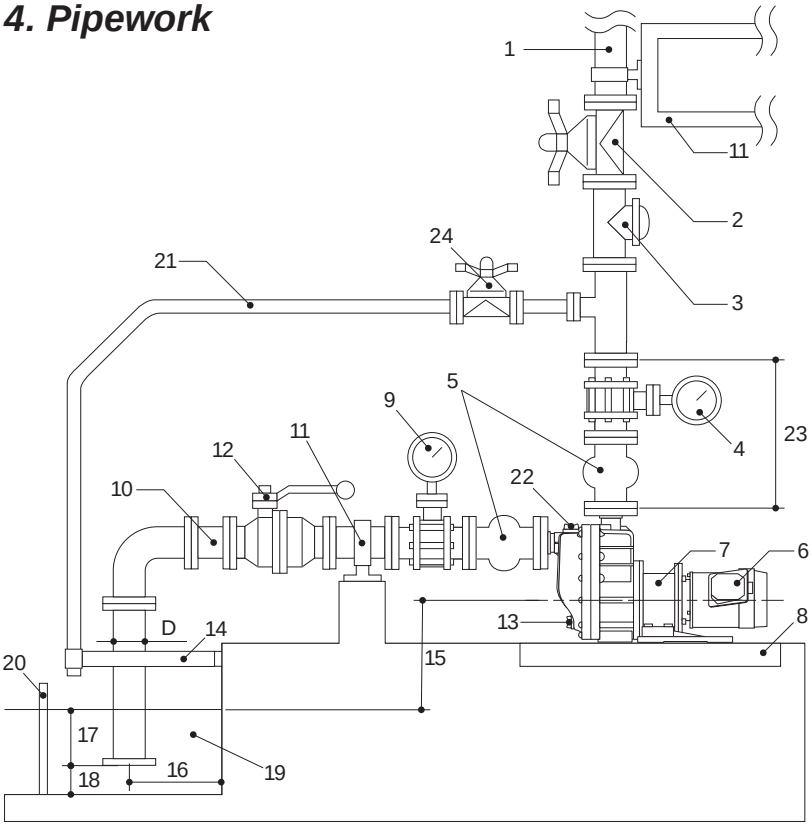


4. Outdoor use model can be used indoors. If the motor is designed for indoor use, do not use it out of doors. When installing the outdoor use model out of doors, take preventative measures to protect a motor and electrical circuit.

⚠CAUTION

- Support the pump and piping with a proper measure.
- 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 43 as well.

4. Pipework



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 bore should be equal to the pump inlet bore (25A, 40A or 50A)

If a suction pipe bore is larger than a pump inlet bore, 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 a 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.

3. End of a suction line

- The end of a suction line should be at least 50cm 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 bore.
- 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 suction line are secure and air doesn't come in. Try to reduce the number of joints. If air enters 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.

7. Pipe support

If piping weight loads the pump, plastic parts are deformed. Be sure to install a pipe support.

■ Discharge line

1. A discharge pipe bore is related to pipe resistance

Pipe resistance rises too high to obtain an intended flow if a discharge pipe bore is too narrow. Degassing efficiency and priming lift will be affected as well. Install a 50cm 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 discharge line is 9m higher than a liquid level.
- Several pumps are running in parallel.

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

- An 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.

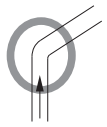
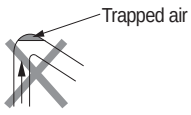
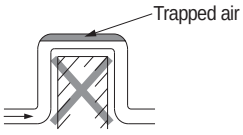
5. A pressure gauge should be installed

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

6. Install a drain valve if it is possible for liquid in a discharge line to freeze

7. Pipe support

If piping weight loads the pump, any plastic part is deformed. Be sure to install a pipe support.

Good conditions	Unacceptable conditions
 Ascension	 Declination
 Inverted arch piping	 Arched piping

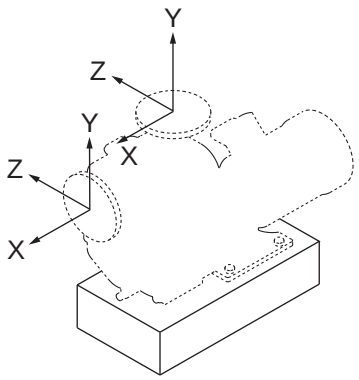
■ Tightening torque between the pump and pipework

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. Tighten bolts diagonally at even tension.

Bolt size	Tightening torque (N•m)
M16	20

■ 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

Electrical wiring and any work on power source must be performed by qualified persons only. We are not responsible for any injury and damage due to noncompliance with this notice. Contact us as necessary.

1. Install an electromagnetic switch according to motor specifications (voltage, capacity, etc.).

2. If the pump is used out of doors, protect switches from rainwater.

3. Electromagnetic switches and push buttons should be installed away from the pump.

Operation

Operation

1. Operational precautions

⚠CAUTION

- Never run the pump dry or run it with a suction side valve (Gate valve) closed. This may damage the pump.


Prohibit

- Stop the pump within one minute when cavitation occurs or when air enters through a suction line.

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

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

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

- If the pump is operated with a discharge valve closed for a long time, the liquid temperature inside the pump rises and damages the pump.


Caution

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

- Take extra care for a discharge pressure not to exceed the pump limit. Refer to page 21, "*7. Maximum operating pressure*".


Caution

- The surface temperature of the pump or pipe rises high along with liquid temperature in or right after operation. Take preventive measures. See the table below for the surface temperature when transferring a liquid of 80°C.

Liquid temperature (°C)	Max. pump surface temperature (Ambient temp. is 40°C)
80	80

- 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.

Noise level
80 dB

2. Before operation

Confirm pump performance and specifications prior to operation.

1. H-Q performance

The performance curves on catalogues are based on pumping clean water at 20ºC in a flooded suction system.

2. Prime the pump before self-priming operation

The SMX 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.).

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

The minimum liquid volume

SMX-22□	3.0L
SMX-44□	4.2L
SMX-54□	5.4L

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. Contact us for detail.
3. Liquid temperature : 0-80ºC (Clean water)
   Self-priming performance reduces as liquid temperature increases. Some liquid with a high vapour pressure or bubbly liquid may not be sucked up in the self-priming mode or not even be pumped.

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

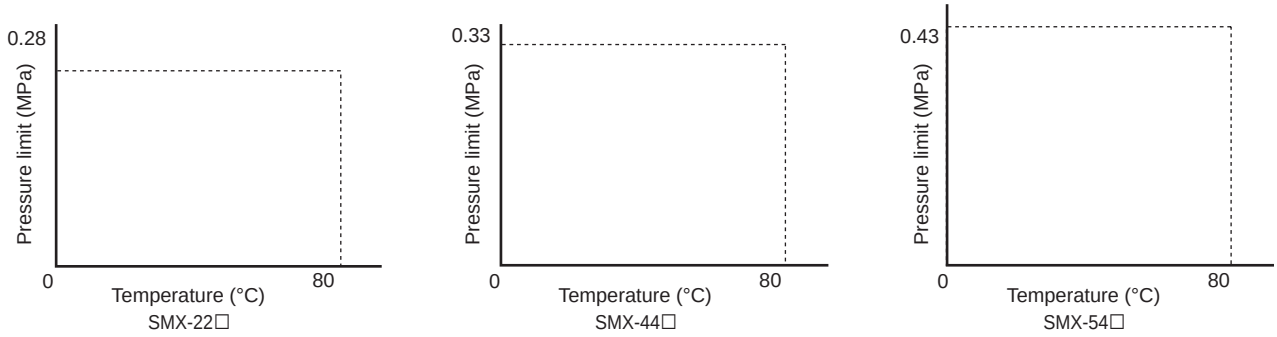
Stop the pump immediately. Liquid can not be pumped at all in this state. Magnetic force reduces if the pump keeps on running in this condition.

6. Operating temperature

Allowable liquid temperature : 0-80 ºC with clean water. Non freezing
Self-priming performance reduces as liquid temperature increases.
Allowable liquid temperature varies with chemicals.
Ambient temperature range : 0-40 ºC
Ambient humidity range : 35-85%RH

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

Take the next steps to start the pump at the first operation or after a long period of storage.

1. Clean the inside of piping and tank.

Do not leave any waste of bond, sealing material, and screws/nuts.

2. Retighten the bolts on piping connections.

Make sure air does not enter the piping. Take extra care to a suction line because of negative pressure in it.

3. Check the bolts on the pump and retighten them as necessary.

4. Detach the cap for priming. Fill the pump with liquid.

⚠CAUTION
Do not pour liquid rapidly. Liquid may overflow.

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

6. Check the direction of motor rotation

Run the motor for a moment in order to check if the motor rotates to the direction pointed by an arrow label (clockwise seen from the motor fan). If the motor rotates in reverse, interchange two of 3-phase power.

4. Operation

■ Starting process

Operate the pump by the following procedure.

	Operation procedure	Remarks
1	• Close or open valves.	• In a flooded suction system... Close suction & discharge valves fully. • In a suction lift system... Open suction & discharge valves fully.
2	• Prime the pump.	• In a flooded suction system... Open suction & discharge valves to fill the pump unit and then close a discharge valve. • In a suction lift system... Prime the pump unit via the priming port. Do not forget to close the priming port.
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** Opening a valve sharply, the motor may be overloaded. Always open a valve while checking ammeters.

	Operation procedure	Remarks
4	Do not operate the pump below the minimum discharge capacity. ►The minimum discharge capacity: 10ℓ/min (SMX-22 and -44), 20ℓ/min (SMX-54) • 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.	
5	<Points to be checked> Check a flow meter and confirm that pump operation is as per specifications during operation.	• If a flow meter is not available, calculate a flow rate 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 "***Troubleshooting***".

■ Stopping process

	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. Be careful when draining harmful liquid. • Use a heater to prevent liquid from freezing when the pump is temporarily stopped in an extremely cold region. • In the event of a power failure, turn off power and close a discharge valve.	

Maintenance

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.


Prohibited

● **Turn off power during maintenance work**

Risk of electrical shock. Make sure the power source is turned off and the pump and devices are stopped prior to work.


Turning off power

● **Wear protective clothing**

Coming in contact with a harmful chemical liquid may cause eye or skin trouble. Wear protective clothing such as a protective mask, goggles and gloves during work.


Wear protective gear

⚠ CAUTION

● **Do not catch the finger**

Magnetic force of the pump is powerful. Take care not to catch the finger in the bracket.


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.
- ► 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.
- ► 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 37. 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 "***1. Troubleshooting***" as necessary.

■ 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.

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	● 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	● 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	● Wear tracks on the rear end or the side face of the magnet capsule ● Cracks on the rear end or the 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	● 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	● 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 limits of bearing and spindle

Model / Part names	SMX-22/-44			SMX-54		
	Default	Wear limit	Wear depth	Default	Wear limit	Wear depth
Bearing inner diameter	Ø 18.0mm	Ø 19.0mm	1.0mm	Ø 24.0mm	Ø 25.0mm	1.0mm
Spindle outer diameter	Ø 18.0mm	Ø 17.0mm	1.0mm	Ø 24.0mm	Ø 23.0mm	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>

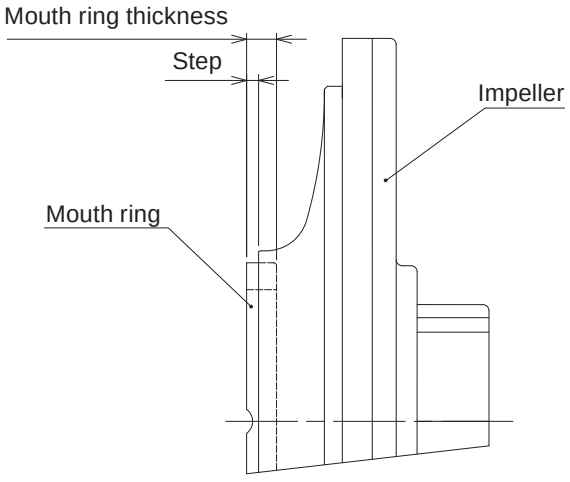
   Inner diameter of bearing is Ø18.7 — Wear depth is 0.7mm (Within wear limit)
   Outer diameter of spindle is Ø17.5 — Wear depth is 0.5mm (Within wear limit)

   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.



Thickness at shipment	Wear limit
7.5 mm	5.5 mm

NOTE: The mouth ring is 2 mm forward from the impeller end 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 "***4. Part names***".)
2. Pump model identification code and manufacturing number (See pump nameplate.)
3. Drawing number if you have our approval drawing

■ Spare parts list <SMX-22>

No	Part names			Materials	Part codes		
					SMX-220	SMX-221	SMX-222
1	Front case			GFRPP	SMX0001		
2	Rear case	Impeller code	V	GFRPP	SMX0002		—
			Y	GFRPP	SMX0003		—
			T	GFRPP	—	SMX0033	
			X	GFRPP	—	SMX0002	
3	Rear casing			GFRPP	SMX0004		
4	Volute spacer	Impeller code	V	GFRPP	SMX0005		—
			Y	GFRPP	SMX0006		—
			X	GFRPP	—	SMX0005	
6	Plate			GFRPP	SMX0007		
7	Cap			GFRPP	SMX0008		
8	Drain cap			GFRPP	SMX0009		
9+29	Impeller unit	Impeller code	V	GFRPP	SMX0010		—
			Y	GFRPP	SMX0011		—
			T	GFRPP	—	SMX0034	
			X	GFRPP	—	SMX0010	
11	Magnet capsule unit		CA	—	SMX0012	SMX0035	SMX0038
			RA	—	SMX0013	SMX0036	SMX0039
			KA	—	SMX0014	SMX0037	SMX0040
19	Flange			GFRPP	SMX0015		
26.1	Rear thrust ring (for RA)			Alumina ceramic	SMX0016		
26.2	Rear thrust	For CA•KA		CFRPPS	SMX0017		
		For RA		CFRPPS	SMX0018		
27	Spindle	For CA•RA		Alumina ceramic	SMX0019		
		For KA		SiC	SMX0020		
30	Gasket		V	FKM	SMX0021		
			E	EPDM	SMX0022		
31.1	O ring (for Rear casing)		V	FKM	SMX0023		
			E	EPDM	SMX0024		
31.2	O ring (for Drain cap/ Flange)		V	FKM	SMX0025		
			E	EPDM	SMX0026		
31.3	O ring (for Rear case)		V	FKM	SMX0027		
			E	EPDM	SMX0028		
31.4	O ring (for Cap)		V	FKM	SMX0029		
			E	EPDM	SMX0030		

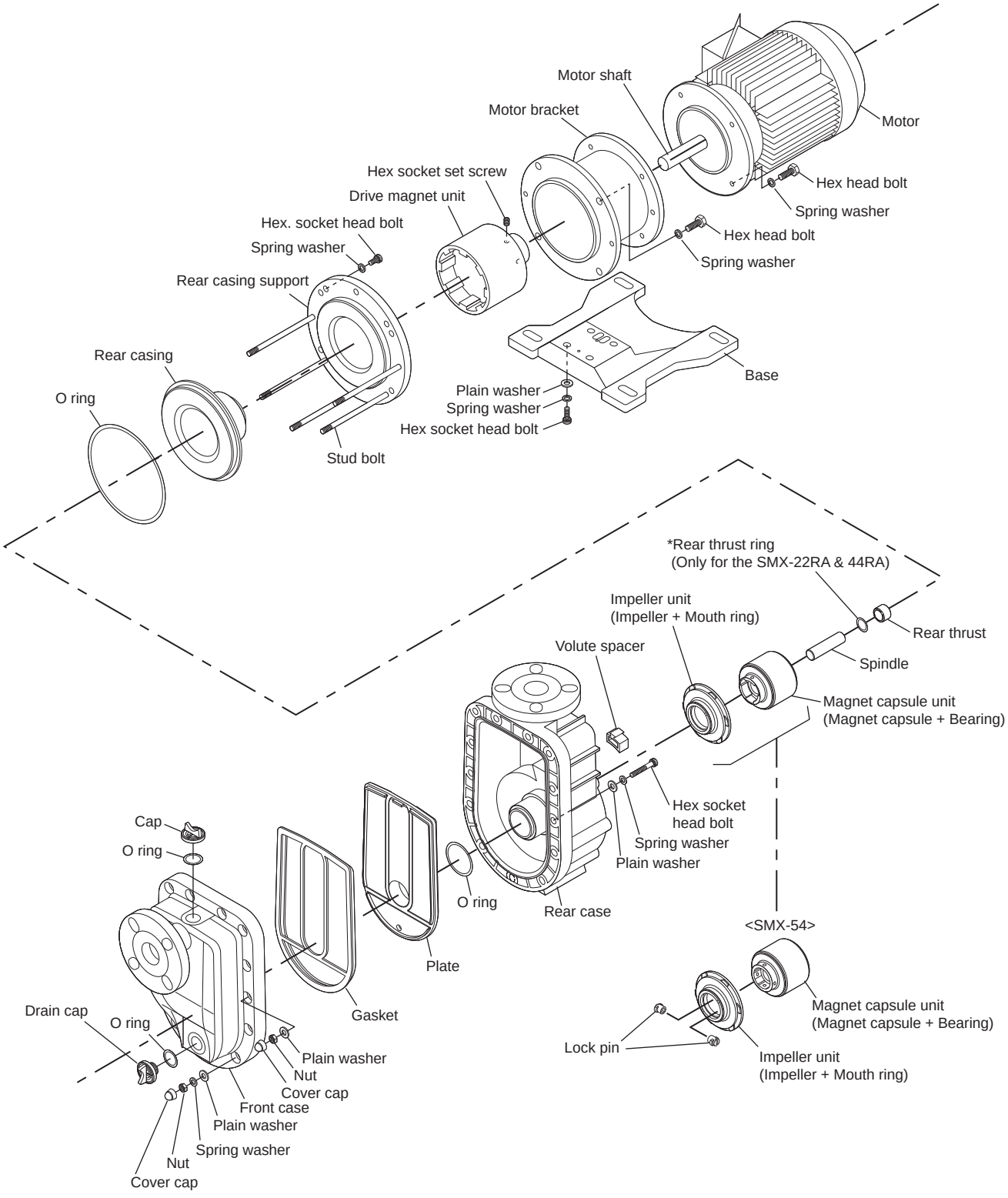
<SMX-44>

No	Part names			Materials	Part codes		
					SMX-441	SMX-442	SMX-443
1	Front case			GFRPP	SMX0041		
2	Rear case	Impeller code	T	GFRPP	SMX0043		—
			Y	GFRPP	SMX0042		—
			X	GFRPP	—	SMX0043	
3	Rear casing			GFRPP	SMX0004		
4	Volute spacer	Impeller code	T	GFRPP	SMX0045		—
			Y	GFRPP	SMX0044		—
			X	GFRPP	—	SMX0055	
6	Plate			GFRPP	SMX0046		
7	Cap			GFRPP	SMX0008		
8	Drain cap			GFRPP	SMX0009		
9+29	Impeller unit	Impeller code	T	GFRPP	SMX0048		—
			Y	GFRPP	SMX0047		—
			X	GFRPP	—	SMX0056	
11	Magnet capsule unit		CA	—	SMX0035	SMX0038	
			RA	—	SMX0036	SMX0039	
			KA	—	SMX0037	SMX0040	
19	Flange			GFRPP	SMX0049		
26.1	Rear thrust ring (for RA)			Alumina ceramic	SMX0016		
26.2	Rear thrust	for CA•KA		CFRPPS	SMX0017		
		for RA		CFRPPS	SMX0018		
27	Spindle	for CA•RA		Alumina ceramic	SMX0019		
		for KA		SiC	SMX0020		
30	Gasket		V	FKM	SMX0051		
			E	EPDM	SMX0052		
31.1	O ring (for Rear casing)		V	FKM	SMX0023		
			E	EPDM	SMX0024		
31.2	O ring (for Drain cap)		V	FKM	SMX0025		
			E	EPDM	SMX0026		
31.3	O ring (for Rear case)		V	FKM	SMX0053		
			E	EPDM	SMX0054		
31.4	O ring (for Cap)		V	FKM	SMX0029		
			E	EPDM	SMX0030		
31.5	O ring (for Flange)		V	FKM	SMX0031		
			E	EPDM	SMX0032		

<SMX-54>

No	Part names			Materials	Part codes		
					SMX-542	SMX-543	SMX-545
1	Front case		V	GFRPP	SMX0093		
			E	GFRPP	SMX0149		
2	Rear case			GFRPP	SMX0094		
3	Rear casing			GFRPP	SMX0095		
4	Volute spacer	Impeller code	Z	GFRPP	—	SMX0129	
			V	GFRPP	SMX0096		
			Y	GFRPP	—	—	SMX0096
			T	GFRPP	—	—	—
			X	GFRPP	—	—	—
6	Plate			GFRPP	SMX0097		
7	Cap			GFRPP	SMX0008		
8	Drain cap			GFRPP	SMX0009		
9+29	Impeller unit	Impeller code	Z	GFRPP	—	SMX0098	
			V	GFRPP	SMX0099		
			Y	GFRPP	—		SMX0099
			T	GFRPP	—	SMX0100	
			X	GFRPP	—		SMX0100
11.1	Magnet capsule unit		CA	—	SMX0101	SMX0130	
			RA	—	SMX0102	SMX0131	
			KA	—	SMX0103	SMX0132	
11.2	Lock pin			GFRPPS	SMX0104		
19.1	Flange 40A			GFRPP	SMX0105		
19.2	Flange 50A			GFRPP	SMX0106		
26	Rear thrust	for CA•RA		Alumina ceramic	SMX0107		
		for KA		SiC	SMX0108		
27	Spindle	for CA•RA		Alumina ceramic	SMX0109		
		for KA		SiC	SMX0110		
30	Gasket		V	FKM	SMX0111		
			E	EPDM	SMX0112		
31.1	O ring (for Rear casing)		V	FKM	SMX0113		
			E	EPDM	SMX0114		
31.2	O ring (for Drain cap)		V	FKM	SMX0025		
			E	EPDM	SMX0026		
31.3	O ring (for Rear case)		V	FKM	SMX0115		
			E	EPDM	SMX0116		
31.4	O ring (for Cap)		V	FKM	SMX0029		
			E	EPDM	SMX0030		
31.5	O ring (for Flange 40A)		V	FKM	SMX0031		
			E	EPDM	SMX0032		
31.6	O ring (for Flange 50A)		V	FKM	SMX0117		
			E	EPDM	SMX0118		

4. Disassembly & Assembly

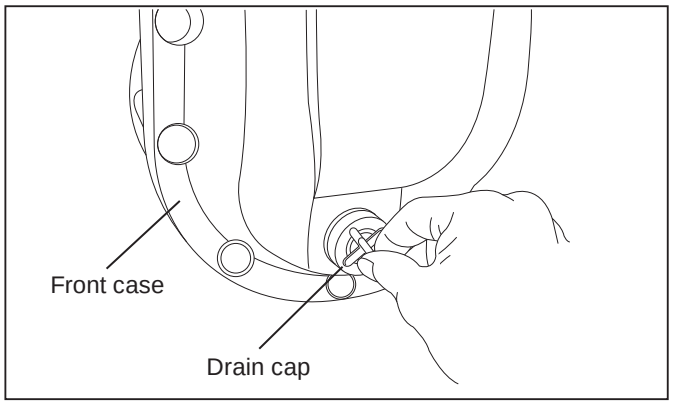


■ Tool list

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 hammper	×1		

■ Dismantlement

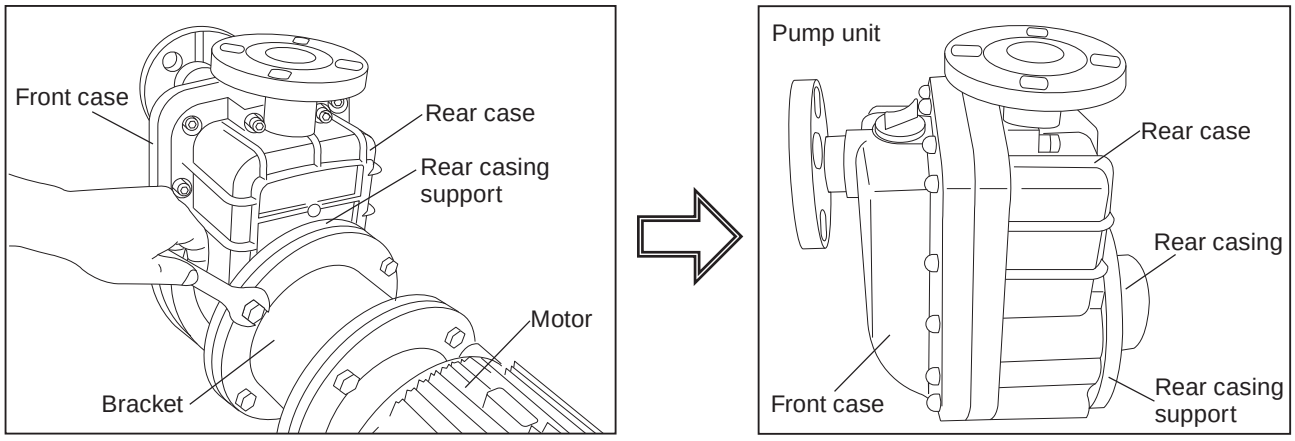
1. Remove the drain cap and drain liquid from the pump unit (Liquid can not be drained completely.).



⚠ CAUTION

Wear chemical proof gloves for the prevention of getting wet with chemicals.

2. Unscrew the motor bracket/pump unit fixing bolts and pull out the pump unit straight from the motor (then drain all the residual liquid). The motor is attracted by the magnetic force. Check the motor is anchored on a foundation before removing the pump unit.



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

⚠ CAUTION

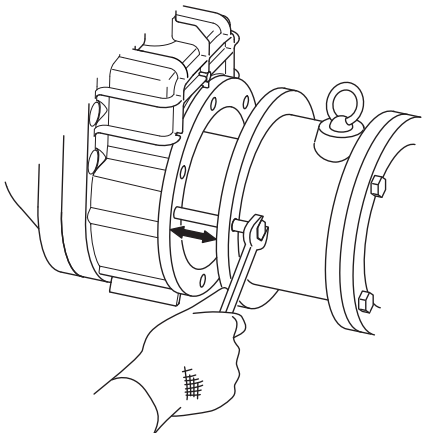
There is strong magnetic force between the pump unit and the motor. Be careful not to catch the finger between them.

NOTE: Screw two M10×50 bolts into the right and left bracket thread holes in turn to push the pump head out.

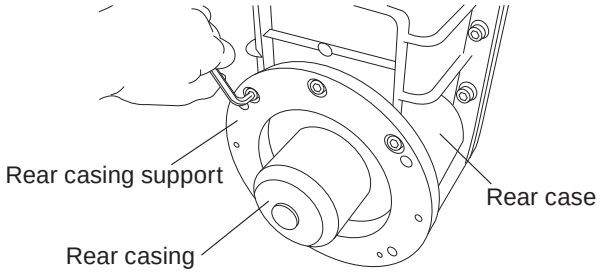
For putting the pump unit and the motor together, screw two M10×50 bolts into the right and left bracket thread holes until the bolts come out about 45mm forward. Mate the bolt ends with the holes on rear casing support. Then start screwing down the bolts evenly in order to move the pump unit closer to the motor and finally put these components together.

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.

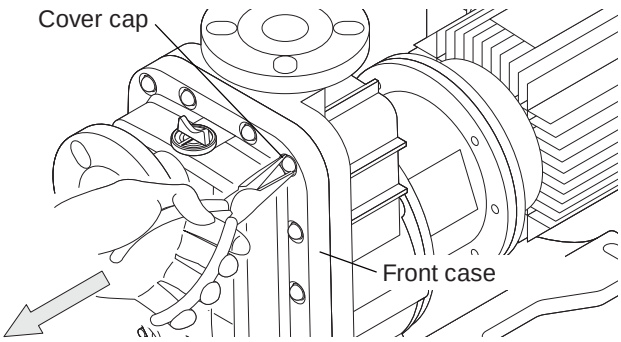


3. Remove three hex. socket head bolts which are fixing the rear casing support to rear case.

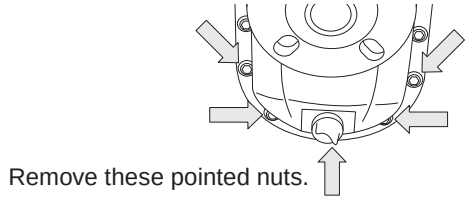


4. Remove all cover caps by using nippers.

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



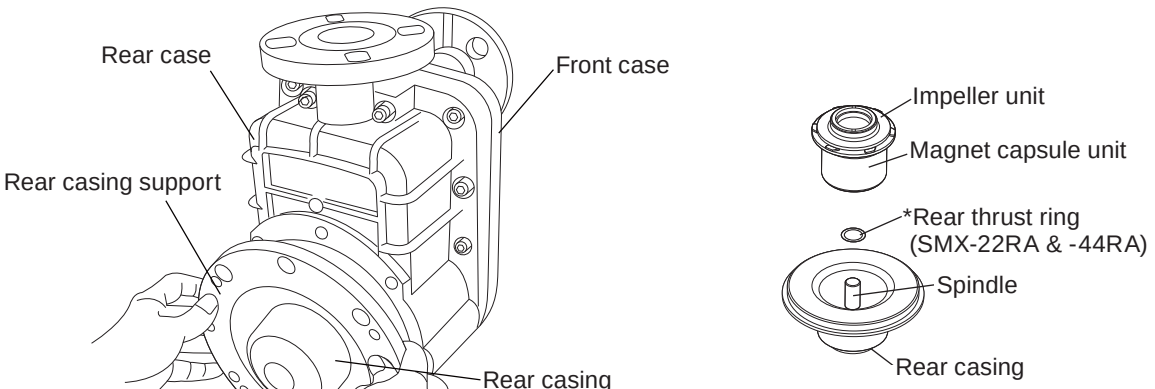
5. Loosen the five nuts on the front case (pointed by arrows).



⚠CAUTION

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

6. Remove the rear casing support, rear casing and the impeller & magnet capsule units from the pump unit (SMX-22 & -44 RA types have a rear thrust ring. Do not loose it.).



7. Loosen the front case/rear case fixing bolts to separate them.

8. Remove a plate, a gasket, O rings, and a volute spacer if it is installed.

■ Assembly

❗INSPECTION

If foreign matters such as iron powder stay on the magnet capsule by magnetic force, remove them.

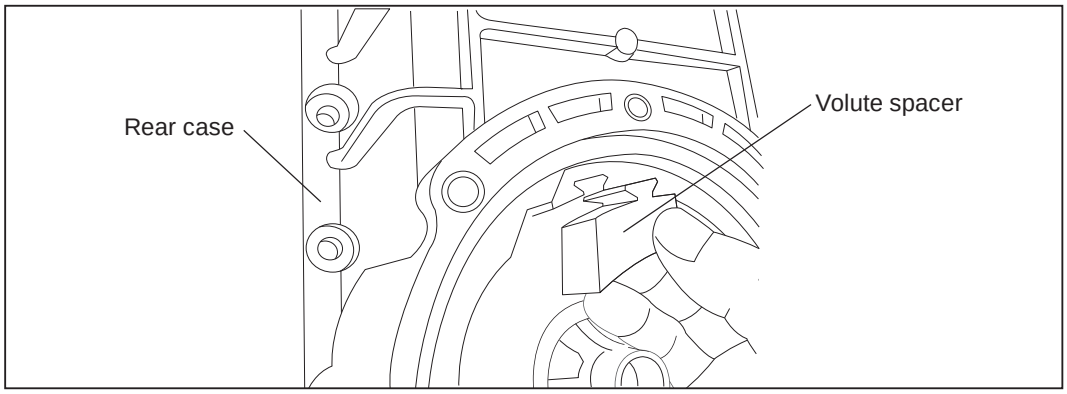
⚠CAUTION

Check that the sealing surfaces of the O ring and the gasket are free from dust and scratches. Use new parts as necessary.

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

2. Fit a gasket to a plate (Make sure the gasket is fitted in a groove on the plate.).

3. Mount the O ring and plate (and the volute spacer if it is provided) to the rear case (Volute spacer has a mounting direction!).



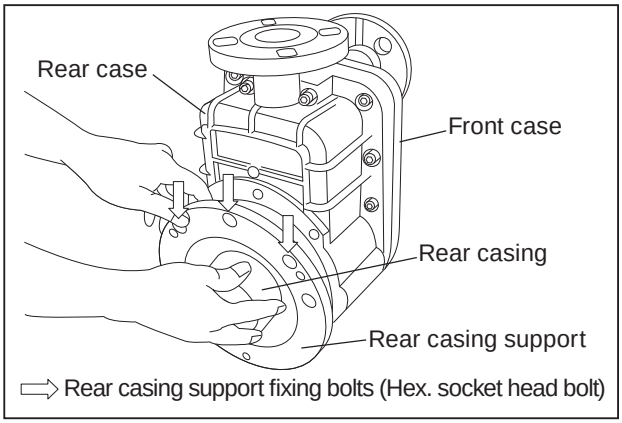
4. Lay the rear case on its rear side and mount the front case. Temporarily tighten the font case/rear case fixing bolts for preventing the O ring and plate from moving.

5. Insert the spindle into the rear casing through rear thrust.

6. Combine the impeller & magnet capsule units and fit them onto the spindle (For the SMX-22RA & -44RA, insert the rear thrust ring onto the spindle before the impeller & magnet capsule units.). And then fit them into the rear casing.

NOTE: See page 39-43 for the combination of the impeller & magnet capsule units.

7. Place the rear casing support in place while holding the rear casing in the rear case. Temporarily tighten the rear casing support fixing bolts and the pump unit fixing nuts.



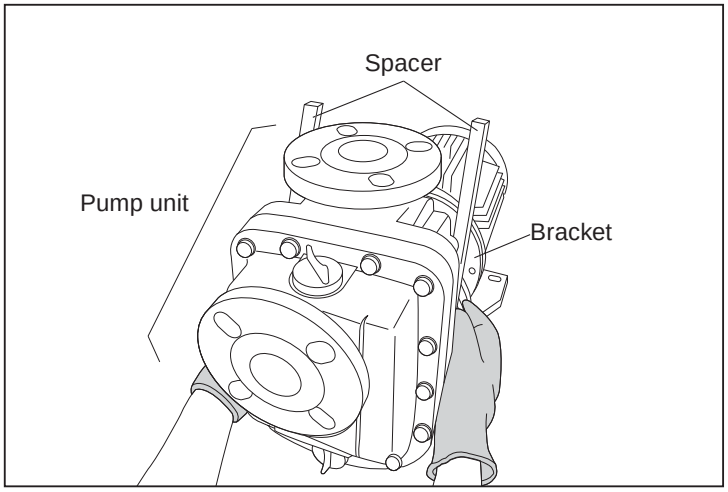
8. Tighten all bolts by the tightening torque below.

<Tightening torque>

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

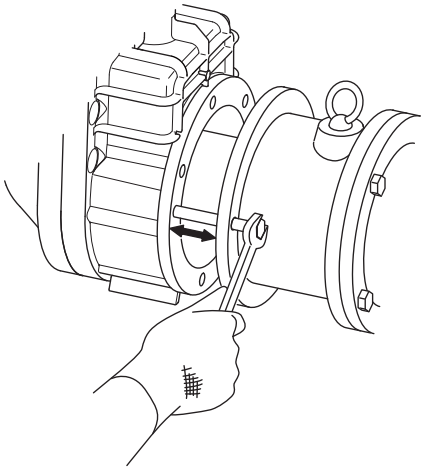
⚠CAUTION
Stainless bolts/nuts are easy to be stuck.

9. Use spacers to secure a space between the rear casing support and motor bracket so as not to catch the finger. Carefully move the pump unit towards the motor bracket, holding the pump unit securely. Do not hit the rear case or allow the motor to move towards the pump unit.



⚠CAUTION
Be careful not to catch the finger. The pump unit is attracted to the motor by magnet force. Fix the motor for preventing it from attracted to the pump unit.

NOTE: Screw two M10×50 bolts into the right and left bracket holes until they come out about 45mm forward, mating the bolt 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.



10. Tighten the motor bracket/pump unit fixing nuts.

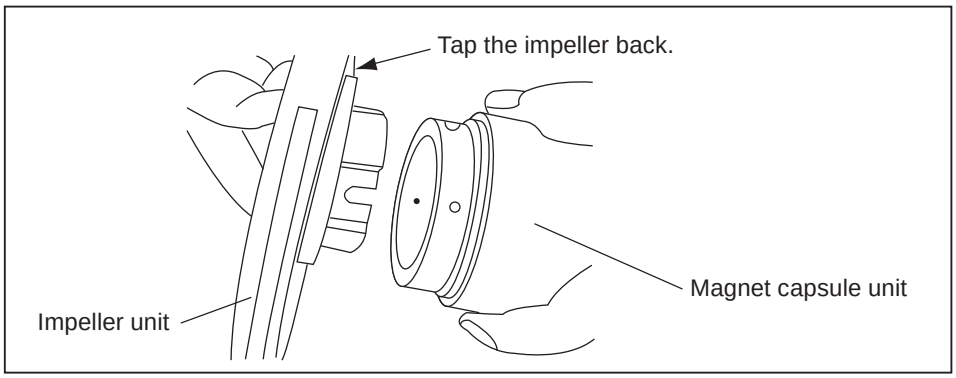
■ Impeller & magnet capsule units

<SMX-22 & -44>

Impeller unit removal

Tap the back side of the impeller unit by a plastic hammer while holding the magnet capsule unit.

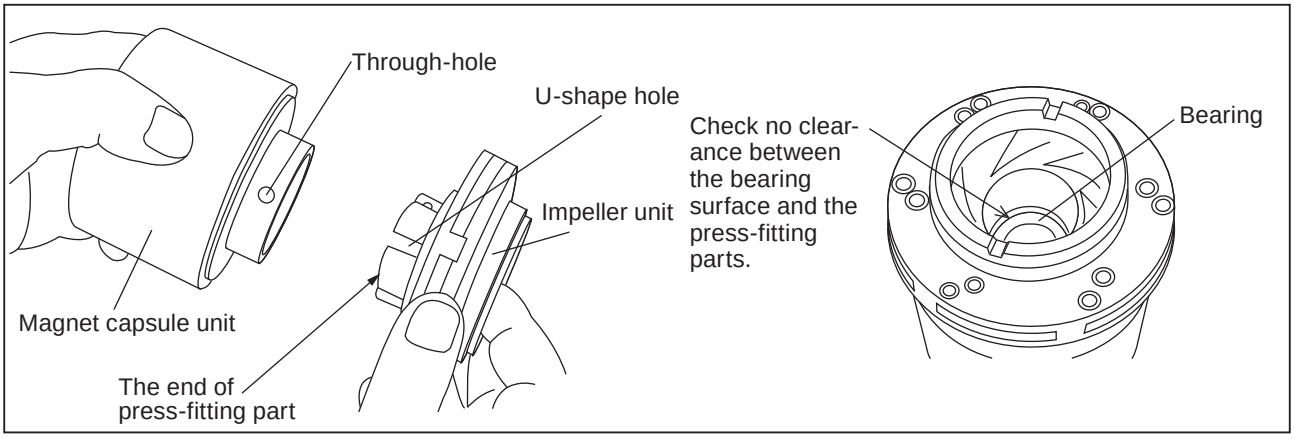
NOTE: If the impeller unit can not be removed from the magnet capsule unit in the above method, immerse the impeller unit in hot water of 80°C for five minutes. And then tap the back side of the impeller unit by a plastic hammer.



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

Impeller unit mounting

Press the impeller unit into the magnet capsule unit according to mating parts. Make sure that the through-hole on the magnet capsule unit comes under the U-shape hole on the impeller unit and there is no clearance between the end of press-fitting part and a bearing surface.



NOTE: If the fitting is too tight to pressfit the impeller unit, immerse the magnet capsule unit into hot water of 80°C for five minutes.

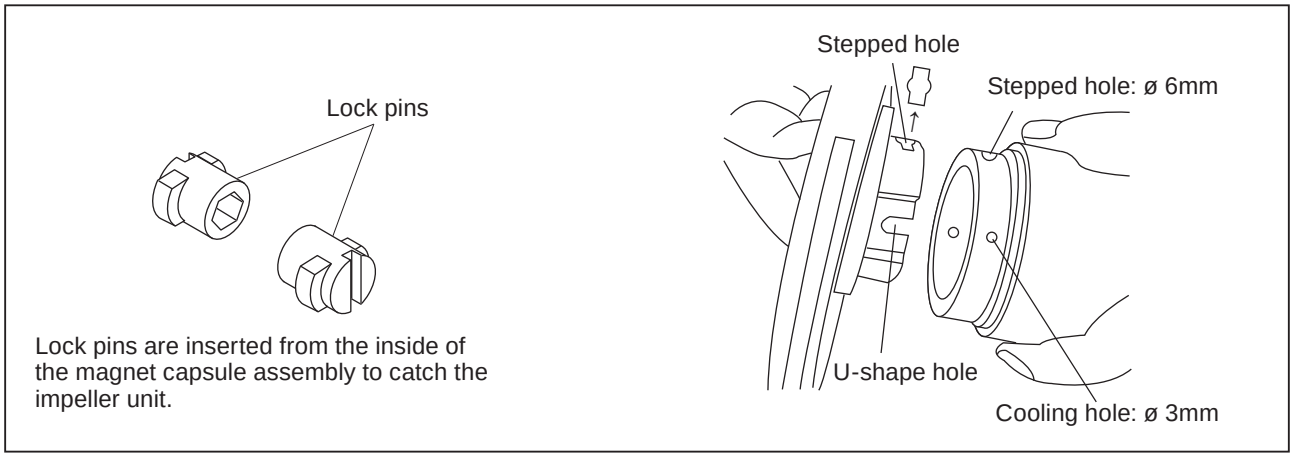
⚠CAUTION
Be careful not to get scaled with hot water.

<SMX-54>

The impeller unit is fixed to the magnet capsule unit by two lock pins. These two pins need to be removed before detaching the impeller unit.

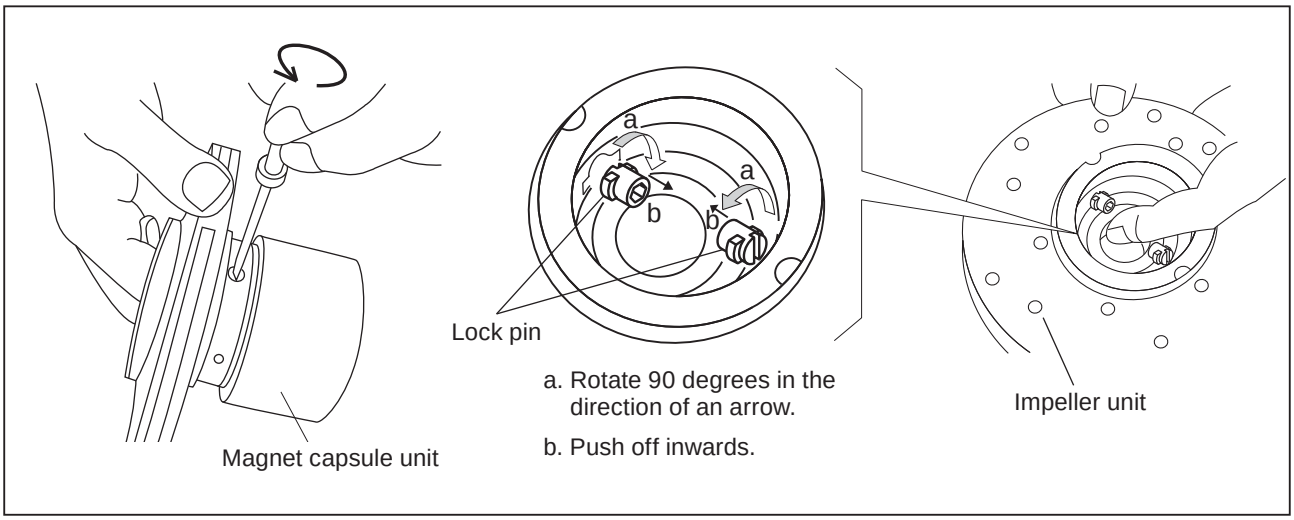
The mating surface on the magnet capsule unit has two large holes (Stepped holes: ø6mm & ø12mm at inner dia) for the lock pins and two small holes (ø3mm) for cooling.

Also, the mating surface on the impeller unit has two U-shape holes for cooling and two stepped holes for the lock pins. Press the impeller unit into the magnet capsule unit with U-shape holes on the small holes (ø3mm.).



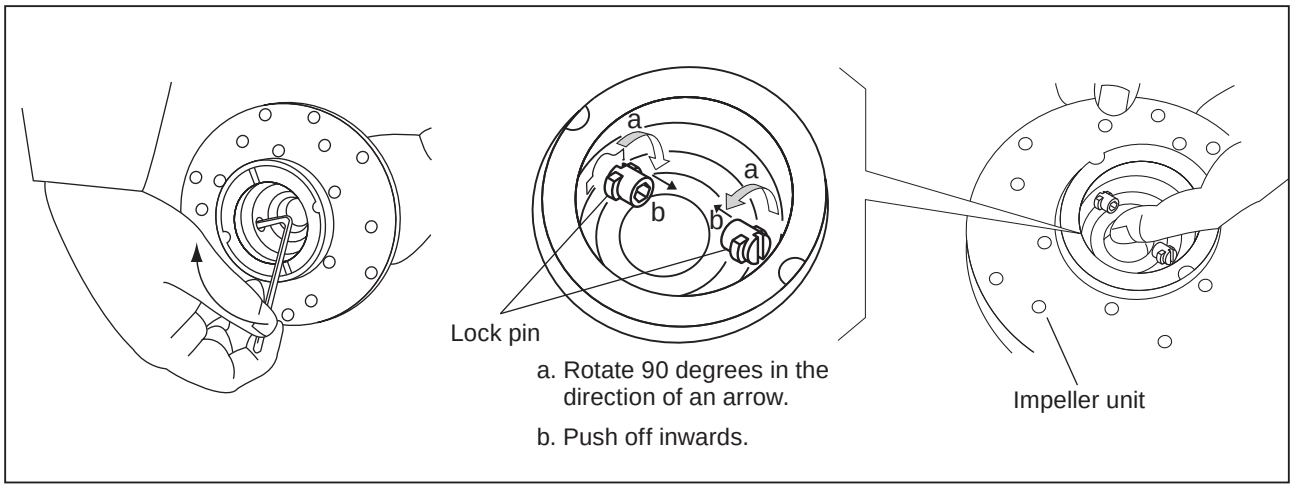
Impeller unit removal

a. Turn the lock pins 90 degrees anticlockwise, using a flathead screw driver and then push it inward to take it out. If it is hard to push the lock pins inward, slightly tap the end of driver handle.

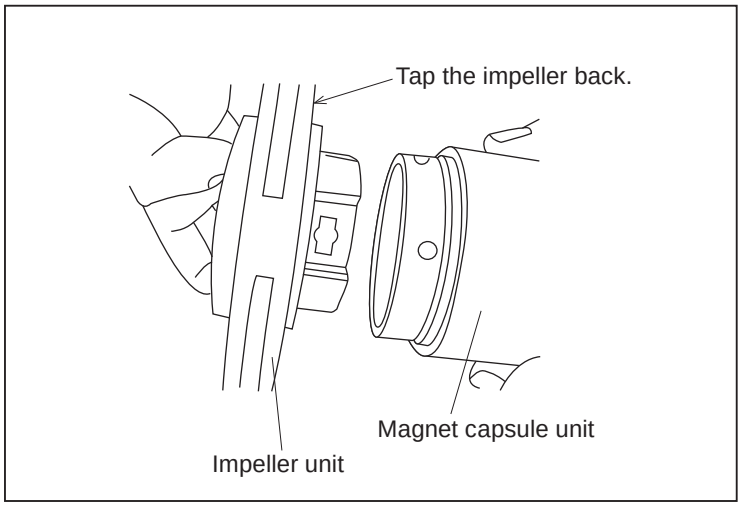


b. The lock pins can also be released by using the 4mm hex. wrench from the inner bore of the impeller unit. In this case be sure to turn the wrench clockwise. After unscrewing the pins, push it out from the outside using a bar.

NOTE: The lock pins will be damaged if it is turned in reverse direction.



c. After the lock pins are removed, tap the back side of the impeller unit by a plastic hammer while holding the magnet capsule unit.

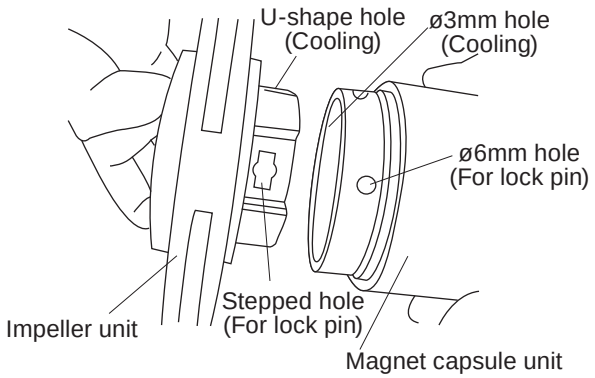


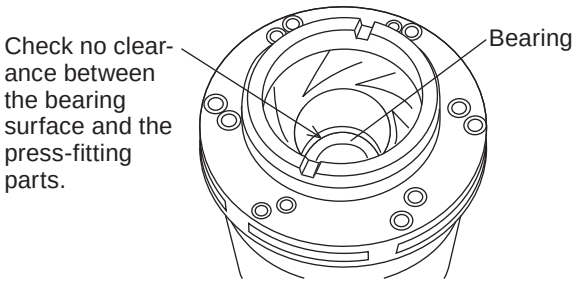
NOTE: If the impeller unit can not be removed from the magnet capsule unit in the above method, immerse the impeller unit in hot water of 80°C for five minutes. And then tap the back side of the impeller unit by a plastic hammer.

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

Impeller unit mounting

a. Press the impeller unit into the magnet capsule unit according to mating parts. Make sure that the through-hole on the magnet capsule unit comes under the U-shape hole on the impeller unit and there is no clearance between the end of press-fitting part and a bearing surface.

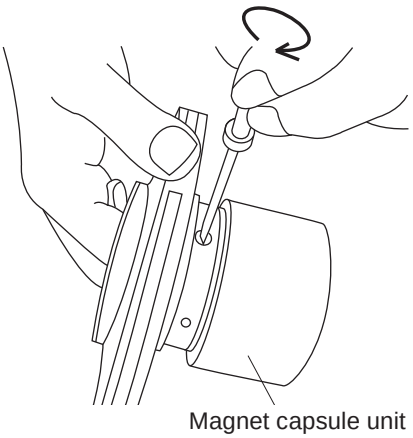


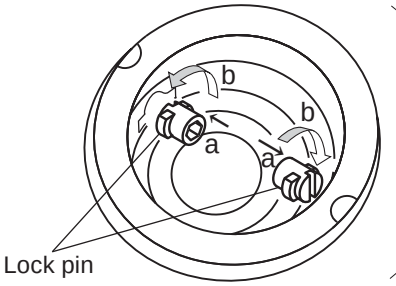


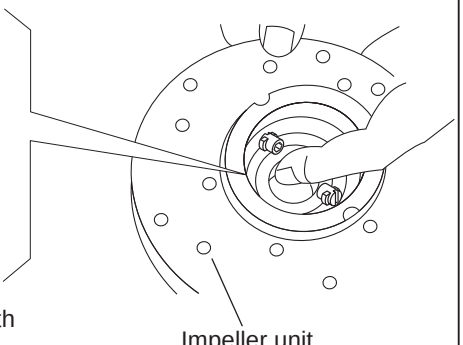
NOTE: If the fitting is too tight to pressfit the impeller unit, immerse the magnet capsule unit into hot water of 80°C for five minutes.

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

b. After fitting the impeller unit, insert the lock pins all the way seated in the lock pin holes from the inner bore. Use a flat-head screwdriver to turn the pins 90 degrees clockwise from the outside while holding the pins from the inner bore. Once it clicks, the impeller unit is secured.





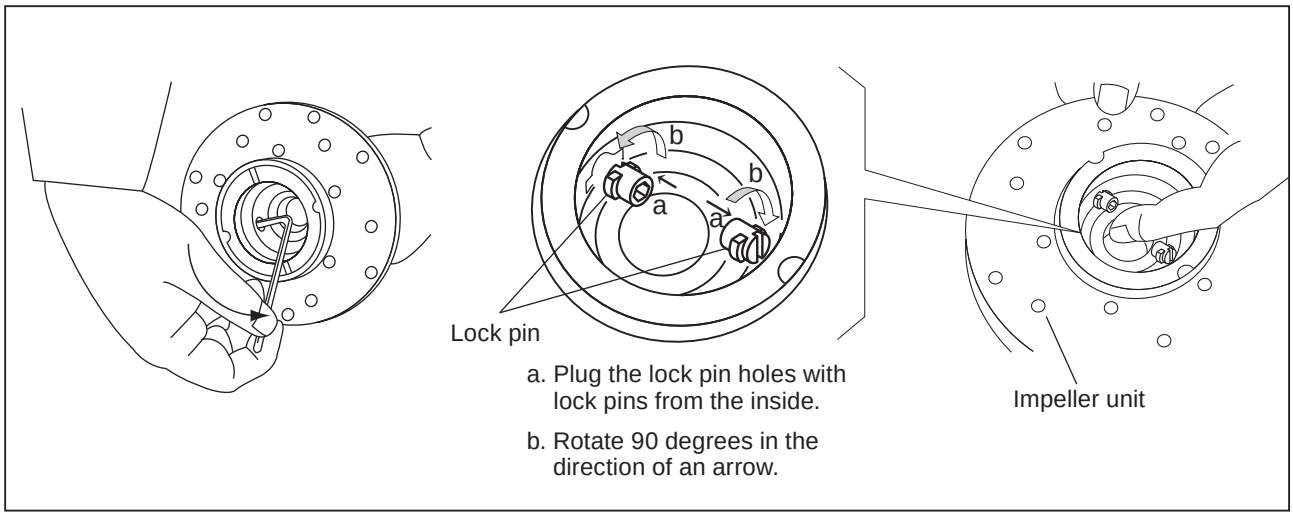


a. Plug the lock pin holes with lock pins from the inside.

b. Rotate 90 degrees in the direction of an arrow.

c. The lock pins can also be locked by using the 4mm hex. wrench from the inner bore of the impeller unit. In this case be sure to turn the wrench anticlockwise.

NOTE: The lock pins will be damaged if it is turned in reverse direction.



a. Plug the lock pin holes with lock pins from the inside.

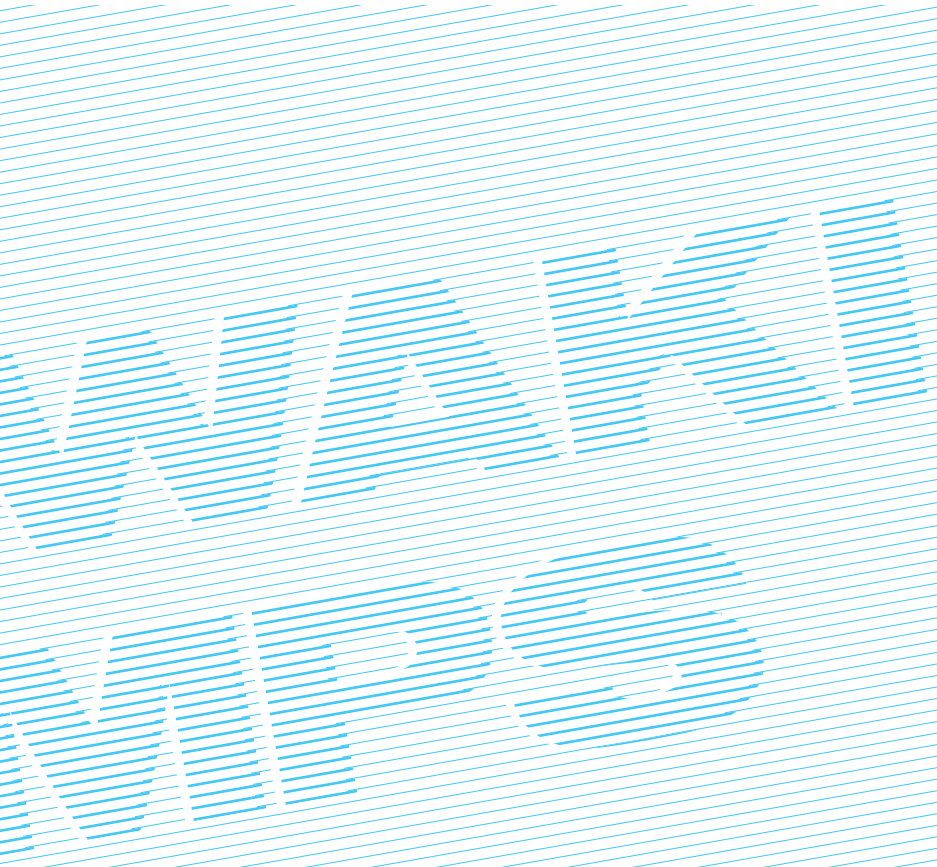
b. Rotate 90 degrees in the direction of an arrow.

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-220	0.37kW	13kg
SMX-221	0.75kW	15.5kg
SMX-222	1.5kW	16.0kg
SMX-441	0.75kW	16.0kg
SMX-442/-443	1.5kW/2.2kW	16.5kg
SMX-542/-543	1.5kW/2.2kW	24kg
SMX-545	4.0kW	32kg

*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.



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