

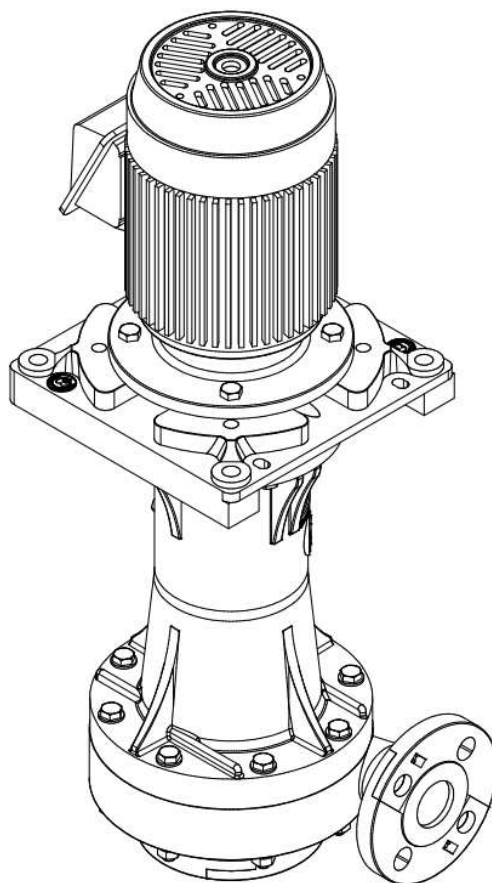
Vertical Sealless Pump

YD – AVK3, YD – AVP3 series

DRYFREE

Instruction manual

Version: 240711



 **World Chemical Co., Ltd.**

TOSHIBA MOTOR

PREFACE

Thank you very much for purchasing World Chemical's vertical sealless pump "DRYFREE".

DRYFREE is constructed of corrosion resistant materials like CFR PP (Carbon fiber reinforced polypropylene), and is both time saving and user friendly. An adequate understanding of this manual is required to maximize the pump's performance and to assure safety and long-term efficiency. Store this manual where it can be easily accessed.

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■ INSPECTION WHEN UNPACKING



Please examine the product before use.




- (1) Check the name plate that the product specification matches your order and accessories.
- (2) Check that the product has not been accidentally damaged during transport.
- (3) If the usage is changed from the time you ordered, should be contact us.

■ SAFETY PRECAUTION (To be observed at all times)

The following procedures are intended to protect you from personal injury and/or property damage.

- The following symbols classify the degree of danger and explain the damages that could occur when its contents are ignored or the pump is used improperly.
- Safety rules to be observed are classified and explained under the following symbols. (The following are examples of picture displays).

	Non-compliance can lead to fatal or serious injury.
Warning	
	Non-compliance can lead to some injury and/or property damage.
Caution	

	This symbol cautions people to be careful.
	This symbol signifies that this action must not be taken.
	This symbol indicates that the action must be taken.



WARNING



- (1) Dangerous liquid, and surroundings.

When using the pump to transfer dangerous liquids or in surroundings (only explosion prevention specifications). Observe the facility standards determined by law and daily check to prevent leakage. If the pump is operated under abnormal conditions like liquid leakage, it may cause serious accident such as personal injury, explosion or fire. Follow the maker's instructions for handling chemical liquid.



- (2) Prohibit from using damaged or modified pumps.

Using damaged or modified pumps may lead to personal injury, electric shock or the pump damage. It is not covered by our warranty.



- (3) Caution about carrying or lifting pumps.

Use the hoist bolt when the pump has it. If not, lift it by using a belt sling with careful attention of the weight balance. This operation is performed by qualified personnel and use the slings enough strong. Even the pump is the lightest one, the weight is around 30kg. Do not carry pumps by hand, because it may lead to accident.



- (4) Prohibit from operating with the power on.

Do not check the pump / motor or dismantle with the power on. It leads to personal injuries from electric shock or from getting caught in the rotor. Take multiple safety measures such as a hand switch other than the main power or operation switch.



- (5) Connecting earth cable.

Using the pump without an earth cable with the motor may cause electric shock. Connect it by qualified person in accordance with electric facilities technical standards and interior wiring regulations.



- (6) Protecting the power supply cord.

Stretching, pinching or breaking the power supply cords or motor lead wires causes fire or electric shock, because of the cable damaged. After wiring, set the terminal box at the right position.



- (7) Installing Ground Fault Interrupter (GFI)

Electric shock may be occurred if the pump is used without attaching ground fault interrupter device. Install a circuit breakers or over-current protection device to prevent electric accidents or the pump damages.



- (8) Caution when removing pumps

When removing the pump from piping, make sure to close the suction and discharge pipe valves and check no liquid leakage. Touching chemical liquid directly may cause to be harmful, so wear protective gear when working.



CAUTION



- (1) Prohibit from unapplied use.

Do not use the pump for purposes other than those specified on the nameplate. Check the motor (phase, voltage and frequency) prior, then, wire the motor. If wrong use, it may cause personal injuries or the pump and peripheral equipment damaged.



- (2) Restrictions on handler.

Carry, install, wire, operate and maintain the pump by experts who have full knowledge of the pump.



- (3) Caution when unpacking.

Unpack after checking the up and down of the packing. When unpacking a wooden crate/box, be careful to avoid injury from nails and silvers.



- (4) Ventilation.

Do not obstruct ventilation of the pump to prevent the motor overheat. If handling toxic or odorous liquids, install the pump in a well-ventilation to prevent poisoning.



- (5) Repairs and returning.

When returning the damaged pump, contact your supplier or us. If the pump is to be returned for repairs by couriers, wash it thoroughly, check no adhered liquid and wrap it with plastic bag.



- (6) Resin parts.

The pump is made of resin and may cause personal injuries for the damage by strong impact. Do not hit the pump against any objects or get it on.

Moreover, place piping supports to prevent the piping load.



- (7) At the start of the pump.

Check the rotation direction when starting the pump at the beginning. On this occasion, open the suction and discharge valves and check no liquid leakage at the pipe connection. Check the rotation direction by turning on the switch instantly after removing air in the piping and fill liquid inside. If the rotation reversed, switch two of the three phases in the three phase power supply to change the direction of rotation. It is sure to turn off the power and confirm safety before switching the two phases.



- (8) Disposing pumps.

When disposing used pumps, remove the adhered liquid and discard as industrial waste in accordance with the law.



- (9) Leak protection.

Take appropriate preventative measures to safeguard against liquid leakage in the event of a breakdown of the pump or piping.

■ MODEL DESCRIPTION

Ex. **YD – 40 01 AVK 3 – CP – D E 5 1 – □**

(1) (2) (3) (4) (5) (6) (7) (8) (9) (10)

- (1) Discharge bore : 40=40A 50=50A 65=65A
 (2) Motor output : 01=1HP/0.75kW, 02=2HP/1.5kW, 05=5HP/3.7kW, 07=7HP/5.5kW, 10=10HP/7.5kW
 (3) Model : AVK3=S.G.1.1 AVP3=S.G.1.4
 (4) Motor type : 1 = Other than IE3 motor 3 = IE3 motor
 (5) Material : CP=CFR PP
 (6) Seal type : D=with Dry seal, K=with Cut seal, W=with Dry seal & Cut seal N=無し
 (7) O-ring material : E=EPDM D=FPM
 (8) Frequency : 5=50Hz 6=60Hz
 (9) Specific gravity : 1=1.1 4=1.4
 (10) Special : V=Non-standard motor, J=Joint type, Z=Non-standard material

● AVK3 S.G.1.1

It can be used in and out of tank. Especially, it is suitable for a scrubber to circulate liquid.

● AVP3 S.G.1.4

It is used for etching machine for PWB as a high-pressure pump.

● Features

1. To spray for etching.
2. To circulate for a scrubber.
3. To circulate for a reacting or mixing tank.
4. To circulate non-electroless nickel /general plating liquid or for heat exchange.
5. To drain/replace chemical liquid.

● Material: CFR PP

● Use

1. The main body is made of high corrosive -resistant plastic. It can be used for various liquid for good heat & corrosive resistance.
2. The special impeller is adopted to reduce air entering as much as possible.
3. Less trouble for the sealless structure by heat & abrasion.
4. Each part manufactured with high dimensional accuracy to assemble molded parts. It can be used from low pressure to high pressure efficiently.
5. Cut seal is adopted as standard to prevent temporary liquid leakage by the backflow after stop the pump. (Except 400*AVK3)

■ STANDARD PERFORMANCE

AVK3

50Hz: S.G.1.1

Model	Bore		Output		Total head m	Capacity L/min	Weight kg	Liquid temperature in use degree
	Suc. A	Dis. A	HP	kW				
YD-4001AVK3-CP-D 51	50	40	1	0.75	9	150	29	0~80
YD-4002AVK3-CP-D 51	50	40	2	1.5	10	300	28	0~80
YD-5003AVK3-CP-W 51	65	50	3	2.2	12	350	33	0~80
YD-6505AVK3-CP-W 51	80	65	5	3.7	15	550	47	0~80
YD-6507AVK3-CP-W 51	80	65	7.5	5.5	18	700	74	0~80

60Hz: S.G.1.1

Model	Bore		Output		Total head m	Capacity L/min	Weight kg	Liquid temperature in use degree
	Suc. A	Dis. A	HP	kW				
YD-4001AVK3-CP-D 61	50	40	1	0.75	8	120	29	0~80
YD-4002AVK3-CP-D 61	50	40	2	1.5	8	300	28	0~80
YD-4003AVK3-CP-D 61	50	40	3	2.2	12	350	31	0~80
YD-5005AVK3-CP-W 61	65	50	5	3.7	15	550	46	0~80
YD-6507AVK3-CP-W 61	80	65	7.5	5.5	18	700	74	0~80
YD-6510AVK3-CP-W 61	80	65	10	7.5	25	850	77	0~80

For usage above 70°C, please consult with our sales department.

AVP3

50Hz: S.G.1.4

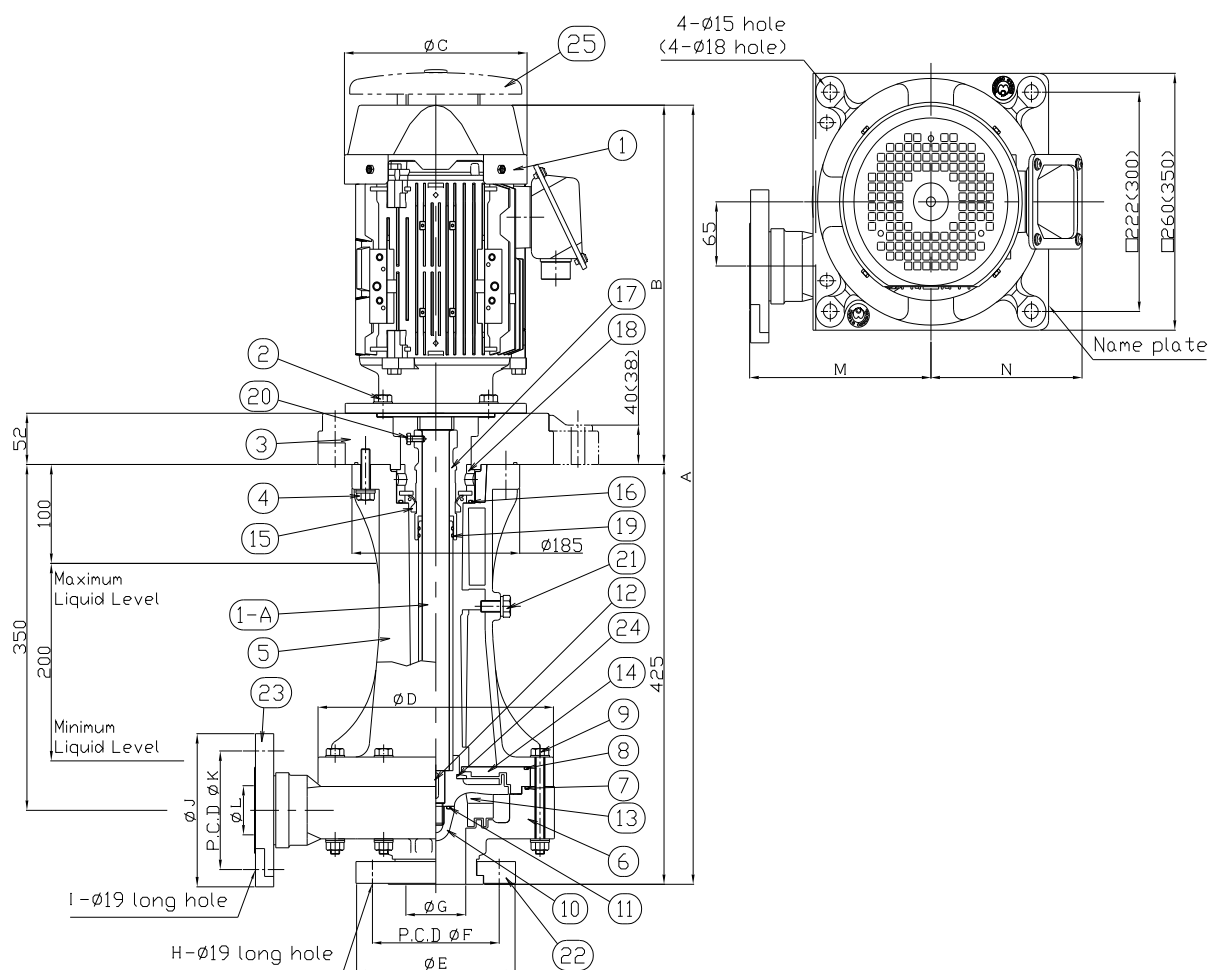
Model	Bore		Output		Total head m	Capacity L/min	Weight kg	Liquid temperature in use degree
	Suc. A	Dis. A	HP	kW				
YD-5003AVP3-CP-W 54	65	50	3	2.2	12	300	33	0~80
YD-5005AVP3-CP-W 54	65	50	5	3.7	15	430	46	0~80
YD-6507AVP3-CP-W 54	80	65	7.5	5.5	17	600	74	0~80
YD-6510AVP3-CP-W 54	80	65	10	7.5	18	750	77	0~80

60Hz: S.G.1.4

Model	Bore		Output		Total head m	Capacity L/min	Weight kg	Liquid temperature in use degree
	Suc. A	Dis. A	HP	kW				
YD-5003AVP3-CP-W 64	65	50	3	2.2	11	300	33	0~80
YD-5005AVP3-CP-W 64	65	50	5	3.7	15	430	46	0~80
YD-6507AVP3-CP-W 64	80	65	7.5	5.5	22	400	74	0~80
YD-6510AVP3-CP-W 64	80	65	10	7.5	20	750	77	0~80

For usage above 70°C, please consult with our sales department.

OUTLINE DIMENSION



The dimension of () is for the pump assembled with the motor 5.5kW, 7.5kW and more.

No.25 is Option.

Parts list

No.	Part name	Material	Qty	Remarks
1	Motor		1	
1-A	Shaft	SUS304	1	
2	Hex. bolt	SUS304 / Titanium	4	M10 x 30 with W
3	Base	GFR PP	1	
4	Hex. bolt	SUS304 / Titanium	8	M10 x 40 with W
5	Connecting pipe	CFR PP	1	
6	Casing	CFR PP	1	
7	O-ring for casing	EPDM / FPM	1	AS568-260
8	O-ring for back plate	EPDM / FPM	1	AS568-260
9	Hex. bolt & Nut	SUS304 / Titanium	8	M10 x 100 with W, SW, N
10	Impeller nut	CFR PP	1	
11	O-ring for impeller nut	EPDM / FPM	1	P-24
12	Key	SUS316	1	
13	Impeller with shaft sleeve	CFR PP ・ SUS304	1	
14	Back plate	CFR PP / PP	1	
15	Dry seal	FPM	1	
16	O-ring for seal case	EPDM / FPM	1	AS568-233
17	Dry seal holder	CFR PP ・ SUS304	1	
18	Seal case	GFR PP ・ Ceramics	1	
19	O-ring for shaft sleeve	EPDM / FPM	2	44
20	Hex. bolt	SUS304	1	M6 x 15
21	Hex. bolt	PVC ・ NBR	1	M12 x 25 with O-ring
22	Split flange (Suction)	CFR PP	1set	
23	Split flange (Discharge)	CFR PP	1set	
24	Cut seal	FPM	1	
25	Drip-proof cover	SPC	1	Option

*1: No.17, 19 and 20 are not attached with the motor. (5.5kW and more).

*2: No.24 "Cut seal" is not attached with the high temperature type pump.

*3: No.24 "Cut seal" is not attached with YD-400□AVK3.

*4: The material of Back plate (No.14) for YD-4001AVK3-CP-D 61 & YD-5003AVP3-CP-W 64 is PP.

*5: The dimension of the joint type pump is different. Refer to the drawings.

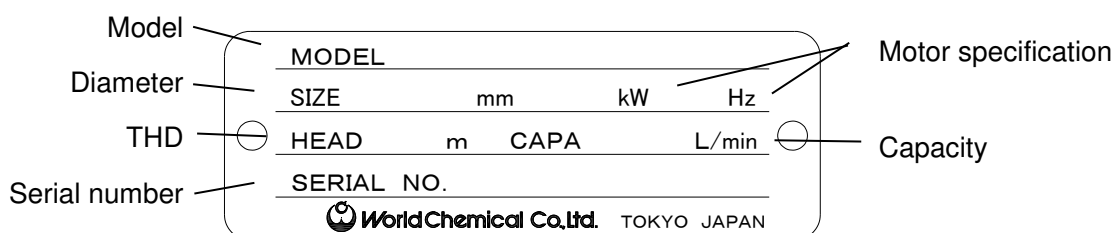
*6: Remove the hex. bolt and O-ring (No.21) and before using the in-tank type pump.

*7: The nameplate is attached on the terminal box of the motor (No.1) and on the left side of the side of the base (No.3).

*8: The bolt (No.2) of the pump with 3.7kW motor is changed to M12 x 35.

*9: The O-rings (No.7 and 8) for 500□AVK and 65□□AVK are change to AS568-265.

*10: The water-proof cover is optional.



Dimension

AVK3

50Hz: S.G.1.1

Model	Bore (A)		Output (kW)	A	B	ϕ C	ϕ D	ϕ E	ϕ F	ϕ G	H	I	ϕ J	ϕ K	ϕ L	M	N
	Suc.	Dis.															
YD-4001AVK3-CP-D 51	50	40	0.75	745	320	170	230	155	120	58	4	4	145	105	42	170	152
YD-4002AVK3-CP-D 51	50	40	1.5	789	364	202	230	155	120	58	4	4	145	105	42	170	168
YD-5003AVK3-CP-W 51	65	50	2.2	789	364	202	260	175	140	66	4	4	155	120	50	200	168
YD-6505AVK3-CP-W 51	80	65	3.7	836	411	243	260	190	150	78	8	4	175	140	63	200	187
YD-6507AVK3-CP-W 51	80	65	5.5	874	449	285	260	190	150	78	8	4	175	140	63	200	263

60Hz: S.G.1.1

Model	Bore (A)		Output (kW)	A	B	ϕ C	ϕ D	ϕ E	ϕ F	ϕ G	H	I	ϕ J	ϕ K	ϕ L	M	N
	Suc.	Dis.															
YD-4001AVK3-CP-D 61	50	40	0.75	745	320	170	230	155	120	58	4	4	145	105	42	170	152
YD-4002AVK3-CP-D 61	50	40	1.5	789	364	202	230	155	120	58	4	4	145	105	42	170	168
YD-4003AVK3-CP-D 61	50	40	2.2	789	364	202	230	155	120	58	4	4	145	105	42	170	168
YD-5005AVK3-CP-W 61	65	50	3.7	836	411	243	260	175	140	66	4	4	155	120	50	200	187
YD-6507AVK3-CP-W 61	80	65	5.5	874	449	285	260	190	150	78	8	4	175	140	63	200	263
YD-6510AVK3-CP-W 61	80	65	7.5	874	449	285	260	190	150	78	8	4	175	140	63	200	263

AVP3

50Hz: S.G.1.4

Model	Bore (A)		Output (kW)	A	B	ϕ C	ϕ D	ϕ E	ϕ F	ϕ G	H	I	ϕ J	ϕ K	ϕ L	M	N
	Suc.	Dis.															
YD-5003AVP3-CP-W 54	65	50	2.2	789	364	202	260	175	140	66	4	4	155	120	50	200	168
YD-5005AVP3-CP-W 54	65	50	3.7	836	411	243	260	175	140	66	4	4	155	120	50	200	187
YD-6507AVP3-CP-W 54	80	65	5.5	874	449	285	260	190	150	78	8	4	175	140	63	200	263
YD-6510AVP3-CP-W 54	80	65	7.5	874	449	285	260	190	150	78	8	4	175	140	63	200	263

60Hz: S.G.1.4

Model	Bore (A)		Output (kW)	A	B	ϕ C	ϕ D	ϕ E	ϕ F	ϕ G	H	I	ϕ J	ϕ K	ϕ L	M	N
	Suc.	Dis.															
YD-5003AVP3-CP-W 64	65	50	2.2	789	364	202	260	175	140	66	4	4	155	120	50	200	168
YD-5005AVP3-CP-W 64	65	50	3.7	836	411	243	260	175	140	66	4	4	155	120	50	200	187
YD-6507AVP3-CP-W 64	80	65	5.5	874	449	285	260	190	150	78	8	4	175	140	63	200	263
YD-6510AVP3-CP-W 64	80	65	7.5	874	449	285	260	190	150	78	8	4	175	140	63	200	263

■ CAUTION WHEN INSTALLING, LAYING PIPES

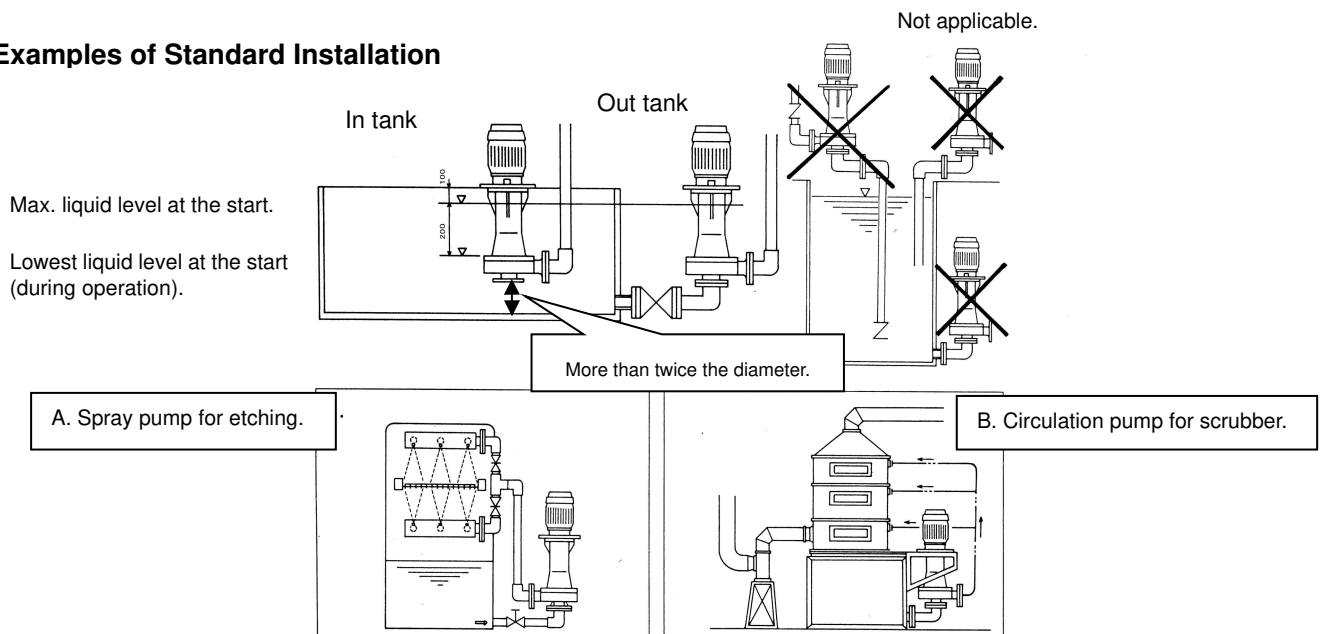
1. Installation height and liquid level in a suction tank

The pump does not have a fixed sliding type seal such as mechanical seals or gland packing. Regarding the installation height, refer to the below picture.

The standard liquid level of a suction tank is from the upper level to the lower level, but when the pump is set at the upper level, the liquid rises to the top of the pump and it may cause liquid leakage at the pump stop or re-start according to the piping or the condition of the attendant equipment.

If there is an attendant equipment at the discharge outlet such as a filter which has liquid pools, install a check valve between the pump and piping to prevent backflow.

Examples of Standard Installation



2. Caution about the operation which is unconfirmed joint and seal parts

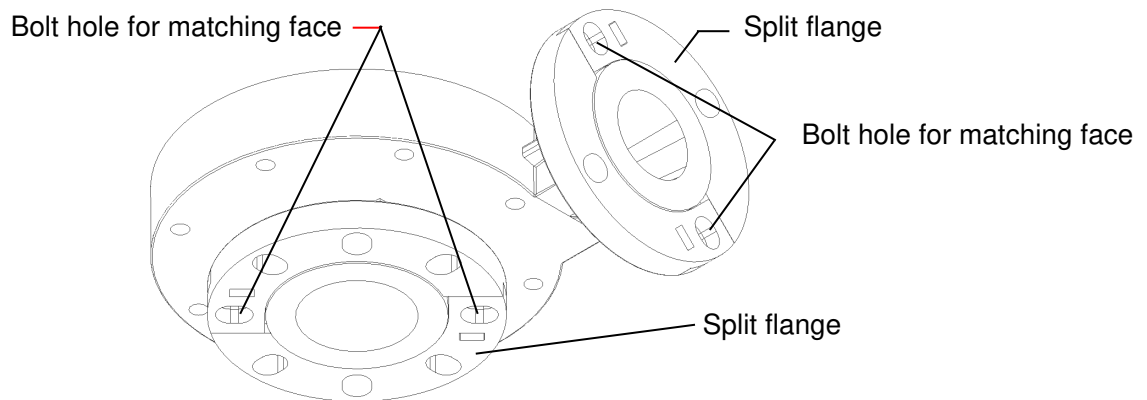
When operating the pump for the first time after installation or re-assembly, check primed water inside and air released. Also, make sure to check the condition of seals of that pump and suction/discharge connection. Operate the pump without liquid leakage and air suction.

3. Installation position and placement

- The Installation position is as near as the suction tank and set the liquid level in the standard range. (Suction flooded). It is possible to use the pump outdoors, not only indoors (Indoor type pump is indoor only) but take safety measures not to badly affect the motor or wire at the emergency such as flooded.
- Anchor the pump vertically on level surface where there is no influence of other machine's vibration. Take a sufficient space around the pump for easy access for maintenance and the motor cooling fan. Ensure to fix the pump mount not to occur vibration.

4. Piping

- For the connection of suction/discharge flanges, use M16 bolt and tighten them evenly with an appropriate torque. M16 bolt: Recommended torque: 19.6N·m (200kgf·cm)
The flange is split type and start to tighten from the bolt on the matching face evenly.



- Employ the flooded suction method at the suction inlet and shorten the pipe with less bending. Place piping supports not to apply the piping load and thermal stress.
- Do not allow spaces where air stays. It causes air lock (Dry running).
- When transferring high-temperature liquid, saturated steam pressure rises and the suction ability is decreased. To prevent cavitation, use pipes with one size larger diameter or shorten the pipe with as less bending as possible.
- Place piping supports not to apply load of discharge pipe to the pump.
- If it is possible for the piping to be expanded by high temperature liquid, the pump may be damaged by expansion. Therefore, install the extendable or flexible joint to prevent the load to the pump at the expansion.
- When placing a screen such as a strainer at the suction inlet, periodically clean it. Clogging makes the pump ability and performance decreased.
- If the piping is long, the specified performance may not obtain by increased piping resistance. Determine the pipe diameter by calculating it.
- Install valves that induce less pressure loss on the suction/discharge pipes with consideration for maintenance and accessibility.

5. Wiring



Handle electrical wiring and power source setup by only qualified people. When personal injury and equipment damage occur against the advice, we accept no responsibility. If necessary, consult with your supplier or us. For wiring, abide by the local and national electrical codes.

- Use an electromagnetic switch that conforms to the specifications of the pump motor (voltage, watt, etc.).
- When using the pump outdoors, wire and set the switches without rainwater and moisture.
- Install the electromagnetic switch and push button at a reasonable distance from the pump.

■ CAUTION WHEN OPERATING

1. General cautions



- In the event of cavitation, stop the pump immediately and do not operate the pump with air trapped.
- If the pump is operated with closed, the temperature of the pump inside rises and it causes the pump failure.
- Turn off the power switch immediately when power outage occurs in operation.
- When transferring high-temperature liquid, the pump surface becomes very hot, so install a protection device to prevent burn injury.

2. Before operation

When operating the pump for the first time after installation or after long-term suspension, prepare for operation as described below.

- Add liquid after cleaning the inside of the pipe and the tank.
- Check no loosened flange bolt or base bolt and re-tighten them.
- Add priming liquid into the pump and release air in the pump and piping.
- Run the motor momentarily to check the direction of motor's rotation after adding priming liquid into the pump (or after checking the pump filled with liquid). The rotation direction is clockwise as viewed from the motor fan. Follow the arrow on the motor casing. If the motor rotates in reverse, stop the pump immediately and switch two wires of the three-phase power wires after the power off.

3. Operation

Check the valves open/close after the preparation. When the operation starts continuously, check that the flow rate and pressure are appropriate specified points.

4. When stopping operation



When turn off the power, the pump stops slowly. If it is not smooth, check the inside of the pump.

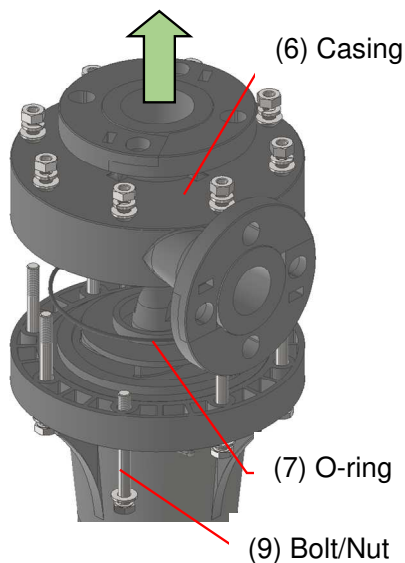
In case of long-term suspension of operation, withdraw inside liquid from the pump, wash inside and close the suction/discharge valves.

■ DISASSEMBLY / ASSEMBLY PROCEDURE

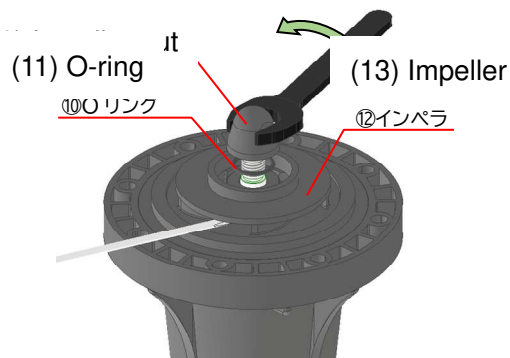
- ※ Dry seal holder (No.17), O-ring (No.19) and bolt (No.20) are not attached with the pump with the motor (5.5kW and more).
- ※ Cut seal (No.24) is not attached with the pump for high temperature liquid.
- ※ YD-400*AVK3 does not have Cut seal (No.24).
- ※ The parts structure of the joint type pump is different. Refer to the drawing for the appropriate pump.

□ DISASSEMBLY PROCEDURE

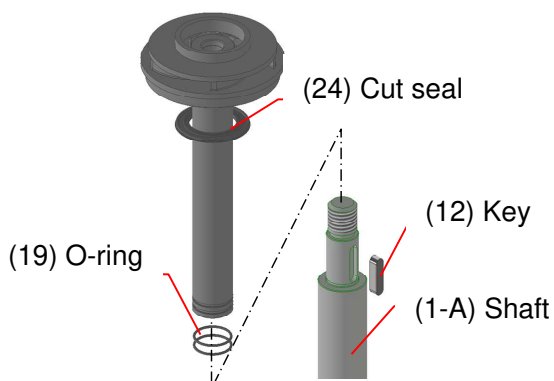
1. Wash the inside of the pump which is removed from the mounting with water and disassemble it.
At that time, put the pump the motor-side down. It is easy to disassemble the pump.



2. Remove the bolts/nuts (9) for casing and pull out the casing (6) and O-ring (7).



3. Fix the blade with a river not to rotate and turn the impeller nut (10) anticlockwise with a wrench, then remove the impeller (13). O-ring (11) is also separated

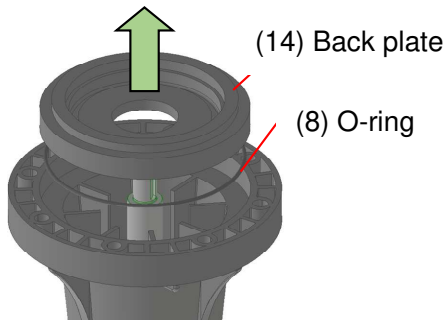


4. Pull the impeller (13) out from the pump shaft (1-A). The O-ring (19), cut seal (24) and key (12) are separated.

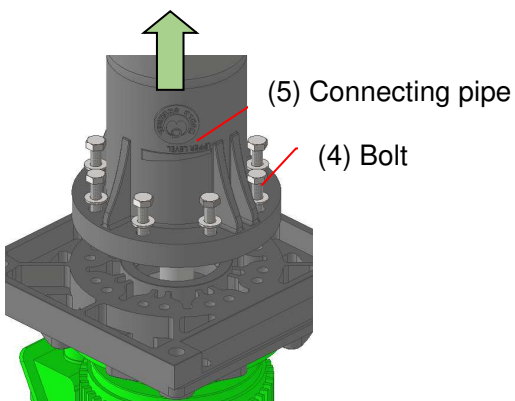
* If the impeller cannot be come out,

- Remove the hex. bolt (4) of the connecting pipe.
- Hit the flange of the connecting pipe by a plastic hammer lightly and remove the impeller.

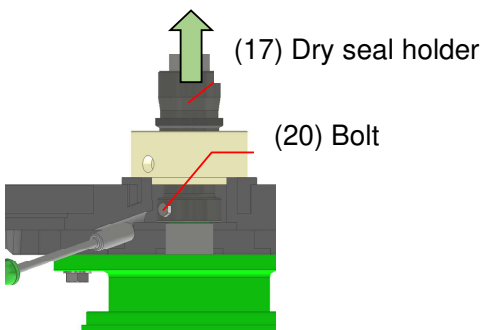
5. Remove the back plate (14) and O-ring (8).



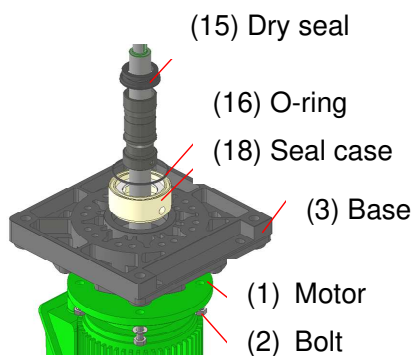
6. Remove the bolt (4) and pull the connecting pipe (5).



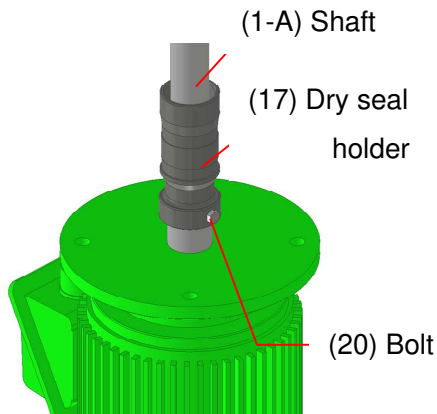
7. Remove the dry seal holder (17). Put a box driver (for M6) through the side hole of the base (3). Pull the dry seal holder (17) out from the pump shaft (1-A) after removing the bolt (20).



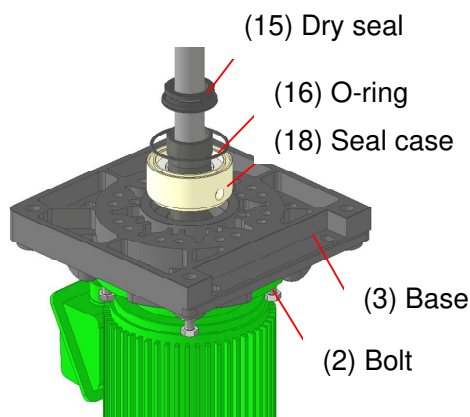
8. Remove the seal case (18) from the base (3). The O-ring (16) and dry seal (15) are also separated. The base (3) is separated from the motor (1) after removing the bolt (2). The pump disassembly procedure is completed.



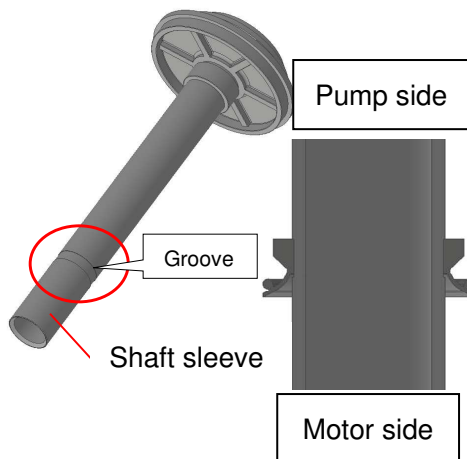
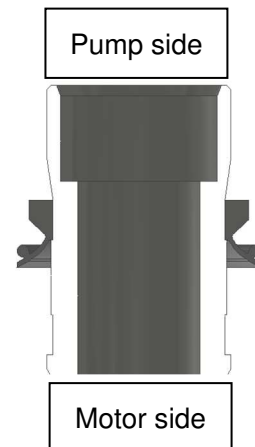
□ Assembly procedure (Note: Replace O-rings, gaskets and sealings to new ones when assembling.)



1. Place the pump the motor (1) fan-side down. Wipe dirt or foreign objects on the pump shaft (1-A) with a cloth.
2. Put the dry seal holder (17) to the pump shaft (1-A). Fit the bolt hole of the dry seal holder (17) and the hole at the bottom of the pump shaft (1-A) and fix them with the bolt (20) by using a box driver (for M6).

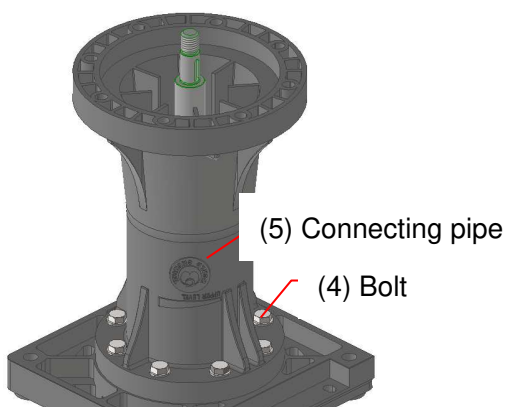


3. Attach the base (3) to the motor (1) and fix them with the bolt (2).
The torque of the bolt (2) is $9.8\text{N}\cdot\text{m}$ ($100\text{kgf}\cdot\text{cm}$).
4. Attach the seal case (18), O-ring (16) and dry seal (15) to the base (3) in this order.
Place the dry seal (15) at the position of the dry seal holder (17) as follows.

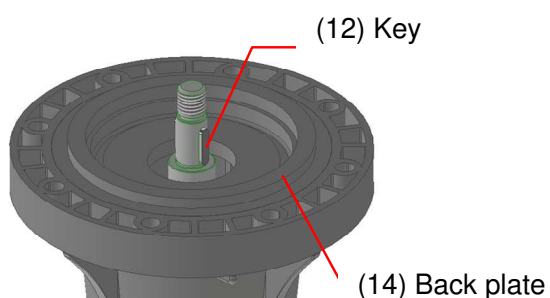


Note:

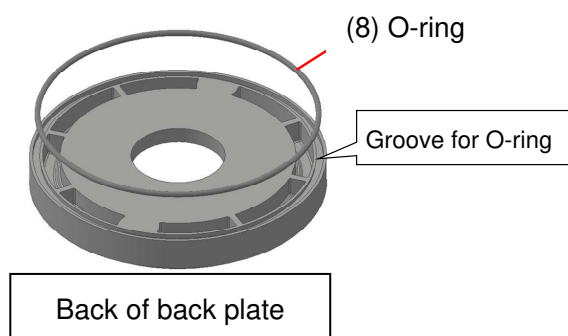
The dry seal holder (17), O-ring (19) and Bolt (20) are not attached with the pump assembled with the motor 5.5kW and more. However, it is necessary to put the dry seal and attach it with the groove of the shaft sleeve like the left picture.



5. Attach the connecting pipe (5) to the base (3) and fix them with the bolt (4).
The torque of the bolt (4) is 9.8N•m (100kgf•cm).

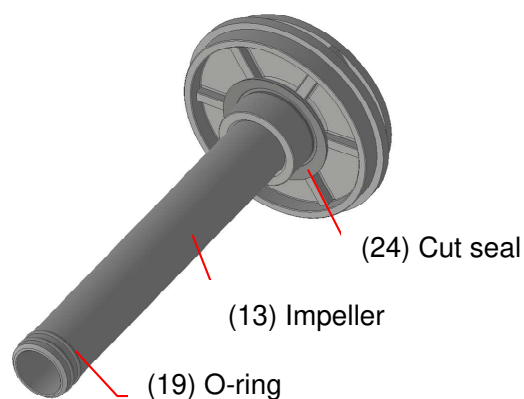


6. Insert the O-ring (8) to the back plate (14) and install it to the connecting pipe (5).
7. Attach the key (12) on the tip of the pump shaft (1-A).

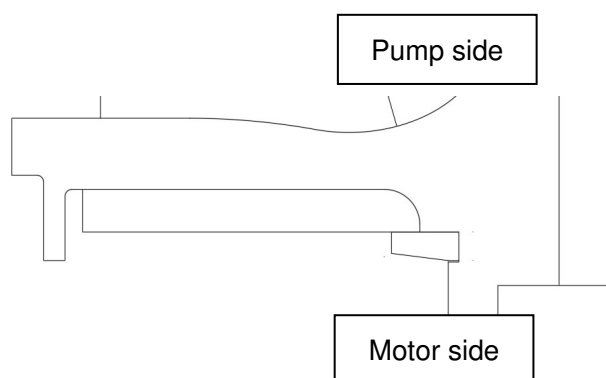


Note:

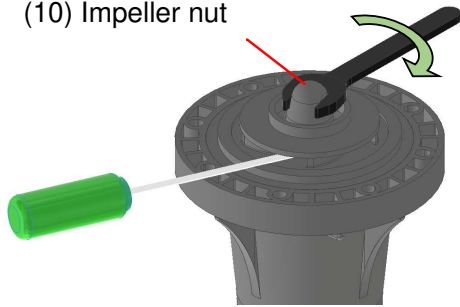
The shape of the back plate may be different from the left picture depending on the pump model.



8. Attach the cut seal (24) and O-ring (19) to the impeller (13) in this order. The cut seal should be attached that the flat surface faces the impeller . (13)



(10) Impeller nut

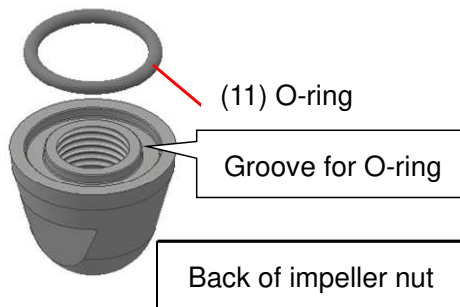


9. Match the impeller (13) to the key groove, insert it to the pump shaft (1-A) and fix them with the impeller nut (10).

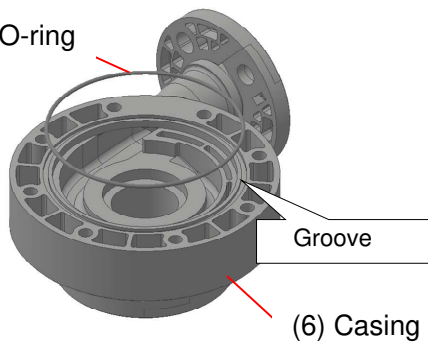
Install the O-ring (11) into the impeller nut (10).

As with the disassembly procedure 3, fix the blade with a wrench not to rotate and tighten it clockwise.

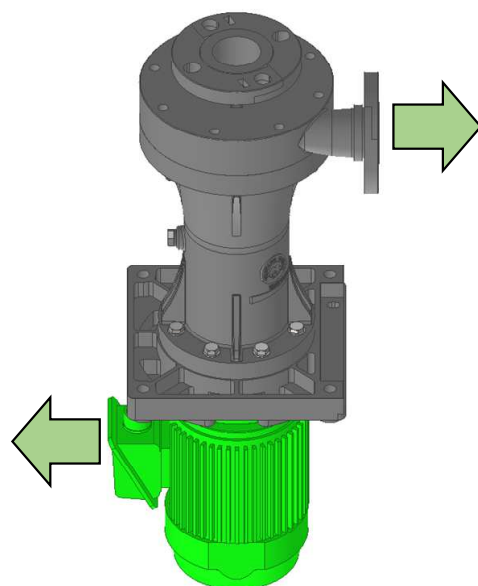
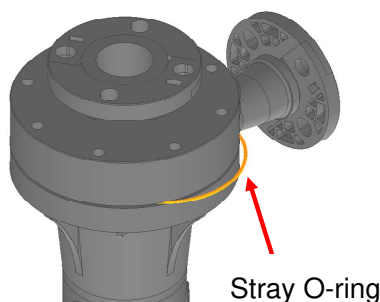
The torque is $9.8\text{N}\cdot\text{m}$ ($100\text{kgf}\cdot\text{m}$).



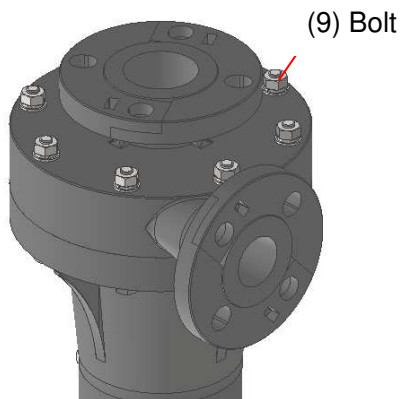
(7) O-ring



10. Attach the O-ring (7) to the casing (6). Then, install the casing (6) to the connecting pipe (5) that the discharge flange is placed oppositely from the terminal box of the motor. At that time, check that O-ring (7) hangs out between the casing (6) and connecting pipe (5).



Direction to place the casing.



11. Fix the casing (6) with the bolt (9). Tighten the bolt diagonally not to unevenly.

The torque is $9.8\text{N}\cdot\text{m}$ ($100\text{kgf}\cdot\text{m}$).

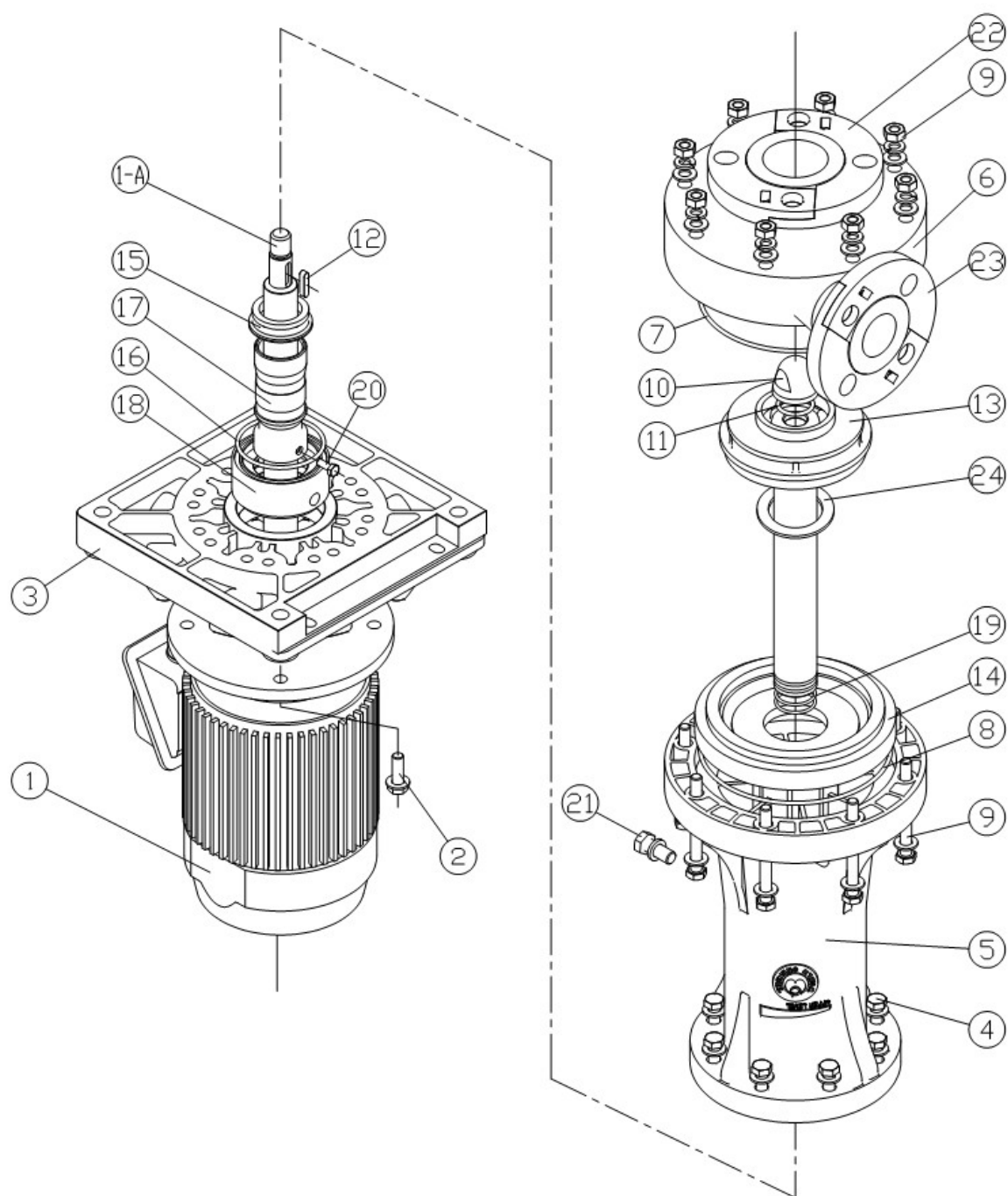
After installation, put your hand into from the suction inlet and check that the impeller (13) rotates smoothly.

The pump assembly is completed for the procedure from 1 to 11.

- Torque for reference.

Bolt for motor (2), Bolt for connecting pipe (4), Bolt for casing (9) and Impeller nut (10) : $9.8\text{N}\cdot\text{m}$ ($100\text{kgf}\cdot\text{cm}$)

■ EXPLODED VIEW



■ TROUBLESHOOTING

If the failure cause is unknown, stop the operation immediately and contact your supplier.

Problem	Sympton on pump		Cause	Check & Measures
	When the discharge valve is closed.	When the discharge valve is opened.		
No pumping		The pressure gauge & vacuum gauge indicate zero.	● Liquid level is lower than the minimum liquid level.	○ Stop the pump, fill with priming liquid and re-start it.
	Liquid does not go into the pump.		● The strainer is clogged. ● Improper suction piping. ● The liquid level in suction tank is declined.	○ Clean the strainer. ○ Check no clogged pipes. ○ Adjust the liquid level.
	When the discharge valve is opened at the start of the operation, the pressure is decreased.	The reading of the pressure and vacuum gauge shakes and drops to zero.	● Air enters through suction pipe or gaskets.	○ Check the suction flange is sealed. ○ Check the abnormal lowering of the suction liquid level. ○ Check the voltage is normal.
	Pumping failure when re-starting the pump after suspension.	No pumping when re-starting the pump after suspension.	● Air lock. Air accumulation in the suction pipe.	○ Release air in pipes. ○ Check pips and modify air pocket section. ○ Back flow liquid enters at the pump stoppage. Adjust pipes to exhaust air to the suction tank / clean the strainer not to clog.
	The pressure gauge readings remain low at all time.		● Pump rotation failure. ● Pump rotation in reverse.	○ Check wiring and the motor. ○ Switch wiring.
Dischrge quantity is not enough.		The reading of the vacuum gauge is high.	● The strainer and the suction pipe are clogged.	○ Clean the striner and remove foreign objects.
	The reading of the pressure gauge and vacuum gauge is normal.	Vibration occurs.	● The impeller is clogged.	○ Remove foreign objects.
		The reading of the pressure and vacuum gauge fluctuates.	● Air enters from the suction pipe or gasket.	○ check the joints of the suction pipe and re-tighten.
			● The discharge outlet is clogged.	○ Remove foreign objects inside the pump and scales in the pipe.
		The reading of the pressure gauge is high, but the vacuum gauge is normal.	● There is resistance in the discharge pipe / Actual head or coefficient of loss is high.	○ Check the actual pump head and coefficient of loss in the discharge pipe and take measures.
	The reading of the pressure gauge and vacuum gauge is low.	The reading of the pressure gauge and and vacuum gauge is low.	● Reverse rotation	○ Switch wiring.
Motor heats up			● The voltage decreases. ● Overload. ● The ambient temperature is high.	○ Check the voltage and frequency. ○ Ccheck the flow rate, liquid specific gravity and viscosity. ○ Well-ventilation.
Sudden loss of discharge quantity		The reading of the vacuum gauge is high.	● The strainer is clogged.	○ Remove foreign objects.
			● Base defect. ● Bolts are loosened. ● The suction pipe is clogged / Cavitation occurs. ● The impeller comes into contact with the casing. ● The motor and bearing are worn.	○ Re-install the pump. ○ Re-tighten bolts. ○ Clean and remove the cause for cavitation. ○ Remove the cause or replace the parts. ○ Replace the motor or bearing.

■ MAINTENANCE

◆ Daily check

- Check for no liquid leakage before operation. If any, stop the operation and take measures.
- Check that pump works smoothly without abnormal noise or vibration.
- Check for the liquid level in the tank and the suction pressure.
- Compare the flow rate, discharge pressure and current value during operation to those values indicated on the nameplate, and check that pump load is normal.

Note: The indication of the pressure gauge is proportionate to the specific gravity of the liquid.

- If spare pumps are available, keep it ready for use by operating it from time to time.
- Check that the discharge pressure, flow rate and motor current/voltage during operation is fluctuated. If they fluctuate greatly, see *Troubleshooting* and take proper actions.

◆ Periodical check

To use the pump smoothly, carry out the periodical check as follows. When an overhaul, handle carefully not to scratch seal parts.

Check term	Parts name	Check points	Measures
Once 12 months or Once 1,000 hours *Leave the check records.	Motor	<ul style="list-style-type: none"> ● Sound of bearing during operation. ● Vibration. ● Looseness of the base bolts. 	<ul style="list-style-type: none"> ○ Replace the bearing. ○ Contact your supplier. ○ Re-tighten bolts.
	Connecting pipe	<ul style="list-style-type: none"> ● Scratch, flaw, crack. ● Corrosion. ● Deformation. ● Liquid leakage from seal parts. 	<ul style="list-style-type: none"> ○ Replace the parts. ○ Replace the parts. ○ Remove load on piping if any. ○ Replace the O-ring if liquid leakage.
	Casing	<ul style="list-style-type: none"> ● Scrach, flaw, crack. ● Scale buildup inside of the WPK. ● Swlling and corrosion of the O-ring. 	<ul style="list-style-type: none"> ○ Replace the parts. ○ Remove scales. ○ Replace the parts. (When disassembly, replace to the new O-ring.)
	Impeller	<ul style="list-style-type: none"> ● Sliding mark on the impeller . ● Corrosion. ● Looseness of impeller nut. 	<ul style="list-style-type: none"> ○ Replace the parts. ○ Replace the parts. ○ Remove the nut / impeller and check for corrosion on shaft and re-tighten it. If shaft is corroded, contact your supplier.
	Seal case	<ul style="list-style-type: none"> ● Abrasion & corrosion of the oil seal. 	<ul style="list-style-type: none"> ○ Replace the parts if it is corroded or worn away greatly.

Warranty / Repair

1. Warranty period and coverage

- (1) The warranty period is 12 months from dispatched from our factory.
- (2) During warranty period, if the pump breaks down or is damaged at the use under the condition instructed in this manual due to manufacturing defect(s), the failure parts are repaired free of charge.
- (3) Even if the failure occurs within the warranty period, the followings are repaired or replaced for compensation in principle.
 - Breakdown or damage due to different use or safekeeping from the instructions in this manual.
 - Breakdown or damage due to incorrect use or unjust repair or modification.
 - Breakdown or damage as result of pollution, salt damage, gas damage, abnormal voltage or undesigned power (voltage, frequency) as well as fire, earthquake, flood disaster, lightning strike or other natural disaster.
 - Abrasion or degradation of consumable parts like a gasket or O-ring.
 - Breakdown or damage during transportation, for relocation or fall after your purchase
- (4) We cannot be responsible for the break down or damage of the customer-specified pump.
- (5) Irregularities or breakdowns due to chemical or hydrodynamic corrosion by liquid are not covered under the warranty. The material chosen at the time of the contract is only a recommendation. We do not guarantee the chemical resistance of the material.
- (6) If the determination of the cause for the breakdown or damage is questionable, it attributes to the negotiation between the customer and us.
- (7) Expenses or other damage incurred as a result of breakdowns at the use under the different condition from the instruction in this manual are not covered under the warranty.

2. Repair

Notice:

For repair, consult the supplier. When returning a pump, thoroughly clean and pack the wet parts kit.

If irregularities are detected during operation, stop the operation immediately for check. (Refer to the section on “troubleshooting”).

- (1) Consult your supplier or us for repair.
- (2) Read this manual again and re-check before requesting repair.
- (3) When visiting to a distance location for repair, the travel expenses are charged.
- (4) Inform the followings when requesting repair.
 - Model name and serial number
 - Use duration and condition
 - Damages parts and condition
 - Liquid (Name, Specific gravity, Temperature, Slurry)

If liquid leaks during transportation, it is very dangerous, so make sure to clean inside thoroughly. When ordering replaced parts, specify the name in the parts name list (P6). Although, inform the parts' number and material, too.

Installation record

Model:	
Purchase date:	Serial number:
Start date:	Supplier:



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