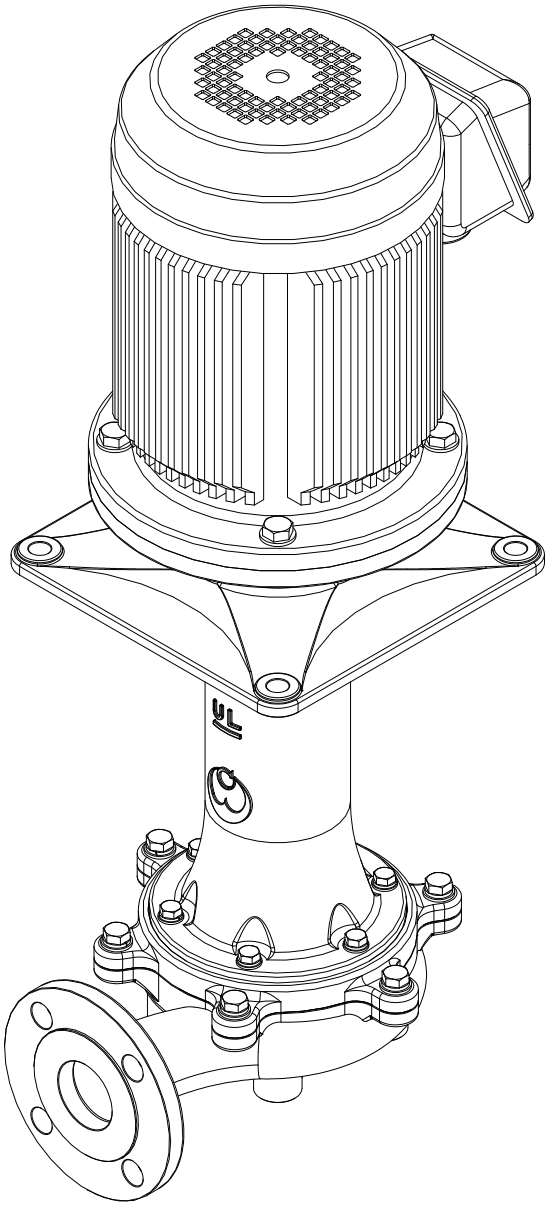
STAINLESS VERTICAL SEALLESS PUMP

DRYFREE-S

YD-LON3-SU

INSTRUSTION MANUAL

Version: 230419



World Chemical CO.,LTD.

Preface

Thank you very much for purchasing World Chemical's stainless vertical sealless pump, DRYFREE S. It is mainly made of high corrosion resistant material, SUS16 (Equivalent to SUS316L), and it is easy to maintain and operate. To use the pump effectively for an extended period of time, proper operation and maintenance are necessary. Please read this instruction manual carefully before use. The specification of the product and the contents of the manual is subject to change without notice for improvement or design change.

ATTENTION:

- Be sure that a person who will handle the pump keeps this instruction manual.
- Store this instruction manual with care where it can be easily accessed.

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STAINLESS VERTICAL SEALLESS PUMP

YD-LON3-SU type

ATTENTION

When piping at the suction side, use the bolt in consideration of the tap depth of the casing as follows, the thickness of the suction flange and packing.

MODEL	BOLT SIZES
YD-400*LON3-SU (all types)	M 16 x 16 mm
YD-500*LON3-SU (all types)	M 16 x 16 mm

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)

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

	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) Use for dangerous liquid or at surrounding

When using the pump to transfer dangerous liquid or at surroundings (only explosion prevention specifications) adhered to the standard at law and make sure to daily check without liquid leakage. If the pump is operated under abnormal conditions such as liquid leakage, it leads to serious accidents such as explosion, fire or personal injuries. Also follow the manufacturers' instructions about the treatment of the liquid.

(2) Prohibit to use damaged or modified pump

Using the pump which is damaged or modified may cause personal injuries, electric shock or any failure. It is not covered by warranty and never use the kind of pumps.

(3) Caution when transporting or lifting the pump

When lifting the pump, make sure to use the hoist bolt. If there is not a hoist bolt, use a belt sling with care of the weight balance. This operation must be performed by qualified personnel and use the sling which is enough strong. The lightest pump is 40 kg and more. Carrying it by hands may lead to accident and do not do as possible.

(4) Prohibit to operate with power on

Do not check or disassemble the pump or motor while the power turns on. It could lead to personal injuries such as getting caught in the rotor or electric shock. Take multiply safety measures such as a handy switch other than the main switch or handy switch.

(5) Connect earth wire

Using the pump without earth wire of the motor may cause electric shock. Connect it by a qualified person in accordance with the electric facility technical standards and interior wiring regulations.

(6) Protect the power cable

Over-stretching, pinching or otherwise damaging the power supply cords or motor lead wires may damage the cable and cause fire or electric shock. Replace the cover of the terminal box in its proper position.

(7) Installing Ground Fault Interrupter (GFI)

Electric shock may occur if the pump is used without the ground fault interrupter device. Prevent the electric accidents and the pump damages by applying circuit breakers, over-current protection devices and/or other protective devices.

(8) Caution when detaching the pump

When the pump is detached from piping, make sure to close the suction and discharge pipe valves not to leak liquid. If contacting with liquid directly, it may be harmful, so wear protective gear when operating.

Caution

(1) Unspecified use

Do not use the pump for purposes other than those specified on the nameplate. Make sure to check the motor specification (phase, voltage and frequency) and connect it. Unspecified use causes personal injuries or damage of the pump and peripheral equipments.

(2) Restriction on person handling the pump

Transportation, installation, wiring, operation, maintenance, and inspection should be performed only by an expert who has full knowledge on the handling the pump.

(3) Open precaution

Check the upside down of the packing. When opening a wooden crate/box, be careful of injury by nails and slivers.

(4) Ventilation

If the motor ventilation is obstructed, the motor is overheated. Additionally, at the time of handling toxic or odorous liquids, set the pump up in a well-ventilated place to prevent symptoms of poisoning.

(5) Repair and return of the pump

When repairing the damaged pump, contact your agent or supplier. If the pump is returned by courier, clean up the inside and outside of the pump by water and check not adhered liquid. Then, wrap it with a vinyl and pack.

(6) Prohibit to touch the rotated parts

Do not touch rotating parts such as the shaft during operation.

(7) At the time of starting the pump

Check the rotating direction at the first starting up the pump. At that time, open the suction & discharge valve and check no liquid leakage at the pipe connection. Turn on the switch instantly and check the rotating direction after the air in the pipe is deflated and the pump is full of liquid. If the 3 phase motor rotates backwards, switch two wire of three. At that time, make sure to turn off the power and check the safety.

(8) Dispose the scrapped pump

Decontaminate the adhered liquid and dispose the scrapper pump in accordance with the law as the industrial waste.

(9) Leak protection

Take appropriate preventative measure against liquid leak in the event of breakdown of the pump or piping.

Unpacking and check

Check as follows. If you have any questions, contact your supplier.

1) Check that the specification indicated in the nameplate such as Model, Head, Capacity, Motor specifications and the voltage in the Motor nameplate are the same as your order
2) Check that all accessories are included.
3) Check no damage during transportation and no loosened bolts visually and by touch.

Model description

YD — 50 05 LON3 - SU — N E 5 1 - V

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

1. Bore

MODEL	SUCTION BORE	DISCAHRGE BORE
400*LON3-SU	50A	40A
500*LON3-SU	65A	50A

2. Motor output
   01：0.75kW 02：1.5kW 03：2.2kW 05：3.7kW

3. Model
   LON3-SU：Stainless Vertical Sealless pump
   Main Material：SUS16 (Equivalent to SUS316L)

4. Seal Material
   N：No seal type (Sealless)

5. O-ring Material
   E：EPDM D：FPM（DAI-EL） P：PTFE

6. Motor Frequency
   5：50Hz 6：60Hz

7. Limit of Specific Gravity
   1：1.1／1.05
   * Consult us, if the pump will be used for the liquid whose specific gravity is 1.1 and more.

8. Special categories
   V：Non-standard voltage Z：Non-standard material
   A：Increase in power X：Special conditions

Standard performance

MODEL	Bore suc. x disc.	Output kW (HP)	Standard performance m-L/min (Ft-GPM)	Frequency Hz	Weight kg
4001LON3-SU-N*51	50A x 40A	0.75	10－100	50	41
4001LON3-SU-N*61	50A x 40A	0.75	7－100	60	41
4002LON3-SU-N*51	50A x 40A	1.5	13－200	50	43
4002LON3-SU-N*61	50A x 40A	1.5	13－200	60	43
4003LON3-SU-N*61	50A x 40A	2.2	14－350	60	45
5003LON3-SU-N*51	65A x 50A	2.2	14－350	50	45
5005LON3-SU-N*51	65A x 50A	3.7	18－500	50	60
5005LON3-SU-N*61	65A x 50A	3.7	18－500	60	60

NOTE

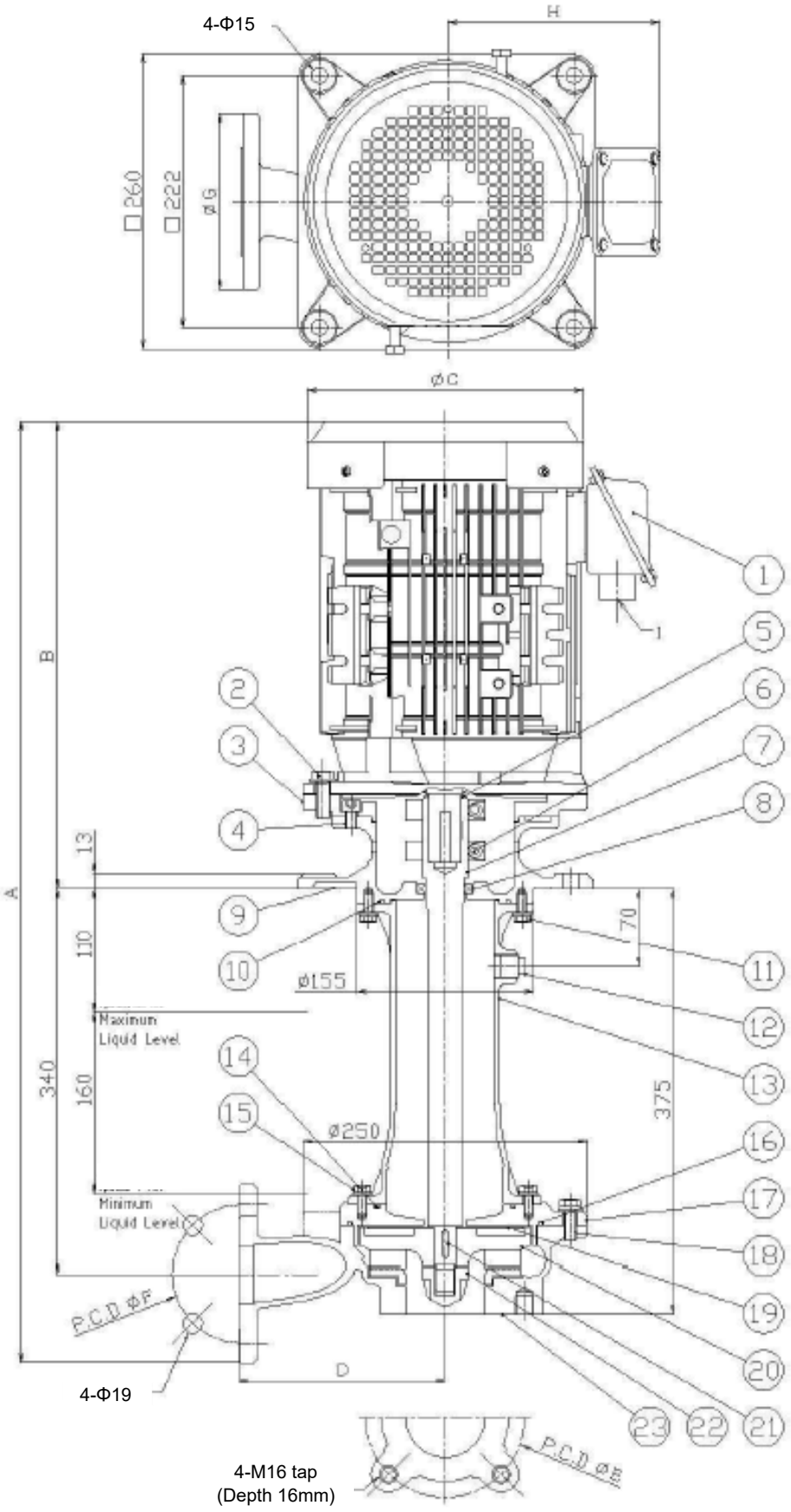
* The table shows the standard performance of clear water (S.G.1.0) at the temperature of 20 degrees. The pump performance is changed according to high specific gravity, viscosity and temperature.

* The range of the temperature of the pump in use is 0-80 degrees. (Clear water)
  At the other condition, consult us.

* During operation, secure the following minimum flow for keeping the inside of the pump cool.
  - Motor output : 0.75kW – 10L/min
  - Motor output : 1.5 – 3.7kW – 20L/min

Outline dimension

The dimension of the motor is for an outdoor motor without waterproof cover.



MODEL	Bore (mm)		Output	A (mm)	B (mm)	φC (mm)	φD (mm)	φE (mm)	φF (mm)	φG (mm)	H (mm)	I	Hz
	Suc	Dic.	kW										
4001LON3-SU	50	40	0.75	708.5	298.5	170	160	120	105	140	159	G(PF)3/4	50/60
4002LON3-SU	50	40	1.5	746	336	202	160	120	105	140	168	G(PF)3/4	50/60
4003LON3-SU	50	40	2.2	775	365	202	160	120	105	140	168	G(PF)3/4	60
5003LON3-SU	65	50	2.2	782.5	365	202	180	140	120	155	168	G(PF)3/4	50
5005LON3-SU	65	50	3.7	826.5	409	243	180	140	120	155	187	G(PF)3/4	50/60

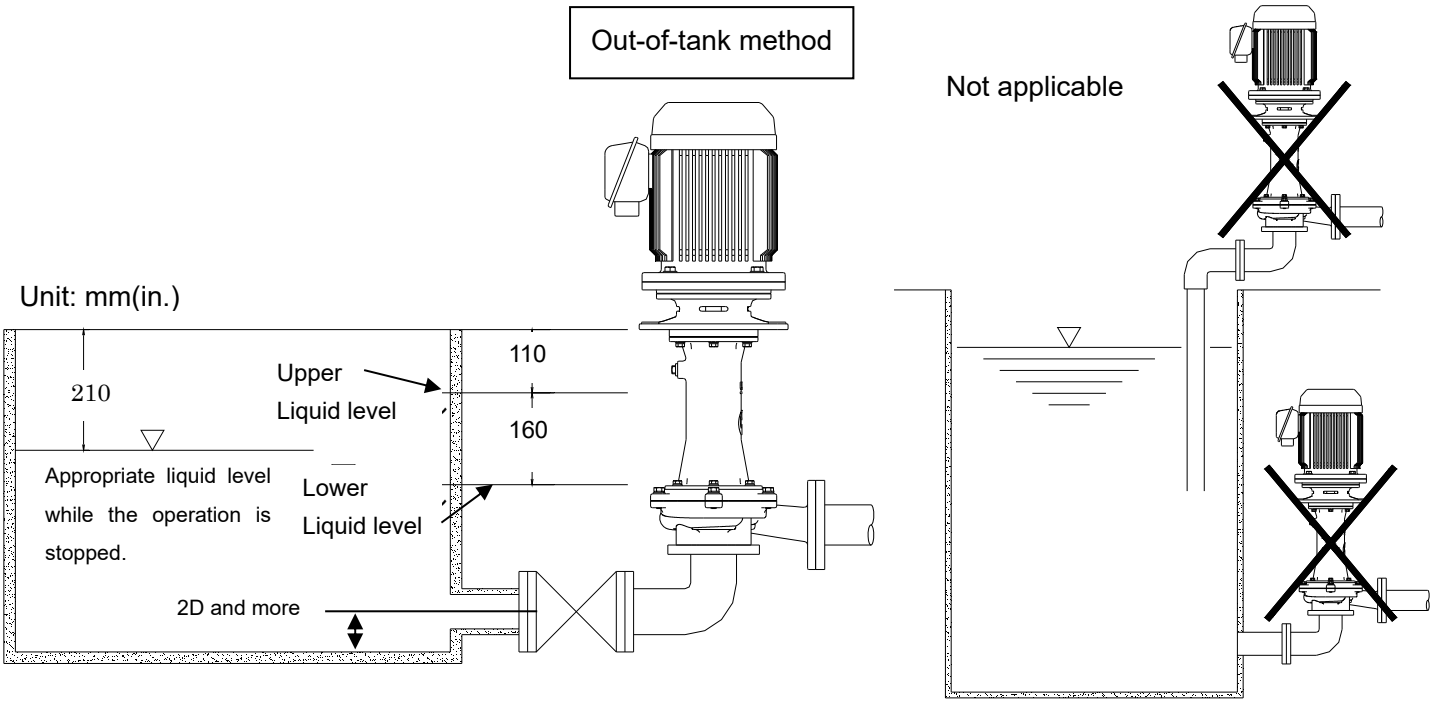
Parts description

No.	PARTS	MATERIAL	Qty
1	Motor		1
2	Hex. bolt	SUS304	4
3	Motor mounting plate	FC200	1 (3.7kW only)
4	Hexagonal socket head cap bolt	SUS304	4 (3.7kW only)
5	Slit collar	SUS304	2
6	Shaft	SUS316L	1
7	Gas seal	SUS316+PTFE	1
8	Pump base	SCS13	1
9	O-ring for pump base	EPDM/FPM/PTFE	1
10	Hex. bolt	SUS304	6
11	Plug	SUS316	1
12	Connecting pipe	SCS16	1
13	O-ring for back plate	EPDM/FPM/PTFE	1
14	Hex. bolt	SUS304	6
15	O-ring for casing	EPDM/FPM/PTFE	1
16	Back plate	SCS16	1
17	Hex. bolt	SUS304	6
18	Impeller disc	SUS316L	1
19	Impeller	CFR PTFE	1
20	Impeller key	SUS316	2
21	Impeller nut	SUS316L	1
22	Casing	SCS16	1

Cautions when installing and piping

1. Installation level and liquid level in the suction tank

The pump does not have a fix type liquid sealing such as a mechanical seal or ground packing. Regarding the install height of the pump, refer the picture as below and set the mount.
The liquid level in the suction tank is between the upper liquid level to lower liquid level of the pump as standard. However, when it is the upper liquid level, liquid possibly leaks depending on the piping or condition of pump and accessary devices at the time of stopping or starting the pump. Furthermore, if the device or piping at the discharge side has liquid puddle such as a filter pump, install the check valve between the pump's discharge flange and device/piping to prevent backflow.



2. Joint and seal check

At the time of the first operation of the pump or after reassembly, check that the pump is full of liquid and air is released. Make sure to check the condition of the pump seal and joints at the suction & discharge port before operation. Operate the pump without liquid leakage and air suction from the seal.

3. Installation place

- The install place is as close as the suction tank and set the liquid level at the standard setting range (flooded suction method).
- Anchor the pump vertically on level place where there is no influence of other machine's vibration. Provide enough space around the pump no to prevent maintenance or the motor fan cool. Fix the pump mount firmly not to generate vibration.
- When the pump is installed outdoor and the motor gets wet, install the protection motor cover.

4. Piping

- Tighten the piping
  Use M16 bolts to connect the suction and discharge flanges and tighten them evenly with an appropriate torque.
- The suction pipe is for the flooded suction type, shorten the piping with less bending. Install the piping support not to apply a load and the thermal stress of the pipe to the pump.
- Do not allow any projection where air stays at the suction piping. It causes air lock.
- When transferring high-temperature liquid, use pipes with on size larger diameter or as short as possible with less bending to prevent cavitation, because the suction performance becomes bad by raising the saturated vapor pressure.
- The pump ability is not changed when transferring the liquid is high-temperature, but the liquid characteristic is changed by the temperature change.
- Install the pipe support to prevent apply a load of the discharge pipe to the pump.
- If a screen such as a strainer is set at the suction inlet, periodically clean it. The pump's performance and function may be greatly affected by clogged screen.
- If the piping is long, the pipe resistance is increased and the performance may not become enough. Determine the pipe diameter by calculating the pipe resistance.
- Install valves with less pressure loss at the suction and discharge piping for maintenance.

5. Wiring 

Perform electrical wiring and power source setup by qualified person who is given the authority. If not, personal injury and equipment accident may occur. If necessary, contact us or your supplier. Abide by the local and national electrical codes when wiring.

- Use the electromagnetic switch which is suitable for the specifications of the pump motor (voltage, capacity, etc.).
- If the pump is installed outdoors, wiring that rainwater does not go into the switch.
- Set the electromagnetic switch and push button at the safety distance from the pump.

6. Operational cautions 

1) Cautions

- Do not operate the pump with the suction valve closed. It vacuumizes the pump inside and makes damage.
- If cavitation occurs, stop the pump immediately. Do not operate the pump with air trapped.
- If the pump is operated with the discharge valve closed for long time, it causes the pump damage by rising the liquid temperature in the pump.
- At power failure, turn off the power immediately.
- When transferring high-temperature liquid, install a protection device around the pump to prevent burn injury because the surface of the pump becomes a very hot.

2) Preparation for operation

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

- Add liquid after the inside of the piping and tank are thoroughly cleaned.
- Check that bolts to connect the flange and base are not loosened and if necessary, re-tighten it.
- Add liquid in the pump and release air in the pump and piping completely. Air is released by removing the air release plug (P16 – No.11) on the connecting pipe of the pump (P16 – No.12). At that time, do not stay your face close to the air release plug. The liquid may spill out and it is dangerous. Re-tighten the plug after air released.
- For checking the motor rotating direction, run the motor momentarily after adding priming liquid into the pump (or after checking that the pump is filled with priming liquid.). The correct rotating direction of the motor is the clockwise as viewed from the motor fan. Follow the arrow put on the motor. If the motor rotates in the wrong direction, stop the pump immediately and switch two wires of the three-phase power wires.

3) Operation

Check the valves open and close to operate the pump continuously after completing the preparation for operation. As it starts, check that the flow rate and pressure are correct.

4) Shut down of the operation

Turn off the power and pay attention whether the pump stops smoothly. If not, check the inside of the pump. In case of long-term suspension, drain liquid in the pump and clean it. Then, close the suction/discharge valves.

7. Maintenance

1) Troubleshooting

If a cause of the pump failure is unknown, stop operating the pump immediately and contact the supplier.

Problem	State		Cause	Check & measures
	Dis. Valve closed	Dis. Valve opened		
Pumping failure		Pressure gauge & vacuum gauge indicate zero.	・Insufficient priming water	・Stop the pump and fill with enough liquid.
	Priming water does not go into the pump		・Strainer is clogged ・Improper suction piping ・The liquid level in the suction tank is lower.	・Clean strainer ・Check the valve closed. ・Correct the liquid level
	After the pump starts, the pressure drops when opening the discharge valve.	Pressure and vacuum gauge show sudden fluctuation and drop to zero	・Air entering through suction pipe or gasket	・Check the seal of the suction flange. ・Check for any abnormal lowing of liquid level ・Check the voltage.
	Pumping failure at the restarting after suspension.	Pumping failure at the restarting after suspension.	・Air lock or air accumulation in the suction pipe	・Release air in the pipe ・Check piping and remove air pock. ・Improve the incline of the pipe and clear the strainer slogging.
	Pressure gauge reading remains low.		・Pump rpm not enough ・Inverse rotation	・Check wiring and motor. ・Reverse wiring
Discharge amount is not enough		Vacuum gauge reading is high.	・Clogged strainer is obstructing in the suction pipe	・Clean the clogged strainer
	Pressure gauge and vacuum gauge showing normal readings	Vibration	・The entrance to impeller is clogged	・Remove foreign objects
		Pressure and vacuum gauge show fluctuation	・Air entering through suction pipe or gasket	・Check the suction pipe joints and re-tighten.
			・Foreign object obstructing the discharge side	・Remove foreign object inside. ・Remove obstruction or scale in pipe
		High pressure gauge reading but normal vacuum reading	・Discharge piping section causing high resistance or actual head & loss of head are too high	・Check for the actual pump head or pressure loss in the discharge pipe and take appropriate action
	Pressure gauge and vacuum gauge are low.	Low pressure gauge reading and low vacuum gauge reading	・Inverse rotation	・Reverse wiring
Motor heats up			・Insufficient voltage ・Overload ・High ambient temperature	・Check the voltage and frequency ・Check the flow rate, liquid specific gravity and viscosity ・Improve ventilation
Sudden loss of discharge amount		High vacuum gauge reading	・Strainer clogged by foreign objects	・Remove foreign object
Vibration			・Base defect ・Loose bolts ・Closed suction pipe, cavitation in the pump ・Impeller comes into contact with casing ・Worn motor bearing	・Re-install ・Re-tighten bolts ・Clean or remove cause for cavitation ・Remove cause or replace ・Replace bearing or motor

2) Maintenance

■ Daily check

- Check no liquid leakage before operation. If any, stop the pump and take measures.
- Check that pump works smoothly, without vibration and abnormal sounds.
- Check the liquid level in the tank and the suction pressure.
- Compare the flow rate, discharge pressure and current value during operation with the indication on the nameplate in order. Check that the pump load is normal.
  *The indicated value of the pressure gauge varies in proportion to the specific gravity of the liquid.
- If a spare pump is available, keep it ready for use by operating it from time to time.
  (Refer to P11 “6. Operational causes” for the operation.)
- Check that the discharge pressure, discharge flow rate and motor current / voltage are not fluctuated. If they change extremely, refer “*Troubleshooting”* and take measures.

■ Periodical check

For smooth operation of the pump, perform the periodical maintenance as follows. At an overhaul, be careful not to damage the sealing parts.

	Part name	What to be checked	Measures
Once a year Or 1,000 hours *Keep the record.	Motor	・Sound of the bearing (Abnormal sounds during operation)	・Replace the bearing.
		・Vibration	・If abnormal, contact the supplier.
		・Looseness of the pump base bolts	・Re-tighten the bolts.
	Connecting Pipe	・Scratch, crack	・If abnormal, replace the part.
		・Corrosion	・If abnormal, replace the part.
		・Deformation	・Remove the load, if the load of the piping is applied.
		・Liquid leakage from the seal part	・If abnormal, replace the O-ring.
	Casing	・Scratch, crack	・If abnormal, replace the part.
		・Scale on the inside of the wet parts kit	・Remove the scale.
		・Swelling and corrosion of O-ring	・If abnormal, replace the part. (Always replace the new O-ring each time disassembly checking.)
	Impeller	・Sliding mark on the whole area of impeller	・If abnormal, replace the part.
		・Corrosion	・If abnormal, replace the part.
		・Looseness of the impeller nut	・If abnormal, disassemble the nut and impeller and check the corrosion on shaft and re-tighten it. If the shaft is corrosive, contact the supplier.
	Gas seal	・Abrasion & corrosion of the gas seal	・Replace the part if it is worn or corrosive.

8. Disassembly and assembly

⚠ **Caution & Warning**

Check that the power is turned off before disassembling the pump and place a sign of “Men at Work” near the power switch to find out. Apply insulation tape around the tip of the cable which is removed from the terminal stand. Be careful of the operation.

■ Disassembly procedure (Refer to the exploded view on page 16)

1) Clean the inside of the pump which is disconnected from the piping with water and disassemble it. Wipe it off well with a cloth and upend the pump on the level place for an easy disassembly.
   NOTE: Disassemble the pump after removing the motor cover.
   (In this time, do not remove the motor fan cover.)

2) Firstly, remove the six bolts (17) from the casing (22) and disassemble the casing. At that time, O-ring (15) is separated.

3) Next, remove the impeller nuts.
   *Follow the procedure of the reference 1 in the page 17 about the tightening and loosening of the impeller nut. When the impeller nut is separated, the impeller (19) can be up vertically and separated. At a time, the impeller disk (18) is separated from the shaft.
   * When removing the impeller, be careful of the reference 2 on page 17.
   Then, remove the impeller key (20) from the shaft.

4) Next, remove the six bolts (10) and separate the connecting pipe (12) by pulling it up. At that time, O-ring (9) is separated.
   * Be careful to remove that the connecting pipe does not contact with the shaft. It may cause the pump damage.

   The back plate is disassembled by removing the six bolts (17). At that time, O-ring (13) is separated.

5) Finally, remove the four bolts (2), then disassemble the pump base (8).

* The following procedure is added for only the pump with the motor (3.7kw).

Remove the four hexagonal bolts (4) and disassemble the motor mounting plate (3) and the pump base (8).

* The spacer ring (A) acts as a shim to adjust the impeller clearance. Do not lose it at the disassemble.

* The plug (11) is for air release. When re-assembling, twist the seal tape three or four times and install it.

■ Assembly procedures

- Clean all disassembled parts with water and wipe them off with a cloth. Take reverse procedures described above to assemble the pump.

- The clearance between the impeller and the casing is 1.5 mm ±0.3 mm.

- Refer to the reference 3 on the page 18 about the assembly procedure of the impeller.

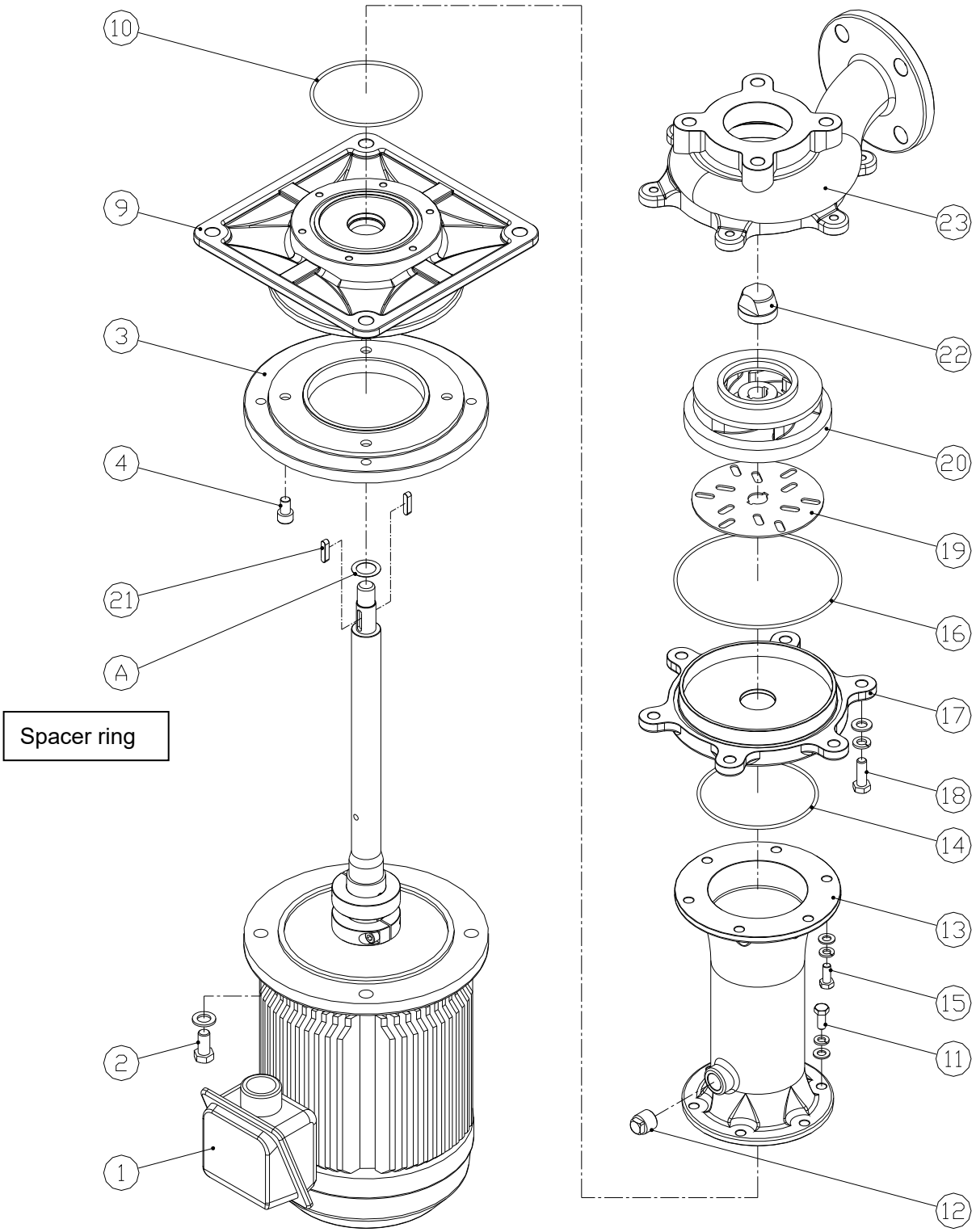
- The recommended torque to tighten the impeller nut is 34.3N・m (350kgf・cm).

- When re-assembling, replace to new O-rings.
  NOTE: The rotating direction of the motor is the clockwise as viewed from the motor.
  NOTE: Refer to our cross-sectional drawing about the assembly procedure of the motor terminal box, connecting pipe, air release hole and discharge casing.

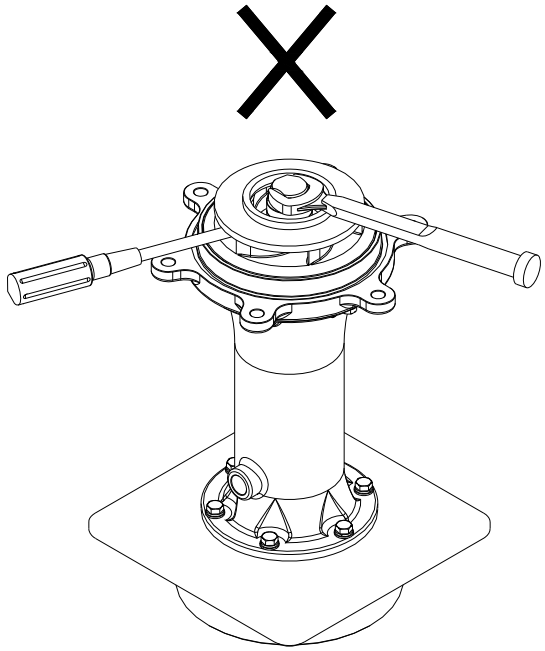
■ Replacement of the shaft

This product uses the joint shaft as a pump shaft. When it is necessary to replace it, some adjustments for the core are needed, so contact your supplier or us.

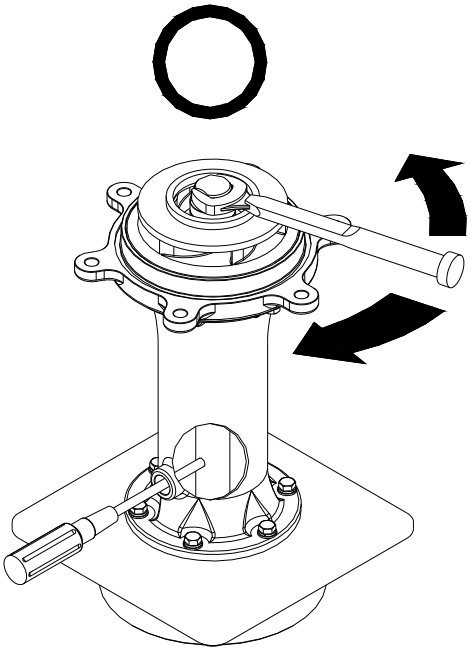
EXPLODED VIEW



Reference 1 : Cautions for tightening and loosening of the impeller nut.

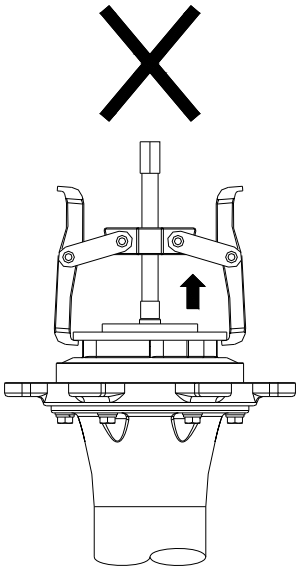


Do not rotate the impeller nut while fixing the impeller. It may cause that the impeller is deformed.

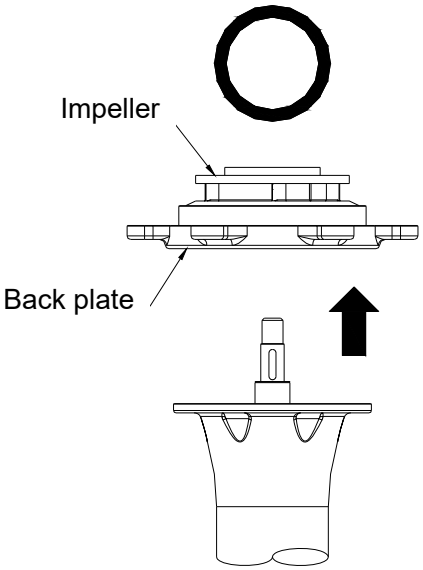


Fix by inserting the driver into the matching hole of the shaft through the air release hole not to rotate the shaft.

Reference 2 : Cautions for removing the impeller.



Do not apply a force to the impeller directly. It may cause that the impeller is deformed.

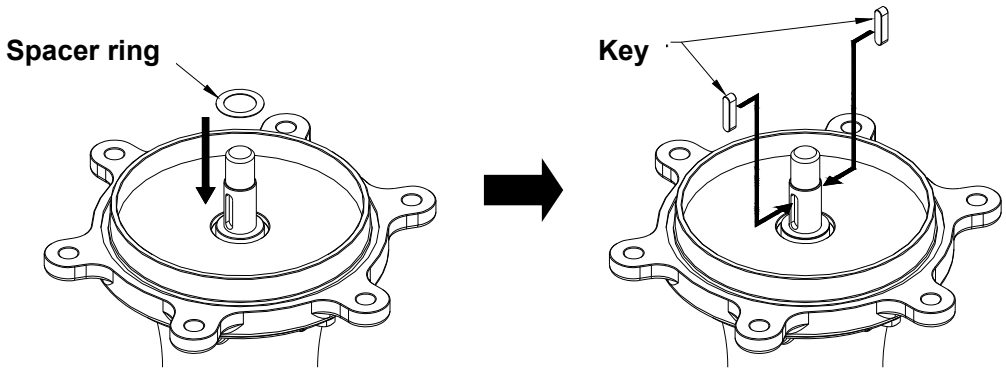


If the impeller is not removed easily, firstly remove the bolt (14) and remove the impeller with the back plate together from the shaft.

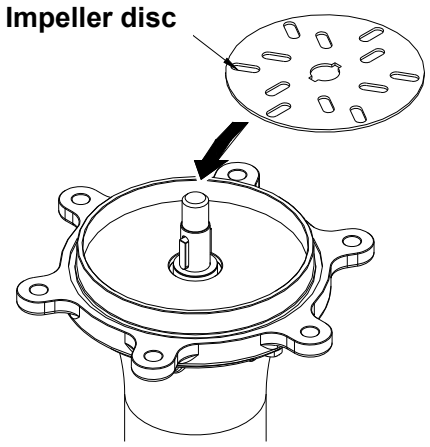
Reference 3 : Assembly procedure of the impeller.

1）Install the spacer ring (A) to the shaft.

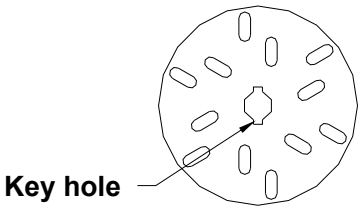
2）Put the two keys (20) into the key groove firmly.



3）Install while checking the direction of the impeller disc (18).

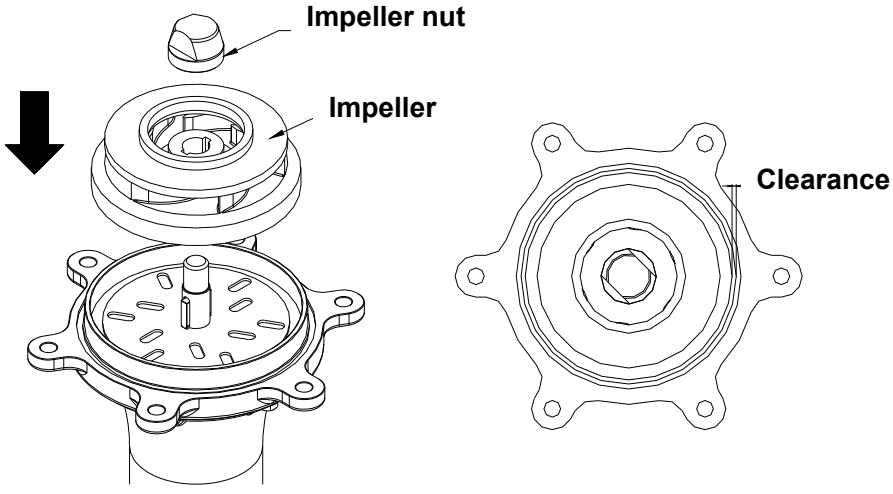


When see as viewed from above, install the disc as shown below. Set the key to the position of the key hole.



4）Install the impeller (19) and the impeller nut (21).

At that time, adjust the clearance between the outer of the impeller and the inner of the back plate to be uniform.



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 packing 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 (P7, 9, 10). Although, inform the parts’ number and material, too.

Installation record

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

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