

Multi-stage Immersion Type VKD Series



CAUTION

- This instruction manual describes important information related to handling the pump. Before using the pump, be sure to read this instruction manual thoroughly for correct handling.
- Be sure to provide this instruction manual to the operator who will actually install, operate, maintain, and inspect the pump.
- Be sure to keep this instruction manual in the place where the operator can read it any time.
- This product is subject to change without prior notice.

Safety Precautions

- Prior to use of the pump (transporting, installation, maintenance, etc.), be sure to read this instruction manual thoroughly for correct handling. All information related to the pump itself and safe use of it are described in this instruction manual, and should be clearly be understood before using the pump.

Appropriate handling at the stage from the product arrival to the beginning of the actual operation is necessary, in addition to the maintenance and inspection after the operation starts, in order to fully achieve the performance of the Coolant Pump, prevent the accident beforehand, and to continue an excellent operation for a long term.


- Safety Notices used in this instruction manual are divided into two ranks: "Danger" and "Caution".




Indicates a potential hazardous situation that, if not avoided, may result in death or serious injuries.




Indicates a potential hazardous situation that, if not avoided, may result in moderate injuries and/or damage to the equipment.

Notices indicated by  Caution] may lead to serious consequences in some situations.

All of the following are important. Be sure to observe them:

|  WARNING | |
|---|--|
| General | <ul style="list-style-type: none"> • Transport, installation, piping, wiring, operation, and maintenance of the pump must be conducted by skilled personnel who thoroughly understand how to handle the pump. Failure to do so may result in electric shock, injuries, fire, etc. • Be sure to turn off the power switch of the pump before conducting any operation. Failure to do so may result in electric shock or fire. • Do not use the pump near flammable gas. Doing so may result in injuries or fire. |
| Installation adjustment | <ul style="list-style-type: none"> • Be sure to ground the grounding wire terminal. Failure to do so may result in electric shock or fire. |
| Piping Wiring | <ul style="list-style-type: none"> • Refer to the connection diagram inside the terminal box or this instruction manual for power cable connection. Incorrect wiring may result in electric shock or fire. • Do not forcibly bend, pull, or crimp the power cable or wires connected to the pump. Doing so may result in electric shock or fire. • Be sure to re-attach the cover of the terminal box correctly after wiring/piping is completed. Failure to do so may result in electric shock. |
| Operation | <ul style="list-style-type: none"> • Never access or touch moving parts (including external fan, impeller, etc.) during operation. You may be caught in any moving parts, resulting in injuries. • If power failure occurs during operation, turn the power switch off. Failure to doing so may cause the pump to start suddenly when power is recovered, resulting in injuries. |

|  CAUTION | |
|--|---|
| General | <ul style="list-style-type: none"> • Be sure to comply with specifications on the nameplate or in this instruction manual. Failure to do so may result in electric shock, injuries, damages to the equipment, etc. • Do not use this pump if damaged. Doing so may result in electric shock, injuries, fire, etc. |

| | |
|---------------------------------|---|
| | <ul style="list-style-type: none"> • Do not insert foreign objects or fingers etc. into openings (e.g. fan cover, discharge port, suction port, drain hole, etc.) of the pump. Doing so may result in electric shock, injuries, damage to equipment, etc. • We are not liable for modifications to the pump made by the user. |
| Transport Carrying | <ul style="list-style-type: none"> • Be extremely careful not to drop or overturn the pump when carrying it. Dropping or overturning the pump may result in injuries. • Before lifting the pump, check the exact mass of the pump, referring to the package box, catalog, nameplate, etc., and ensure that the lifting conditions satisfy the mass. Failure to do so may cause the pump to drop or overturn, resulting in injuries or damage. |
| Unpacking | <ul style="list-style-type: none"> • Place the package in the correct vertical direction to unpack it. Failure to do so may result in injuries. • Check that the correct product has been delivered. Using the incorrect product may result in injuries, damage, fire, etc. |
| Installation adjustment | <ul style="list-style-type: none"> • Never place flammable objects near the pump. Doing so may result in fire. • Do not place objects around the pump that block ventilation. Doing so may affect the cooling effect, resulting in burns, fire, etc. due to excessive heating. • Before connecting the pump to equipment, check the rotation direction. Incorrect rotation direction may result in injuries or damages. • Do not touch the impeller of the pump. Doing so may result in injuries. • Never stand on the pump. Doing so may result in injuries. • Install the pump in such a direction that the information on the nameplate is clearly visible. Do not place objects in front of the nameplate. Do not remove the nameplate. • Use a star-delta starter (with a magnetic switch on the primary side, 3-contactor type) for star-delta starting. Failure to do so may result in fire. • Do not operate the product exceeding the operating frequency 60Hz(50Hz only model is 50Hz) when driven with an inverter. Doing so may result in the pump burning out or fire. • Do not use a fluid with a higher viscosity than the maximum limit of viscosity. Doing so may result in the pump burning out or fire. |
| Piping Wiring | <ul style="list-style-type: none"> • Conform to the Electric Facility Technical Standard authorized by the government and the Interior Wiring Code of the electric power company. Failure to do so may result in the pump burning out or fire. • Do not touch terminals when measuring insulation resistance. Doing so may result in electric shock. • A protective device is not equipped. An over-current protective device should be attached to the pump as required by the Electrical Facility Technical Standard. In order to prevent fire or damage due to the pump burning out, we recommend that you consult us and install other protective devices (e.g. Earth-leakage circuit breaker, etc.). |
| Operation | <ul style="list-style-type: none"> • If any problem occurs, stop operation immediately and turn the power switch off. Failure to do so may result in electric shock, injuries, or fire. • Do not touch the pump during operation, as the temperature of it becomes considerably high. Doing so may result in burns. |
| Maintenance | <ul style="list-style-type: none"> • Do not touch terminals when measuring insulation resistance. Doing so may result in electric shock. • Be careful when using solvent or similar to clean the pump. Inappropriate use of solvent may result in poisoning. In addition, the use of thinner and/or benzine may cause a change or abruption of painting color of the pump. |
| Repair Disassembly Modification | <ul style="list-style-type: none"> • The pump must be repaired, disassembled, or modified by skilled personnel. Failure to do so may result in electric shock, injures, or fire. |
| Disposal | <ul style="list-style-type: none"> • Dispose of the pump as general industrial waste. |

Acceptance checks -----

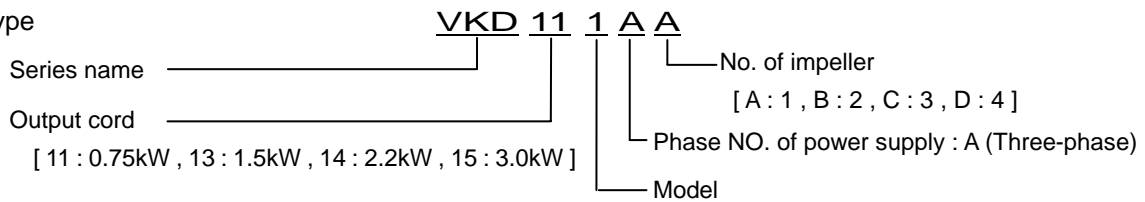
Please check the following when the coolant pump is delivered.

- 1) Check the type, output, voltage, frequency, etc. of the delivered pump in reference with the nameplate to verify that the correct product has been delivered.
- 2) Check that the coolant pump has not been damaged during transport and that bolts are firmly tightened. If any problems are found, please consult the dealer where you purchased the coolant pump.

Specifications -----

Refer to the nameplate for the coolant pump's head, flow rate, frequency, voltage, current, etc. Other specifications are described below.

1) Type



2) Fluid

The Coolant Pump (standard product) is designed for use with coolant, including grinding oil and cutting oil.

In addition, the pump cannot be used with special fluid such as printing fluid, acids. When you want to use other special fluid, inquire of your dealer or our sales branches.

3) Fluid temperature

-20 to 40°C (without freezing)

4) Fluid viscosity

Using high viscosity fluids will shorten the life of the motor and may cause the motor to burn out. Be sure to use the fluids with the viscosity within the limit in the table below. Note that the viscosity may greatly increase as the fluid temperature decreases. Check the viscosity when the temperature of the fluid in use is lowest.

| Limit of viscosity [mm ² /S] | |
|---|---------|
| at 50Hz | at 60Hz |
| 75 | |

Notes

1. The current indicated on the nameplate is when the maximum load is applied at the limit of viscosity (operated with valve open).
2. The rated head and flow rate indicated on the nameplate is when the viscosity is 1 mm²/s.

5) Installation location

Always use the pump indoors in a location free of flammable gas or vapor and at an altitude of 1,000 m or less.

6) Ambient temperature -20 to 40°C

Installation -----

- 1) Select a well ventilated location with little dust and humidity. Do not install the pump where fluid splashes onto the motor.
- 2) Install the pump so that cooling air for the motor can be taken in.
- 3) Install the pump on a flat surface to prevent any clearance.
- 4) Select a location where servicing can be performed easily. (Secure sufficient space.)
- 5) The pump is resistant to externally applied vibration acceleration up to approximately 4.9 to 6.9m/s².
- 6) Because the pump section is installed in a tank, an mounting hole larger than the outer diameter of the pump needs to be made. See the outline drawing.
- 7) Because the suction port is on the bottom of the pump in the pump section, secure at least dimension in outline drawing between the bottom of the tank and the suction port. Secure the largest separation possible to prevent the strainer being clogged with cutting chips and dust.
- 8) The pump is painted. However, if you want to coat the pump with another color, lightly sandpaper the pump surface to improve paint adhesive performance.
- 9) Please note handling enough to give pump neither the impact nor the offset load when the pump is lifted up and transported.

Piping -----

- 1) Make the piping as short as possible with the minimum number of elbow bends, joints, valves. Use standard sized pipes. Thin pipes, or those with an excessive number of bends, may reduce the amount of discharge.
- 2) Support pipes to prevent the weight of the pipes being loaded directly onto the pump.
- 3) Do not forcibly screw the pipes into the pump. Doing so may damage the joints.
- 4) Use seal tape, fluid packing, etc. for threaded sections to prevent fluid and air leaks. Wind the seal tape correctly so that the port of the pipe is not blocked.
- 5) Use the largest fluid tank possible.
 - * The recommended tank capacity is at least three times of discharge amount per minute. Using a tank with excessively small capacity may cause problems, such as the fluid temperature increasing, reduction in the amount of discharge due to generation of bubbles, etc.
 - * Put the fluid quietly so that air should not mix when you pour the fluid into the tank.
- 6) Prevent cutting chips and dust from entering the pump.
 - * We recommend that you pass the cutting fluid through an overflow section and filter at least three times.
- 7) Take appropriate preventive measures to prevent water hammer (e.g. install an accumulator etc.).

Wiring -----

1) Wiring must conform to the Electric Facility Technical Standard authorized by the government and the Interior Wiring Code of the electric power company.

2) For standard voltage products, see the drawing on the right and connect the motor terminals to the power supply terminals correctly.



* When the number of terminals is 4 or more, refer to the connection nameplate inside the terminal box.

- 3) Ground the wire in case of earth-leakage.
- 4) We recommended that you use a thermal overload relay to protect the motor from overload and burn out.
- 5) You can change the position of the terminal box relative to the discharge port of the pump in 90-degree increments by shifting the motor frame. Change the position of the terminal box depending on the installation location.
- 6) When using connectors, glands, etc., take sufficient precautions to prevent cutting chips, coolant, etc. from entering the terminal box through the lead-in port. Do not remove the grommet from the lead-in ports that are not used.
- 7) Note that the electric current will increase and the motor may be burnt out when the voltage drop is remarkable. Or else, the thermal overload relay may trip.

Operation -----

1. Before starting operation

Check that the fluid is above the specified level.

2. When starting operation (When conducting test run)

- 1) Check that the pump rotates counterclockwise (to the left) when viewed from the top.
- 2) Check that there are no problems, such as overcurrent, vibration, or noise. If any problem is identified, see the "Troubleshooting" section for appropriate measures.
- 3) Check that the trial run when it is operated at variable velocity by the inverter.
 - It is likely to resonate on the pump installation condition. Please avoid and use the frequency when resonating.
 - When a low driving frequency and the viscosity of the liquid are high, the liquid might not be exhaled.
 - Please do not use it exceeding the driving frequency 60Hz(50Hz in case of 50Hz exclusive use). The motor might damage by a fire.

3. Operation

- 1) An involute pump is used for the Coolant Pump, meaning the flow rate can be adjusted by opening and closing the valve on the discharge side. (Operating that closes up the valve is also possible.)
- 2) This pump is Mechanical seal-less (the sealing up device none in the shaft seal part) structure. Therefore, it is not abnormality of the product though the liquid comes out from the outer cylinder of the pump.
- 3) Depending on the viscosity of the fluid, air may be taken in if the fluid level is too low, lowering the amount of discharge or preventing the fluid being pumped. Make the fluid level higher than "Minimum fluid level". Note that the minimum fluid level differs depending on the viscosity of the fluid. For safety, keep the fluid level as high as possible.
- 4) If power failure occurs during operation, turn the power switch off.

Maintenance -----

1. Daily checks

Check for abnormal vibration or sound when starting operation and during operation.

2. Periodic checks

- 1) Remove dust, oil, etc. on the external surface of the coolant pump.
- 2) Accumulation of cutting chips in the tank may cause pump failure. Clean the inside of the tank periodically.
- 3) Check that bolts are firmly tightened.

3. Maintenance of bearing

Using shielded type grease-sealed bearings reduces the bulk of maintenance work including replenishing grease. Exchange the bearing when an abnormal sound or vibration occurs from the bearing.

4. Maintenance of oil seal

Pumps have an oil seal to prevent fluid entering in the bearing section. Replace the oil seal with a new one when replacing the bearing.

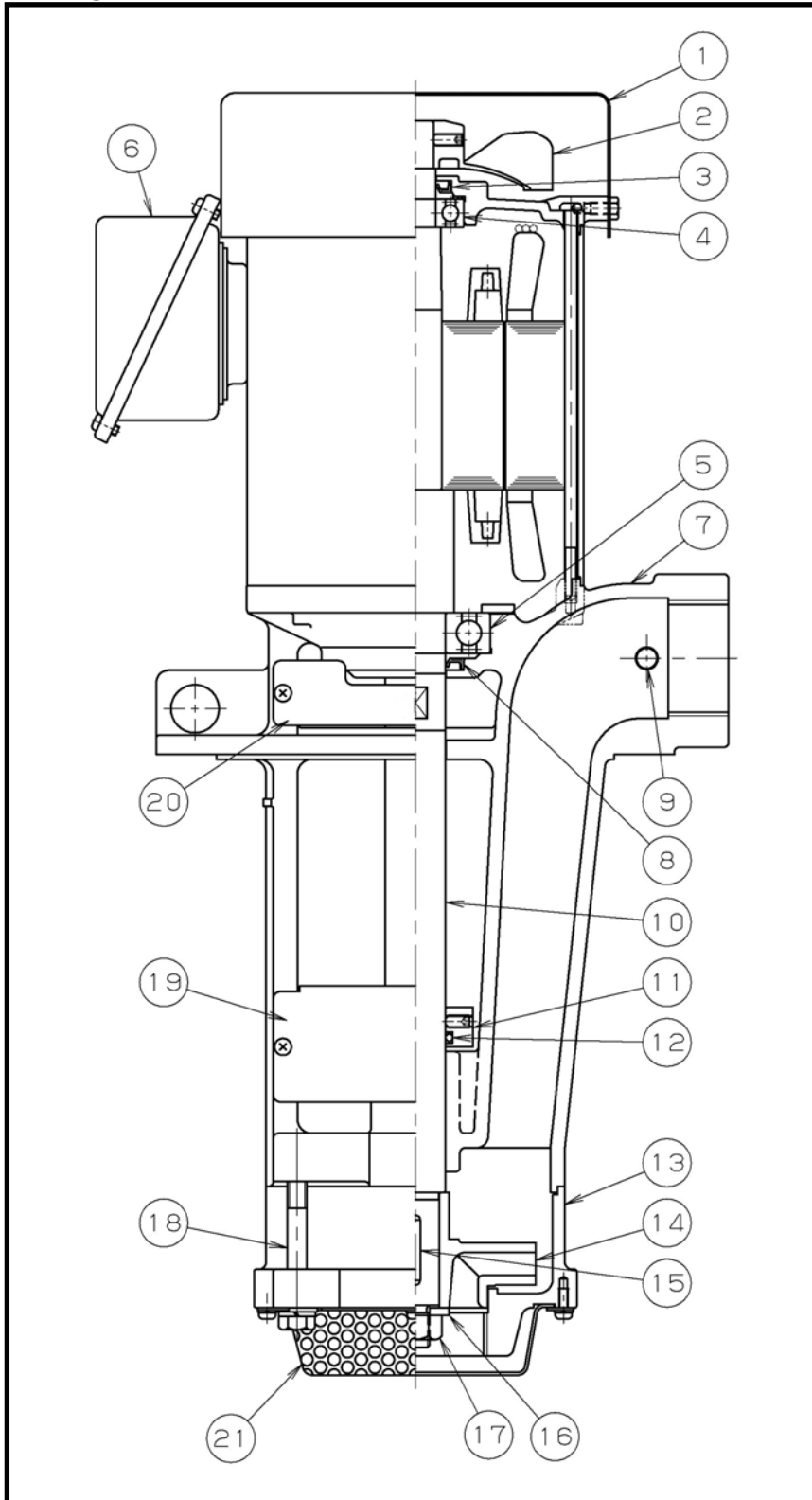
* Parts replacement

The service life of parts is determined by the type, atmospheric conditions, and working conditions. We recommend that you replace parts referring to the table below:

Replacement frequency of consumable parts

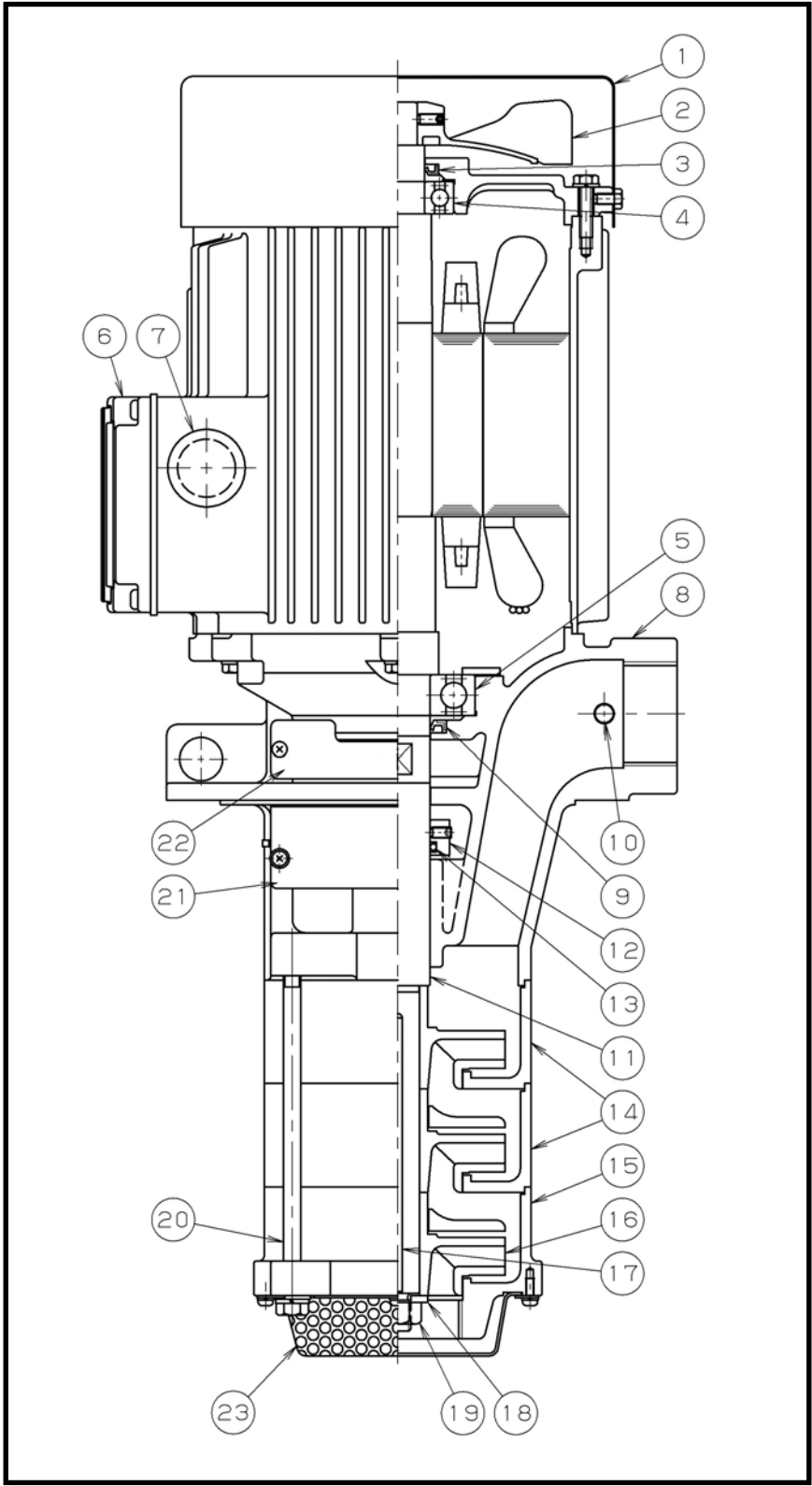
| Part name | Model | Replacement frequency (Note Not guaranteed) |
|---------------------|-------|--|
| Bearing | All | Each 1 to 2 years |
| Oil seal | All | Each 1 to 2 years |
| O-ring | All | Each 2 to 3 years |
| Impeller | All | When worn out |
| Others (screw etc.) | All | When necessary |

Configuration



| | Parts name | Material |
|----|--------------------------|-----------------|
| 1 | Fan cover | SPCE |
| 2 | External fan | Resin |
| 3 | Oil seal | NBR |
| 4 | Deep groove ball bearing | |
| 5 | Deep groove ball bearing | |
| 6 | Terminal box | SPCC |
| 7 | Pump stem | FC200 |
| 8 | Oil seal | NBR |
| 9 | Air bleed valve | SUS |
| 10 | Shaft | S45C |
| 11 | Oil thrower | SUS304 |
| 12 | O-ring | Fluoride rubber |
| 13 | Casing | FC200 |
| 14 | Impeller | FC200 |
| 15 | Key | S45C-D |
| 16 | Washer | SPCC |
| 17 | Nut | |
| 18 | Bolt | |
| 19 | Side guard | SPCC |
| 20 | Side guard | SPCC |
| 21 | Strainer | SPCC |

Note) The construction etc. may be modified without any preliminary notice.



| | Parts name | Material |
|----|--------------------------|-----------------|
| 1 | Fan cover | SPCE |
| 2 | External fan | Resin |
| 3 | Oil seal | NBR |
| 4 | Deep groove ball bearing | |
| 5 | Deep groove ball bearing | |
| 6 | Terminal box | ADC12 |
| 7 | Grommet | NBR |
| 8 | Pump stem | FC200 |
| 9 | Oil seal | NBR |
| 10 | Air bleed valve | SUS |
| 11 | Shaft | S45C |
| 12 | Oil thrower | SUS304 |
| 13 | O-ring | Fluoride rubber |
| 14 | Casing | FC200 |
| 15 | Casing | FC200 |
| 16 | Impeller | FC200 |
| 17 | Key | S45C-D |
| 18 | Washer | SPCC |
| 19 | Nut | |
| 20 | Bolt | |
| 21 | Side guard | SPCC |
| 22 | Side guard | SPCC |
| 23 | Strainer | SPCC |

Note) The construction etc. may be modified without any preliminary notice.

Troubleshooting -----

- Troubleshooting

If any problem is identified, see "Troubleshooting quick reference" below for appropriate measures.

Troubleshooting quick reference

| Failure conditions | | Cause | Solution |
|--------------------|---------------------------------------|--|---|
| Rotation disabled | No sound | Cables are disconnected or connected incorrectly. | Check cables and connections. |
| | | Fuse is blown or thermal overload relay is tripped. | Replace fuse or check thermal overload relay. |
| | | Stator coil is disconnected. | Contact authorized dealer for repairs. |
| | Knocking sound | Voltage is too low. | Adjust voltage. |
| | | Cables are disconnected or connected incorrectly. | Check cables and connections. |
| | | Fuse is blown or thermal overload relay is tripped. | Replace fuse or check thermal overload relay. |
| | | Stator coil is disconnected. | Contact authorized dealer for repairs. |
| | | Stator contacts rotor due to worn bearing. | Replace bearing. |
| | | Foreign matter caught in impeller. | Eliminate foreign matter. |
| Rotation enabled | Motor overheats /overcurrent | Voltage is too high or too low. | Adjust voltage. |
| | | Voltage is unbalanced. | Check circuit. |
| | | Stator coil is disconnected, short-circuited, or grounded. | Contact authorized dealer for repairs. |
| | | Stator contacts rotor due to worn bearing. | Replace bearing. |
| | | Viscosity of fluid is too high. | Use fluid with lower viscosity. |
| | Pumping fluid disabled | Suction port is above fluid level. | Adjust fluid level. |
| | Insufficient discharge | Large amount of bubbles in fluid. | Prevent bubble generation/suction. |
| | | Rotation direction is incorrect. | Connect terminals correctly. |
| | | Piping loss is high. | Review piping. |
| | | Fluid does not run smoothly. | Eliminate foreign matter. Check connections. |
| | | Impellers are worn out. | Replace impellers. |
| | Abnormal sound Excessive vibration | Bearing is worn out. | Replace bearing. |
| | | Pump is in single-phase operation. | Check circuit. |
| | Water hammer occurrence | Water hammer occurs when a valve is closed suddenly. | Install an accumulator. |

- Scope and period of guarantees

The guarantee period of the pump is one year after shipment to the place indicated in the purchase order. When failure occurs during the guarantee period, under normal use within the range of the product specifications according to this instruction manual, damaged parts will be replaced or the pump will be repaired for free, excluding failure due to any of the following:

- (1) Inappropriate handling or operation by the user
- (2) Any cause other than the pump
- (3) Incorrect repair or modification
- (4) Any occasion out of control of the supplier such as natural disaster or casualty

This guarantee applies to delivered pumps only, and does not apply to other equipment damaged due to failure of the pump.

- Investigation and repair

After the guarantee period elapses, all diagnosis and repair fees are charged. Even during the guarantee period, we also provide repairs or diagnosis of failures due to causes not included in the free services listed above at a charge. When you need repairs or replacement parts, contact your dealer or our sales branches.



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