
COOLANT PUMP

NPJ, NQJ, NQP-SERIES

Notice

Make sure that this Instruction Manual is delivered to the end user of this motor.

Coolant Pump

Safety Precautions

Thank you for purchasing the coolant pump.

This pump has been designed with an outstanding electrical and mechanical performance, and detailed caution has been taken during manufacture to ensure safe use.

Read this instruction manual thoroughly before starting use to ensure long usage through correct handling, maintenance and inspection.

Before starting use of this coolant pump (before starting installation, operation, maintenance or inspection, etc.), always read this manual and other enclosed documents thoroughly to ensure correct use. After reading, always store this manual where it can be accessed easily.


The safety precautions are ranked as "DANGER" and "CAUTION" in this instruction manual.



: When a dangerous situation may occur if handling is mistaken leading to fatal or major injuries.



: When a dangerous situation may occur if handling is mistaken leading to medium or minor injuries, or physical damage.

Note that some items described as  **CAUTION** may lead to major results depending on the situation. In any case, important information that must be observed is described.

DANGER

[General]

- Do not use this coolant pump in an explosive atmosphere. Use an explosion-proof motor for that type of atmosphere. Failure to observe this could lead to injuries or fires, etc.
- Do not work with a live wire state. Always turn the power OFF before starting work. Failure to observe this could lead to electric shocks.
- Only trained persons must perform transportation, installation, piping and wiring, operation, maintenance and inspection. Failure to observe this could lead to electric shocks, injuries or fires, etc.

[Piping and wiring]

- Securely connect the power cable. (Make sure that the screws are not loose.) Failure to do so could lead to electric shocks or fires.
- Do not bend, pull or catch the power cable or motor lead wires with force. Doing so could lead to electric shocks.



DANGER

[Installation and adjustment]

- Always ground the grounding terminal. Failure to do so could lead to electric shocks.

[Operation]

- Do not operate the cooling pump with the terminal box cover removed. After work, return the terminal box cover to its original position. Failure to do so could lead to electric shocks.
- Never go near or touch the rotating parts (shaft, etc.) during operation. Failure to observe this could lead to entanglement or injuries.
- Always turn the power switch OFF if a power failure occurs. Failure to do so could lead to injuries.



CAUTION

[General]

- Do not use the pump outside its specifications. Failure to observe this could lead to electric shocks, injuries or damage, etc.
- Do not insert fingers or objects into the motor or pump openings. Failure to observe this could lead to injuries or damage, etc.
- Do not use a damaged pump. Failure to observe this could lead to injuries or fires, etc.
- Modifications of the product by the user are not covered by the Mitsubishi Warranty. Thus, Mitsubishi will not bear any responsibility.

[Shipment and transportation]

- Dropping or falling of the pump during transportation will create a hazardous situation, so take special care.
- If the pump is provided with a hanging bolt, use the hanging bolt. Avoid lifting the entire machine with the hanging bolt after the pump is installed on a machine.
Check the pump weight before lifting it, and do not lift a pump that exceeds the hanging bolt's rated weight.

[Unpacking]

- Confirm the orientation of the package. If the package is crated, take care to the nails when unpacking. Failure to do so could lead to injuries.
- Confirm that the delivered product is as ordered. Installation of an incorrect product could lead to injuries or damage, etc.



CAUTION

[Installation and adjustment]

- When using star-delta starter, select one with an electromagnetic switch (three-conductor type) on the primary side. Failure to do so could lead to fires.
- Do not drive the pump with an inverter. The motor load will fluctuate according to the coolant speed, and may cause overload operation. Furthermore, depending on the voltage, a strengthened insulation may be required. Thus, the pump for inverter drive must be an exclusive type. When planning to drive with an inverter, order an exclusive pump.
- Do not place flammable objects around the motor. Failure to observe this could lead to fires.
- Do not place objects around the motor that will block the ventilation. Failure to observe this could lead to blocking of the cooling leading to abnormal overheating and fires or burns, etc.
- When installing the pump onto the machine, make sure that it is securely fix with a bolt, etc., into the installation holes on the pump flange. Incorrect installation could lead to damage of the device.
- Never get on the motor. Install a cover so that the rotary sections are not contacted. Failure to observe this could lead to injuries.

[Piping and wiring]

- Always turn the power OFF and never touch the terminals directly with bare hands when measuring the insulation resistance. Failure to observe this could lead to electric shocks.
- Wire the pump according to Electrical Facility Technology Standards or local electricity laws. Failure to observe this could lead to burning or fires.
- This motor does not have a protection device. Installation of an overload protection device is mandatory under Electrical Facility Technology Standards. Installation of a protection device (leakage breaker, etc.) besides an overload protection device is recommended.

[Operation]

- The motor will become quite hot during operation. Take care not to touch the motor with your hands or body. Failure to observe this could lead to burns, etc.
- Stop operation immediately if an abnormality occurs. Failure to observe this could lead to electric shocks, injuries or fires, etc.
- For the NPJ-type, do not run the pump for 30 seconds or more without any fluids (dry run). Failure to observe this could lead to damage or fires due to heating of the mechanical seal.

[Maintenance and inspection]

- Always turn the power OFF and never touch the terminals directly with bare hands when measuring the insulation resistance. Failure to observe this could lead to electric shocks.
- The motor frame will become quite hot during operation. Do not touch it with bare hands. Failure to observe this could lead to burns, etc.

[Repairs, disassembly, modification]

- All repairs, disassembly and modification must be done by a specialist. Failure to do so could lead to electric shocks, injuries or fires, etc.

[Disposal]

- Treat the motor as general industrial waste when disposing of it.

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Quality Assurance Period and Scope

- As a rule, TERAL TAKU will repair faults found to be the fault of TERAL TAKU free of charge for one year from the date of product delivery.
- The product warranty applies only to the delivered product unit.

1. Type and Structure

Table 1 Type and structure

Class		Type	Structure
Self-priming type		NPJ NPJ-60G NPJ-100G NPJ-180G NPJ-250G NPJ-400G NPJ-700G NPJ-750G	This is a general 3-phase "coolant pump" having an integrated motor and pump and which can be randomly set on a frame. A mechanical seal is used.
Immersible type	Flow rate type	NQJ NQJ-60G NQJ-100G NQJ-180G NQJ-250G NQJ-400G NQJ-700G NQJ-e750G NQJ-S180G-240 NQJ-S250G-290 NQJ-S250G-180 NQJ-S400G-180	The motor and pump sections use the same shaft but have separated structures. The pump section is immersed in oil and used. As a mechanical seal is not used, this type is suitable for machines in which the seal section easily wears due to the contamination of oil by grinding chips and cutting chips. A fringer is installed on the motor side to prevent the entry of oil.
	Pressure type	NQP NQP-180G NQP-250G NQP-400G	This is a high-pressure specification immersed type pump. The structure is the same as the NQJ-type.

2. Installation and Operation

(1) Installation

NPJ-type	Install the pump as close to the oil surface as possible.
NQJ-type NQP-type	The pump section must always be immersed in the oil. Control the oil level so that the tank oil level is between the maximum oil level height and minimum oil level height indicated in the outline drawings.

The coolant pump is treated with a special paint so that it can be used with alkaline cutting oils often used recently. The motor is a fully closed or a fully enclosed with outer blade type, but is not waterproof. Thus, take care when installing so that large amounts of water and oil do not contact the motor.

(2) Piping

Remove the dust caps on the delivery outlet (OUT) and suction inlet (IN), and connect the pipes selected from Table 2.

With the NPJ-type, if there is an air leak on the suction inlet side, the pump performance will drop. Make sure that the connection is complete by using sealing tape or by applying a sealing agent, etc., and tightening the pipe.

Table 2 Pipe table

Output (W)	Pipe dimensions	Thread dimensions	Pump installation bolt
60, 100	Gas pipe 3/8B	Rp3/8 thread (pipe thread)	M6 (two places)
180	Gas pipe 1/2B	Rp1/2 thread (pipe thread)	M8 (two places)
250	Gas pipe 3/4B	Rp3/4 thread (pipe thread)	M8 (two places)
400,700,750	Gas pipe 1B	Rp1 thread (pipe thread)	M8 (two places)

(3) Oil tank

Use a tank that has at least two partitions to create an overflow so that the oil returns to the suction inlet. Make sure that cutting chips, etc., do not enter the tank. If there are many bubbles, the pump performance will drop, so when quietly fill the tank with oil so that air does not enter. Note that problems such as wear will occur if large amounts of slurry, etc., enter the tank.

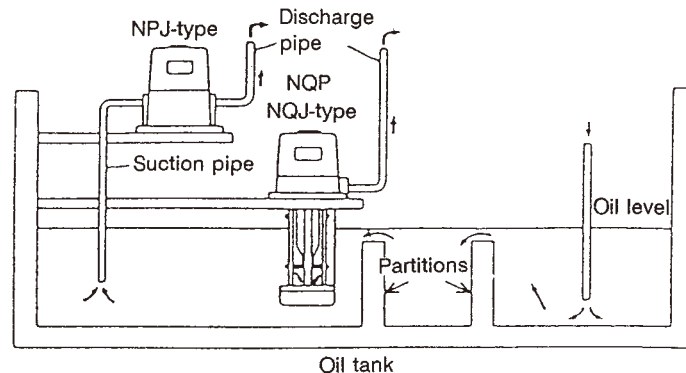


Fig. 1 Installation

(4) Connection with power supply

The orientation of the terminal box on the coolant pump can be freely changed to face the top, bottom, left or right.

Securely tighten the connection of the power cable and motor lead wire so that the terminals do not loosen. If the terminal loosens impairing the contact, the motor will enter the single-phase run state and may be burnt.

(5) Protection

Use the switchers and fuses specified by the power company.

When using a commercial switch, always use a fuse that has a capacity of three to four times the current listed on the nameplate. If the viscosity of the oil being used is too high, the motor may become constrained due to open phase operation or entry of foreign matter in the pump, and could burn. If there is a risk of this state, use of a Mitsubishi MS-K magnetic switcher for overload protection and motor starting is recommended. Use the maximum tolerable current listed in the catalog and nameplate when setting the thermal relay current. A grounding terminal is provided in the terminal box, so please use it.

(6) Voltage

If the voltage drop is remarkable, the anticipated pump performance will not be achieved. The motor torque will drop in proportion to a square of the voltage drop, causing the delivery rate to drop and the current to increase. The motor may burn in this case. If there is a voltage unbalance in the three phases, the thermal relay may trip.

(7) Rotation direction

The rotation direction is shown with arrows on the top of the frame or the fan cover. If the rotation is reversed, interchange two of the three terminal wires. (The clockwise rotation is the normal rotation as a standard.)

(8) Nominal oil

For the NPJ-type (self-priming type), nominal oil is required for the first operation after installation. The nominal oil charges the pump chamber and suction piping passage from the discharge side. Connecting a T-shape in the discharge side piping is handy for charging the oil. If the pump is run for 30 seconds or more without oil after installation or a long stop of the pump, the operation will take place with the mechanical seal in the dry state. This will cause the mechanical seal to be damaged.

(9) Oil rate adjustment

This is a centrifugal spiral pump, and the oil rate can be easily adjusted with the cock or sluice valve. (The stop valve has a large resistance, and thus use cannot be recommended.)

3. Daily Precautions and Maintenance

(1) Temperature rise

The temperature of the motor section will rise through operation, but a stable state (saturated state) will be reached after two to three hours from starting operation. Sections affected by the temperature rise is the motor coil section. The coolant pump uses Class B insulation, so it can be used in the following range.

$$[\text{Ambient temperature}] + [\text{Temperature rise value}] = 120^{\circ}\text{C}$$

If the ambient temperature exceeds 40°C, please contact the maker.

(2) Replacement of mechanical seal

The NPJ-type uses a long-life mechanical seal, so the pump can be used safely. However, the mechanical seal can be damaged by the entry of grinding chips or cutting chips, etc. If oil leaks from the drain hole (waste oil hole), the mechanical seal may be worn or damaged, or cutting chips, etc., may have entered between the sealed surface of the mechanical seal, by that causing the seal function to be lost. Replace the mechanical seal in this case.

[Mechanical seal type] EA560-013 (Dimensions 11 × 24 × 24)

Follow the procedure given in Table 3 to replace the mechanical seal. (Contact the Mitsubishi Service Center for replacements when possible.)

Please purchase the mechanical seal from a Mitsubishi agent, dealer, sales office or service center.

Table 3 Mechanical seal replacement procedure

Disassemble the pump with steps 1 to 9 in the table, and assemble with the steps in reverse. Take care not to damage the sliding surface of the new mechanical seal. Application of turbine oil, etc., on the sliding surface will make assembly easier, and will help prevent rusting. Refer to Figs. 4 and 5 for the parts given with Nos. in the table.

Item	Remarks
1. Remove the end lid ⑬ .	
2. Remove the shaft end screw (right screw) ⑲ , and pull off the impeller ① .	
3. Remove the fan cover ⑭ . Remove the external fan fixing screw, and pull the external fan ① off the shaft.	Types NPJ-400 and 700 and 750 only
4. Remove the frame and bracket installation screws. (2 places at 180° symmetrical)	
5. Remove the frame ⑥ from the bracket ⑩ .	Lightly tap with a wooden hammer to remove.
6. Remove the bearing retainer installation screws, and remove the bearing retainer ⑦ .	When assembling, tighten the installation screws uniformly and sequentially.
7. Pull the rotor ④ off the bracket ⑩ .	
8. Remove the rotary ring of the mechanical seal ⑨ installed on shaft ⑱ .	Apply turbine oil 32 on the shaft when assembling, and mount the fixing ring (bracket) within one minute of mounting the rotary ring.
9. Pull the fixing ring of the mechanical seal ⑨ off the bracket ⑩ .	Push off from the pump chamber side.

(3) Replacement of ball bearings

Shielded ball bearings filled with high-performance grease are used, so a good lubrication performance can be achieved for a long time without foreign matter entering the bearings or without grease leaking.

If abnormalities occur because of the life, etc., of the ball bearings, replace them according to Table 4.

Table 4 Ball bearing type

Usage position	Ball bearing type
Motor upper section	6201CXZZ /6203CXZZ (e750)
Motor lower section (pump side)	6203ZZ

Follow Table 3 "Mechanical seal replacement procedure" to disassemble the pump. After the rotary ring of the mechanical seal has been removed in step 8 of Table 3, carefully remove the bearings from the rotor with a pull-out tool. Make sure not to twist off the bearings at this time. The shaft for the NQJ and NQP types is long, and the shaft may deform if force is applied on the end. Thus, use the stepped section, etc., near the bearings to remove the bearings.

When mounting the bearings, quietly press them on by placing a pipe on the inner race of the bearings, and pressing them down without inclination, or heat the bearings with a heater or kiln (never exceed 100°C), and insert them.

Assemble the upper section AC bearings onto the motor by applying grease between the two outer diameter O-rings.

The shaft end section is an important part used to fix the impeller rotation and to maintain the straightness to the shaft, so take care not to apply impact or damage the shaft end during disassembly and assembly work.

Contact the Mitsubishi agent, dealer, sales office or service center for the ball bearings.

(4) Precautions for fixing impeller

The shaft end section and impeller shaft installation section will affect the impeller installation strength and assembly precision, so sufficiently clean before installing. The installation screw tightening torque is 56kgf-cm.

(5) Precautions for burning accidents

If the viscosity of the oil being used is too high, or if foreign matter enters the pump constraining the rotor, the motor will be overloaded and may burn. Burning can also occur due to single-phase operation and voltage drops.

The motor can also burn if the air surrounding the pump is not exchanged with outdoor air, causing the ambient temperature to become too high. Make special considerations for ventilation, etc.

If the discharge stops or drops suddenly, turn the switch off and check for foreign matter in the pump. If the risk of burning accidents is high, use a Mitsubishi MS type magnetic contactor.

For the NPJ-type, if the pump is run in a closed-off state for a long time, the frictional heat of the impeller and mechanical seal will build up in the pump because of the structure of the pump. This can cause the temperature to exceed the tolerable value, so make sure to not run the pump in a closed-off state for 30 minutes or more. If the pump is to be run continuously regardless of the oil discharge, use a thin pipe to create a branch circuit (bypass circuit) separately from the main pipe, and flow a small amount of oil.

(6) Drain hole

The drain hole is provided on the bracket side. This hole is used to protect the lower section shielded ball bearings in the event that oil leaks into the motor from the pump. If oil is leaking from this hole during operation, stop the operation and inspect the state.

NPJ-type Possibility of mechanical seal abnormality is great.

NQJ-type Possibility of tank oil level being higher than specified value is great.

This drain hole is also used to discharge any water that builds up in the motor due to the breathing function.

(7) Daily maintenance

Besides paying attention to the operation state during daily use, not much maintenance is required. However, the cooling performance will drop if dust accumulates on the outer surface of the motor, so periodically clean it.

Periodically clean the oil tank or exchange the oil so that foreign matter does not enter the oil. Also clean the filter when using the NQ-type.

(8) Consumable part replacement period

The consumable parts and replacement periods are shown in Table 5.

Table 5 Consumable part replacement period

Part name	Model	Replacement period
Ball bearings	All models	Approx. 10,000 hours
Mechanical seal	NPJ-type	Approx. 5,000 hours
O-ring	NPJ-type	When pump is disassembled (approx. 5,000 hours)
Fringer	NQJ, NQP-type	When pump is disassembled (approx. 10,000 hours)
Filter	NQJ, NQP-type	When pump is disassembled (approx. 10,000 hours)
Impeller	All models	When worn

- Note)**
1. The values given in this table are a guideline, and are not the guaranteed values.
 2. If the head or threads of the screws, etc., become worn, replace them as necessary.
 3. The rubber parts such as the mechanical seal, O-ring and fringer will deteriorate with time even if the pump is not operated. Replace these parts once every three years.

(9) Maintenance of stator coil

The life of the stator coil will vary greatly according to the usage state, but generally is approx. 40,000 hours. Overhaul the coil at about 40,000 hours. The coil can be used in a cleaner state if it is cleaned and dried when the mechanical seal or bearings are replaced.

4. Pump Performance

Refer to the characteristics diagram given in the catalog for the pump performance. The value given on the nameplate shows the discharge rate using clean water. (The 220V/60Hz characteristics are slightly better than the 200V/60Hz characteristics.)

Note that the discharge rate will fluctuate greatly in the following cases.

(1) Pipe friction loss

The discharge rate is obtained by subtracting the head lost due to the piping and joints, etc., from the "Discharge rate - total head" curve. The piping head loss is not constant because of the smoothness of the inner surface of the pipe, flow rate and viscosity, etc. However, an example for a smooth pipe is shown in Figs. 2 and 3.

Use as few joints and bends (elbows, etc.) in the piping, and avoid piping in which the cross-sectional area fluctuates suddenly.

(2) Oil viscosity and pump performance

As the viscosity of the oil being used increases, the motor load increases and the discharge rate drops. The discharge rate will drop, but design the system so that the oil can be used to the following viscosities.

Table 5 Usable viscosity Unit mm²/s (=cSt)

Model	50Hz	60Hz
NPJ (Self-priming flow rate type)	150	75
NQJ (Immersible flow rate type)	150	75
NQP (Immersible pressure type)	32	

The viscosity of the oil changes greatly according to the temperature. Note that in the winter, the oil temperature will drop and the viscosity will increase causing the motor load to increase. Contact Taku Electric when using oil with an especially high viscosity.

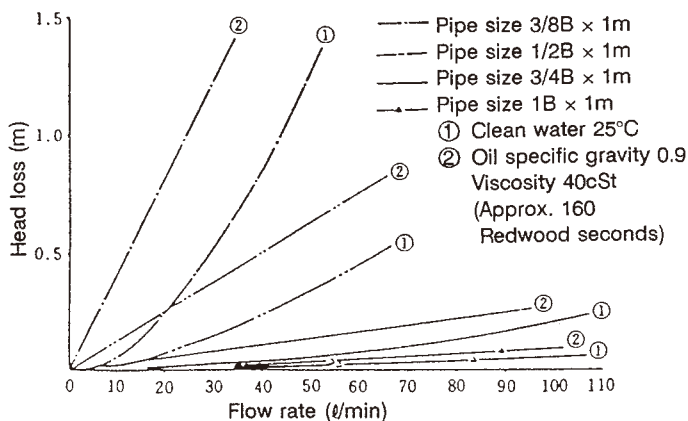


Fig. 2 Pipe frictional head loss

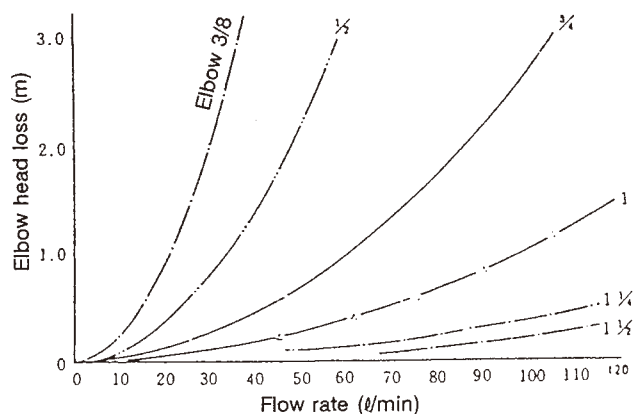


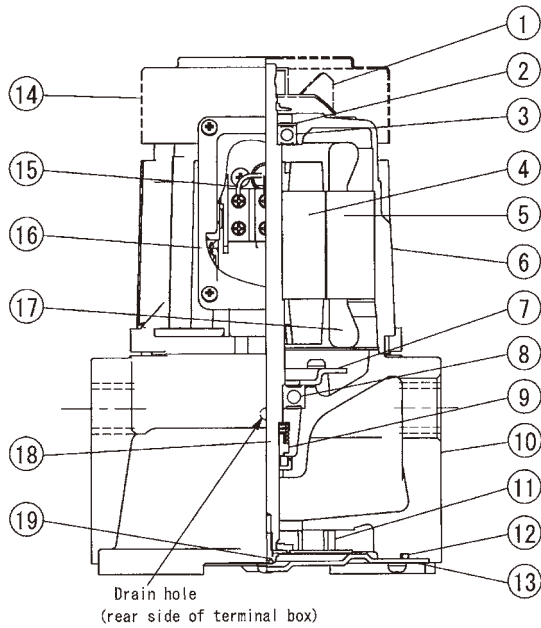
Fig. 3 Elbow head loss (per elbow)

5. Troubleshooting

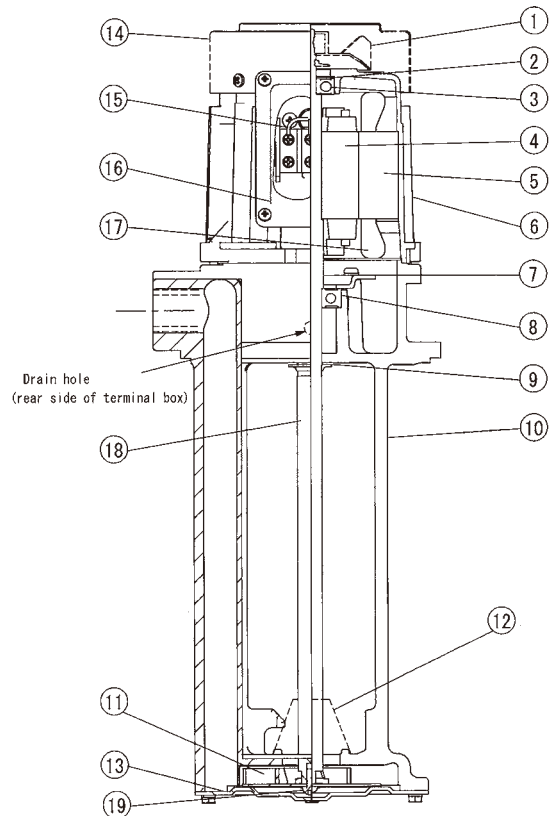
Phenomenon		Cause	Remedy
The motor does not rotate.	A groan is heard.	The switch contact is defective.	Adjust the contact section.
		The fuse is blown.	Replace the fuse.
		One phase of the cable is broken.	Replace the cable.
		The stator (motor) coil has a broken wire.	Have a specialist repair.
		The rotor and stator are contacting due to bearing wear.	Have a specialist repair.
	A sound is not heard.	The stator (motor) coil has a broken wire.	Have a specialist repair.
		Power failure	Contact the power company.
		The connection cable has a broken wire.	Replace the cable.
	The switch contact is defective.	Adjust or replace the contact section.	
The motor rotates.	A groan is heard. The current is excessive.	The rotor and stator are contacting.	Have a specialist repair.
		The gap between the rotor and stator is unbalanced.	
		One phase of the stator (motor) coil is short circuited.	
	The discharge rate is low or none is discharged.	The motor is rotating in reverse.	Interchange two of the three terminals.
		A large quantity of bubbles forms in the tank.	Remove the cause of the bubbles.
		The impeller is worn or damaged.	Have a specialist repair.
		The air in the pump is pressed down due to a backflow of the oil in the pipes, and the impeller is exposed to the air.	Discharge the air (Install a bypass circuit, etc.) Drain the oil in the pipe. Reduce the difference of elevation in the piping.
		Air is leaking in the suction side piping. (NPJ-type)	Repair the piping.
		The fluid level is too low.	Increase the fluid level.
		The filter is clogged. (NQJ, NPJ types)	Clean the filter.
		The mechanical seal is worn. (NPJ-type)	Replace the mechanical seal.
	The discharge rate fluctuates suddenly.	The mechanical seal is worn. (NPJ-type)	Replace the mechanical seal.
		Foreign matter has entered.	Inspect and clean.
		The piping is disconnected or damaged.	Repair or replace the piping.
	Oil is leaking from the drain hole.	The mechanical seal is worn. (NPJ-type)	Replace the mechanical seal.
		The fluid level is too high, or bubbles have formed in the tank. (NQJ, NQP types)	Lower the fluid level. Remove the cause of the bubbles.
	The thermal relay has tripped.	The fluid viscosity is too high.	Use a low-viscosity fluid.
		The voltage drop is great or the voltage is unbalanced.	Inspect the power source.
		Foreign matter has caught.	Inspect the inside of the pump.

6. Names of Each Part

NPJ-type



NQJ, NQP types



Part No.	Part name	
	NPJ-type	NQJ, NQP types
* 1	External fan	
2	Preload spring	
3	Shielded ball bearing on opposite load side	
4	Rotor	
5	Stator core	
6	Frame	
7	Bearing retainer	
8	Shielded ball bearing on load side	
9	Mechanical seal	Fringer
10	Bracket	
11	Impeller	
12	O-ring	Filter (option)
13	End lid	
* 14	Fan cover	
15	Lead wire	
16	Terminal box	
17	Stator coil	
18	Shaft	
19	Impeller installation screw	

Caution 1. The part marked with a * is provided only for the 400W and 700 and 750W models.
 2. The part No. 19 impeller installation screw is a right-hand screw.

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