TSURUMI PUMP

172-369-22/B-10013-2

PMU Submersible Vortex Pump

OPERATION MANUAL

INTRODUCTION

Thank you for selecting the Tsurumi PMU Submersible Vortex Pump for your application.

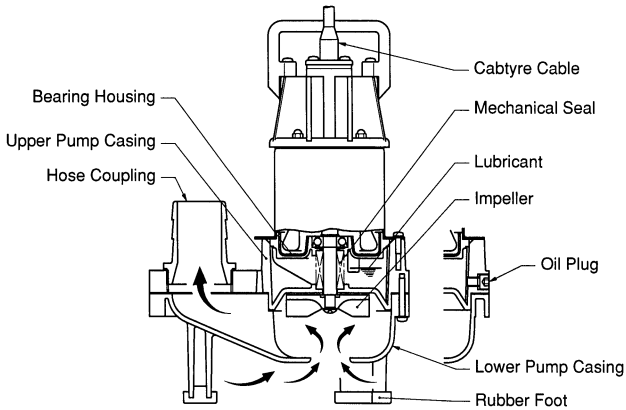
This equipment should not be used for applications other than those listed in this manual. Failure to observe this precaution may lead to a malfunction or an accident. In the event of a malfunction or an accident, the manufacturer will not assume any liability. After reading this Operation Manual, keep it in a location that is easily accessible, so that it can be referred to whenever information is needed while operating the equipment.

CONTENTS

TSURUMI MANUFACTURING CO., LTD.

1 PART NAMES

■ Example



2 PRIOR TO OPERATION

After unpacking, verify the contents.

Product Inspection

Inspect the product for damage during shipment, and make sure all bolts and nuts are tightened properly.

Specification Check

Check the nameplate of the unit to verify that it is the product that you have ordered. Pay particular attention to its voltage and frequency specifications.

Accessory Check

Verify that all accessory items are included in the package.

Screw-On Hose Coupling (non-automatic type only) 1
Hose Band (non-automatic type only) 1
Operation Manual 1

Note: *If you discover any damage or discrepancy in the product, please contact the dealer where this equipment was purchased or the Tsurumi sales office in your area.*

Product Specifications

⚠CAUTION **Do not operate this product under any conditions other than those that have been specified.**

■ Major Standard Specifications

Applicable Liquids	Consistency and Temperature	Waste water, liquid carrying waste and solid matters, sump tank water ; 0 ~ 40℃
Pump	Impeller	Vortex type
	Shaft Seal	Double Mechanical Seal
	Bearing	Sealed Ball Bearing
Motor	Specifications	Dry Submersible Induction Motor, 2-Pole
	Insulation	Class E
	Protection System (built-in)	Miniature Protector
	Lubricant	Liquid Paraffin VG15
Connection		Screwed Flange Hose Coupling (non-automatic type)

3 INSTALLATION

⚠CAUTION

- **Do not use the pump for pumping liquids other than plain water, such as oil, salt water, or organic solvents.**
- **The supply voltage should be within ± 5% of the rated voltage.**
- **The water temperature for operating the pump should be between 0 ~ 40℃.**

Failure to observe the precautions given above could cause the pump to malfunction, which may lead to current leakage or electrical shock.

Note: *To use the pump for a special solution, contact the dealer where it was purchased, or the Tsurumi sales office in your area.*

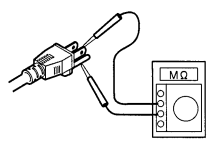
■ Critical Use Pressure

⚠CAUTION **Do not operate the pump in an area that is exposed to a water pressure that exceeds the values given below.**

Critical Use Pressure	0.2MPa (2kgf/cm²) − discharge pressure during use

Preparation for Installation

Use a megger to measure the resistance between the tip of the cabtyre cable plug and the ground terminal to verify the insulation resistance of the motor.



(This diagram shows a 2-pin plug type.)

⚠CAUTION **Beware that the power plug varies by country or region.**

Insulation resistance reference value
= 20M Ω minimum

Note: *The insulation resistance reference value of 20M Ω minimum is based on a new or repaired pump. For reference values of a pump that has already been put into operation, refer to "6. Maintenance and Inspection" of this manual.*

Precautions During Installation

⚠WARNING **When installing the pump, be mindful of the pump's center of gravity and weight. If the pump is not suspended properly, the pump may fall and break, which may lead to injury.**

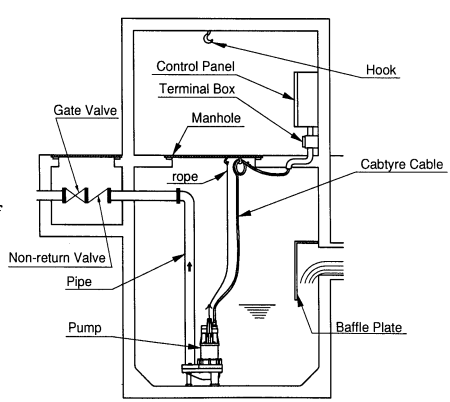
⚠CAUTION **When installing or moving the pump, never suspend the pump by the cabtyre cable. Doing so will damage the cable, which may cause a current leakage, electrical shock, or fire.**

Refer to the installation examples illustrated below and pay attention to the points described below to install the pump.

⚠CAUTION **During piping work if the welding sparks, paint, or concrete come in contact with the pump, they could cause the pump to malfunction, which may lead to current leakage or electrical shock.**

(1) When transporting or installing the pump, do not kink the cabtyre cable or use it in place of a rope.

(2) With the cabtyre cable lifted slightly, secure it to the hook (a hook must be prepared in advance by placing it on the frame of a manhole or the like).



⚠CAUTION **Do not operate the pump with the cabtyre cable dangling. Failure to observe this precaution may cause the cabtyre cable to become wrapped around the impeller, which could cut the cable, break the impeller, or cause flooding, which may lead to current leakage or electrical shock.**

(3) Install the pump horizontally on top of a surface such as concrete, in an area that is free of turbulence and does not cause the pump to take air in.
(4) The area near the inlet of a water tank is susceptible to turbulence or allows the pump to take air in; therefore, place the pump and the float switch away from the inlet or install a baffle plate.
(5) Properly perform piping work so as not to create any air pockets in the middle of piping.

⚠CAUTION **With automatic control, the sewage water in the pipe could flow backwards, causing the water surface control to react immediately. As a result, the pump will operate ON/OFF repeatedly, which could cause the pump to malfunction.**

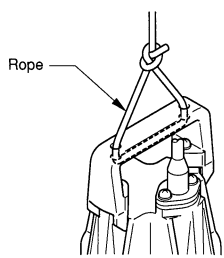
(6) Install a non-return valve if the pump tank is deep, or if the vertical head or the lateral distance is long.

Attaching a Rope to Suspend the Pump

Refer to the illustration on the right in order to suspend the pump by a rope.

⚠CAUTION **Make sure that the rope does not become twisted during installation. Failure to observe this precaution could cause the rope to break and the pump to fall and break, which could lead to injury.**

Note: *To use the pump with the guide rail, refer to the separate operation manual entitled "Guide Rail".*



4 ELECTRICAL WIRING

Electrical Wiring Work

⚠WARNING

- **All electrical work must be performed by an authorized electrician, in compliance with local electrical equipment standards and internal wiring codes. Never allow an unauthorized person to perform electrical work because it is not only against the law, but it can also be extremely dangerous.**
- **Improper wiring can lead to current leakage, electrical shock, or fire.**
- **Be sure to use a dedicated ground leakage circuit breaker and overcurrent protector provided exclusively for this unit, to prevent the pump from being damaged. Failure to observe this precaution may lead to current leakage and electrical shock.**

Operate well within the capacity of the power supply and wiring.

Grounding

⚠WARNING **Be sure to install the ground wire securely. Failure to observe this precaution could damage the pump and cause current leakage, which may lead to electrical shock.**

⚠CAUTION **Do not connect the ground wire to a gas pipe, water pipe, lightning rod, or telephone ground wire. Improper grounding could cause electrical shock.**

Connecting the Power Plug

⚠WARNING **Before inserting the power plug , make sure that the power supply (i.e. circuit breaker) is properly disconnected. Failure to do so may lead to electrical shock, short, or injury caused by the unintended starting of the pump.**

⚠CAUTION **Do not use damaged cabtyre cables, power plugs, or loose power outlets. Failure to observe this precaution could lead to electrical shock, short circuit, or fire.**

Follow the diagram on the right to connect the power.

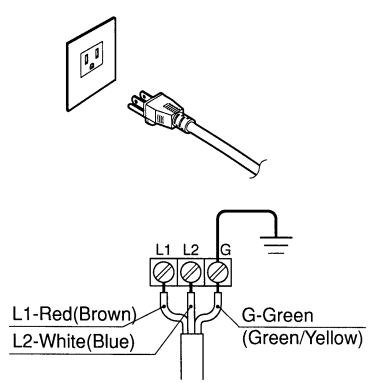
When using a three-prong grounded plug,connect as shown in the drawing.

⚠CAUTION **Be sure to use a dedicated power supply with a ground leakage circuit breaker.**

(This diagram shows a 2-pin plug type.)

⚠CAUTION **Beware that the power plug varies by country or region.**

Note: *the shape of the plug may differ from that shown in the illustration.*



Tighten the connecting terminals at the end of the cabtyre cable securely against the terminal board of the control panel.

Motor Protector

The pump is equipped with a built-in motor protector (miniature protector).
If a current overload or overheating occurs under the symptoms given below, the pump will stop automatically to protect the motor regardless of the water level at the time of operation.

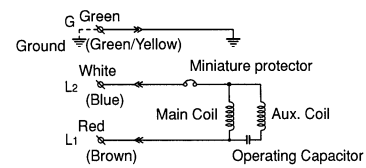
- Extreme fluctuation of power supply voltage
- Pump operated under overload condition
- Pump operated at binding condition

Note: *After the motor protector has tripped, the motor automatically resumes its operation. Therefore, make sure to disconnect the cabtyre cable from the power outlet, and eliminate the cause of the problem.*
Do not operate the pump at unusually low head, or with the impeller clogged with debris. Doing so will not only prevent the pump from attaining its full potential, but may also generate abnormal noise and vibration and damage the pump.

Electrical Circuit Diagrams

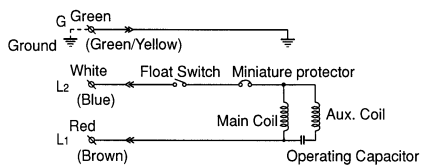
Non-Automatic Circuit

Power Supply: Single-Phase



Automatic Circuit

Power Supply: Single-Phase



5 OPERATION

Prior to Operation

(1) Once again, check the nameplate of the pump to verify that its voltage and frequency are correct.

⚠CAUTION **Improper voltage and frequency of the power supply will prevent the pump from attaining its full potential, and may also damage the pump.**

Note: *Verify the specs on the pump's nameplate.*

(2) Check the wiring, power supply voltage, the capacity of the ground leakage circuit breaker, and the insulation resistance of the motor.

■ Insulation resistance reference value = 20M Ω minimum

Note: *The insulation resistance reference value of 20M Ω minimum is based on a new or repaired pump. For reference values of a pump that has already been put into operation, refer to "Maintenance and Inspection".*

(3) Adjust the setting of the thermal relay (i.e. 3E relay) to the pump's rated current.

Note: *Verify the rated current on the pump's nameplate.*

5-1 NON-AUTOMATIC OPERATION

Trial Operation

⚠WARNING **Never start the pump while it is suspended, as the pump may jerk and cause a serious accident involving injury.**

(1) Operate the pump 3 to 10 minutes to verify the conditions listed below.

⚠CAUTION **In case the pump exhibits an abnormal condition (such as a considerable amount of vibration, noise, or smell), disconnect the power supply immediately and contact the dealer where you purchased the equipment, or Tsurumi's sales office in your area. If the pump continues to be used in the abnormal state, it may cause current leakage, electrical shock, or fire.**

(2) Proceed with the normal operation if no abnormal conditions are found during the trial operation.

Operation

⚠WARNING **The pump unit may be extremely hot during operation. To prevent burns, do not touch the pump unit with bare hands during or after the operation.**

Pay attention to the water level during the pump operation. The pump will become damaged if it is allowed to operate dry.

Due to an overload operation or a pump malfunction, if the motor protector trips to stop the pump, make sure to eliminate the cause of the problem before restarting.

To operate a submersible pump (including automatic operation), set the water level so that the pump will operate about 10 times per hour.

Note: *A large amount of amperage flows when a submergible pump is started, causing the temperature of its windings to rise rapidly. Beware that a frequent stop-and-go operation of the pump will accelerate the deterioration of the insulation of the motor windings and thus affect the use life of the motor.*

Operating Water Level

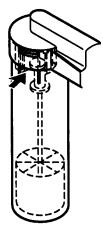
⚠CAUTION **Do not operate the pump at the lowest water level longer than 30 minutes, as it could damage the pump, causing current leakage and electrical shock . For details on the lowest water level, refer to the dimension drawing, which is provided separately.**

5-2 Automatic Operation

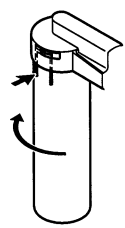
Cleaning the Float Case

If debris accumulates in the float case, it could cause the automatic operation of the pump to function improperly. If the pump continues to operate even though the stopping water level has been reached, or the pump does not start even if the starting water level has been reached, the accumulation of debris in the float case could be a possible cause. If such a condition exists, clean the inside of the float case as follows:

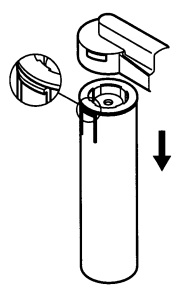
(1) Gently hold the upper portion of the float case and press the protrusion on the lower portion of the float case.



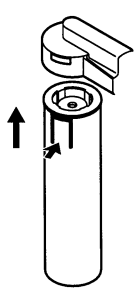
(2) Turn the lower portion of the float case clockwise, as seen from the top of the pump.



(3) Pull the float case straight down.



(4) Clean the inside of the case. Then, gently press the protrusion on the lower portion of the float case with your finger and insert it into the upper portion. Make sure that the protrusion is securely fitted into the cutout.



6 MAINTENANCE AND INSPECTION

Regular maintenance and inspection are indispensable to maintaining the pump's performance. If the pump behaves differently from its normal operating condition, refer to section "8. Trouble-shooting" and take appropriate measures at an early stage. We also recommend that you have a spare pump on hand for an emergency.

Prior to Inspection

⚠WARNING **Make sure that the power supply (i.e. circuit breaker) is disconnected and disconnect the cabtyre cable from the power outlet. Failure to do so may cause electrical shock or unintended starting of the pump, which may lead to serious accidents.**

(1) Washing the Pump
Remove any debris attached to the pump's outer surface, and wash the pump with tap water. Pay particular attention to the impeller area, and completely remove any debris from the impeller.

(2) Inspecting the Pump Exterior
Verify that there is no damage, and that the bolts and nuts have not loosened.

Note: *If the pump must be disassembled for repair due to damage or loose bolts or nuts, contact the dealer where it was purchased, or the Tsurumi sales office in your area.*

Daily and Periodic Inspection

Interval	Inspection Item
Daily	Measuring the operating current ■To be within the rated current Measuring the power voltage ■ Power supply voltage tolerance = within ±5% of the rated voltage
Monthly	Measuring the insulation resistance ■ Insulation resistance reference value = 1MΩ minimum [NOTE] The motor must be inspected if the insulation resistance is considerably lower than the last inspection.
Semi-yearly	Inspecting oil ■1,500 hours or 6 months, whichever comes first
Yearly	Changing oil ■ 3,000 hours or 12 months, whichever comes first Changing the mechanical seal [NOTE] The inspection and replacement of the mechanical seal requires specialized equipment. To have this operation performed, contact the dealer where this equipment was purchased, or the Tsurumi sales office in your area.
Once every 2 to 5 years	Overhaul ■ The pump must be overhauled even if the pump appears normal during operation. Especially, the pump may need to be overhauled earlier if it is used continuously. [NOTE] To overhaul the pump, contact the dealer where it was purchased, or the Tsurumi sales office in your area.

Note: *Refer to section "Oil Inspection and Change Procedures" below for further detail.*

Storage

If the pump will not be operated for a long period of time, pull the pump up, wash the pump, allow it to dry, and store it indoors.

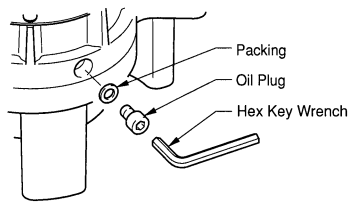
Note: *For reinstallation, be sure to perform a trial operation before putting the pump into operation.*

If the pump remains immersed in water, operate it on a regular basis (i.e. once a week).

Oil Inspection and Changing Procedures

Inspecting Oil

Remove the oil plug and take out a small amount of oil. The oil can be extracted easily by tilting the pump so that the oil filler plug faces downward. If the oil appears milky or intermixed with water, a likely cause is a defective shaft sealing device (i.e. mechanical seal), which requires that the pump be disassembled and repaired.



Changing Oil

Remove the oil plug and drain the oil completely. Pour a specified volume of oil into the oil filler inlet.

Specified Oil: Liquid Paraffin VG15

Unit : mℓ

Applicable Model	Specified Volume
Model with 0.15kW power output	210

Note: *The drained oil must be disposed of properly to prevent it from being released into the sewer or rivers. The packing or the O-ring for the oil plug must be replaced with a new part at each oil inspection and change.*

7 DISASSEMBLY AND REASSEMBLY PROCEDURE

Prior to Disassembly and Reassembly

⚠WARNING **Before disassembling and reassembling the pump, be sure that the power supply (i.e. circuit breaker) is disconnected, and remove the cabtyre cable from the outlet or the terminal board. Do not connect or disconnect the power plug with a wet hand, in order to prevent electrical shock. Do not perform an activation test (to check the rotation of the impeller) during disassembly and reassembly. Failure to observe this precaution could lead to a serious accident, including injury.**

This section explains the disassembly and reassembly processes that are involved up to the replacement of the impeller itself. Operations involving the disassembly and reassembly of the sealing portion (i.e. mechanical seal) and of the motor require a specialized facility including vacuum and electrical test equipment. For these operations, contact the dealer where this equipment was purchased, or the Tsurumi sales office in your area.

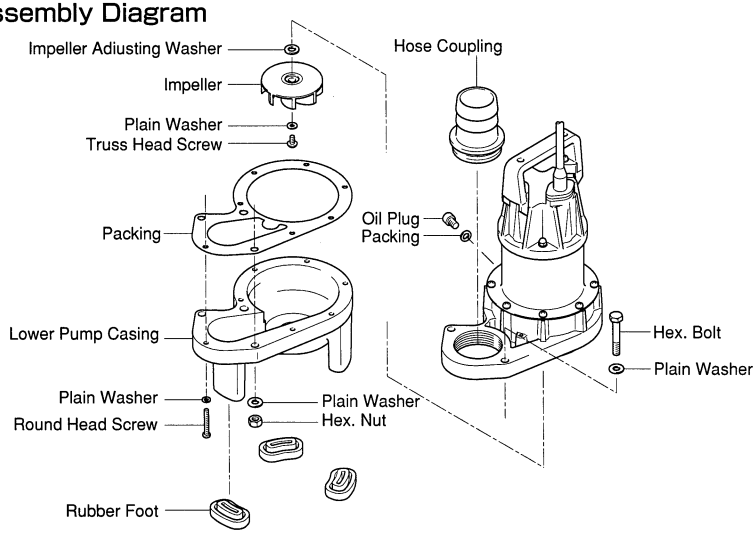
Disassembly Procedure

Note: *Drain the oil prior to disassembly.*

(1) Lower pump casing removal:
Remove the hex bolts, round head screws, plain washers, and remove the lower pump casing, packing, and hex nuts.

(2) Impeller removal:
Remove the truss head screw, plain washer, and remove the impeller and impeller adjusting washer.

Disassembly Diagram



Reassembly Procedure

Observe the precautions given below and reassemble the unit in the reverse order of disassembly.

Note: *Upon the completion of reassembly, make sure to fill the pump with the specified volume of oil. Replace the packing with a new one. If there are other parts that are worn or damaged, replace them also with new ones.*

After reinstalling the impeller, make sure that it spins smoothly.

8 TROUBLESHOOTING

⚠WARNING To prevent serious accidents, disconnect the power supply before inspecting the pump.

Read this Operation Manual carefully before requesting repair. After re-inspecting the pump, if it does not operate normally, contact the dealer where this equipment was purchased, or the Tsurumi sales office in your area.

Symptom	Cause	Countermeasure
Pump fails to start; or, starts but stops immediately.	① No proper power is supplied (i.e. power outage). ② Malfunction in automatic control (control panel) ③ Foreign matter is wedged in the impeller, causing the motor protector to trip. ④ Malfunction in float.	① Contact the electric power company or an electrical repair shop. ② Have the cause investigated and repaired by a specialist. ③ Inspect the pump and remove the debris. ④ Remove obstacles and check the operation of the stop float.
Pump starts but stops after a certain length of time.	① The pump has been operating for a long time while being exposed to air, causing the motor protector to trip.	① After resuming operation, switch to operation of approximately once every 30 minutes.
The power supply circuit breaker trips.	① The equipment is not matched to the pump specifications or the equipment rating is improperly set. ② Malfunction of motor (seizure or water leakage). ③ A 50Hz unit is used at 60Hz.	① Replace the equipment with the correct specification or set it to the correct setting. ② Repair or replace. ③ Check the nameplate and replace the pump or the impeller.
Pump operates but does not pump water.	① An air lock occurred in the pump. ② The pump or the piping is blocked. ③ The piping is partially blocked or the valve is operating improperly.	① Stop momentarily and then restart; or, clean the air release valve. ② Remove the blockage. ③ Remove the blockage, or repair or replace the valve.
The pumping volume is low.	① The impeller or the pump casing is significantly worn. ② There is a great piping loss. ③ A 60Hz pump is used at 50Hz.	① Repair or replace the affected part. ② Re-examine the work plan. ③ Check the nameplate and replace the pump or the impeller.
Pump generates vibration or noise.	① The pipe support is loose. ② Motor bearings are damaged. ③ Valve is tightly closed.	① Secure the pipe support. ② Replace the bearings. ③ Adjust the valve to the proper opening.
The pump does not stop automatically.	① The movement of the floats is obstructed. The switch in a float is faulty. ② The water level of the float is set lower than the pump's minimum possible operating water level.	① Remove the blockage. Or, replace the part. ② Set the water level of the float higher than the pump's minimum possible operating water level.

The following information is required when ordering repairs or making other inquiries.

Product model	
Manufacturing number	
Purchase date	
Remarks	

Disposal of Product

Properly dispose of the product by disassembling it, presorting the contents, and sending them to the waste material treatment site.