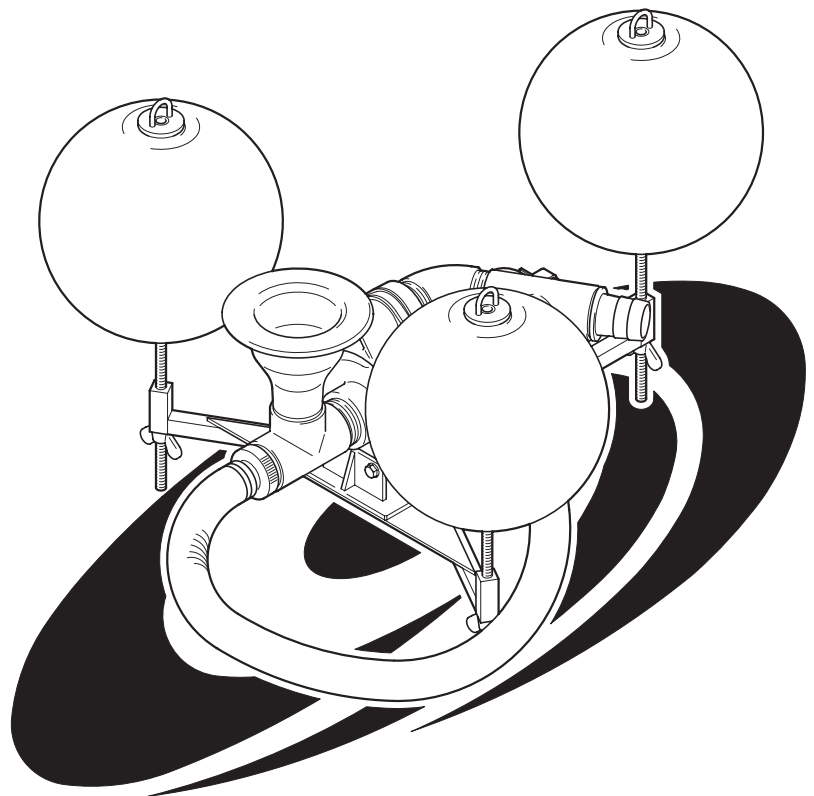


# **FSP Series**

## **Floating Scum Skimmers**

### **OPERATION MANUAL**



**TSURUMI MANUFACTURING CO., LTD.**

# INTRODUCTION

Thank you for selecting the Tsurumi FSP Series Floating Scum Skimmers.

This instruction manual explains the product operations and gives important precautions regarding its safe use. In order to use the product to maximum benefit, be sure to read the instructions thoroughly and follow them carefully.

To avoid accident, do not use the pump in any way other than as described in this instruction manual. Note that the manufacturer cannot be responsible for accidents arising because the product was not used as prescribed. After reading this instruction manual, keep it nearby as a reference in case questions arise during use.

When lending this product to another party, always be sure to include this instruction manual as well.

If this instruction manual should become lost or damaged, ask your nearest dealer or Tsurumi representative for another copy.

Every effort has been made to ensure the completeness and accuracy of this document. Please contact your nearest dealer or Tsurumi representative if you notice any possible error or omission.

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# 1 BE SURE TO READ FOR YOUR SAFETY

Be sure to thoroughly read and understand the SAFETY PRECAUTIONS given in this section before using the equipment in order to operate the equipment correctly.

The precautionary measures described in this section are intended to prevent danger or damage to you or to others. The contents of this manual that could possibly be performed improperly are classified into two categories: **⚠ WARNING**, and **⚠ CAUTION**. The categories indicate the extent of possible damage or the urgency of the precaution. Note however, that what is included under **⚠ CAUTION** may at times lead to a more serious problem. In either case, the categories pertain to safety-related items, and as such, must be observed carefully.

- **⚠ WARNING** : Operating the equipment improperly by failing to observe this precaution may possibly lead to death or injury to humans.
- **⚠ CAUTION** : Operating the equipment improperly by failing to observe this precaution may possibly cause injury to humans and other physical damage.
- **NOTE** : Gives information that does not fall in the WARNING or CAUTION categories.
- **Explanation of Symbols:**



: The  $\triangle$  mark indicates a WARNING or CAUTION item. The symbol inside the mark describes the precaution in more detail ("electrical shock", in the case of the example on the left).



: The  $\circ$  mark indicates a prohibited action. The symbol inside the mark, or a notation in the vicinity of the mark describes the precaution in more detail ("disassembly prohibited", in the case of the example on the left).



: The  $\bullet$  mark indicates an action that must be taken, or instructs how to perform a task. The symbol inside the mark describes the precaution in more detail ("provide ground work", in the case of the example on the left).

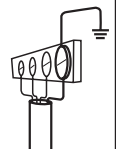
## PRECAUTIONS TO THE PRODUCT SPECIFICATIONS



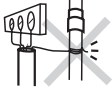











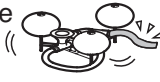
<b>⚠ CAUTION</b>	
	<ul style="list-style-type: none"> <li>● Do not operate the product under any conditions other than those for which it is specified. <b>Failure to observe the precaution can lead to electrical leakage, electrical shock, fire, water overflow or other problems.</b></li> </ul>





















## PRECAUTIONS DURING TRANSPORT AND INSTALLATION







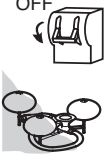
<b>⚠ WARNING</b>			
	<ul style="list-style-type: none"> <li>● Use an appropriate lifting equipment to lift the unit. <b>Improper lifting may result in the fall of the product which could cause damage of the product or human injury.</b></li> </ul>		
	<ul style="list-style-type: none"> <li>● Electrical wiring should be performed in accordance with all applicable regulations in your country. <b>Absolutely provide a dedicated earth leakage circuit breaker and a thermal overload relay suitable for the product (available on the market). Imperfect wiring or improper protective equipment can lead to electrical leakage, fire, or explosion in the worst case.</b></li> </ul>		
			<ul style="list-style-type: none"> <li>● Install the product properly in accordance with this instruction manual. <b>Improper installation may result in electrical leakage, electrical shock, fire, water leakage, or injury.</b></li> </ul>
			<ul style="list-style-type: none"> <li>● Provide a secure grounding dedicated for the product. Never fail to provide an earth leakage circuit breaker and a thermal overload relay in your starter or control panel (Both available on the market). <b>If an electrical leakage occurs by due to a product failure, it may cause electrical shock.</b></li> </ul>













 <b>CAUTION</b>	
 <p>● Be sure to provide a ground wire securely. Do not connect the ground wire to a gas pipe, water pipe, lightning rod, or telephone ground wire. <b>Improper grounding could cause electrical shock.</b></p> 	 <p>● Connect every conductor of the cabtyre cable securely to the terminals. <b>Failure to observe this can lead to electrical shock, short-circuit, or fire.</b></p> 
 <p>● Do not scratch, fold, twist, make alterations, or bundle the cable, or use it as a lifting device. <b>The cable may be damaged, which may cause electrical leakage, short-circuit, electrical shock, or fire.</b></p> 	 <p>● Provide a countermeasure against overflow, like instillation of a stand-by pump. <b>If it is insufficient, the overflow may damage nearby wall, floor and other equipment.</b></p>
 <p>● Install the discharge piping securely so that no water leakage may occur. <b>Failure to do so may result in damage to nearby walls, floors, and other equipment.</b></p>	 <p>● When the product will be carried by hand, decide the number of persons considering the mass of the product. When lifting up the product, do not attempt to do it by simply bowing from the waist. <b>Use the knees, too, to protect your back.</b></p> 
 <p>● This pump is neither dust-proof nor explosion-proof. Do not use it at a dusty place or at a place where toxic, corrosive or explosive gas is present. <b>Use in such places could cause fire or explosion.</b></p> 	 <p>● If a hose is used for the discharge line, take a measure to prevent the hose from shaking. <b>If the hose shakes, you may be wet or injured.</b></p> 

## PRECAUTIONS DURING TEST OPERATION AND OPERATION




 <b>WARNING</b>	
 <p>● Never try to operate the pump if somebody is present in the pump sump. <b>If an electrical leakage occurs, it can cause electrical shock.</b></p> 	 <p>● Never start the pump while it is suspended, <b>as the unit may jerk and could lead to injury.</b></p> 
 <p>● When changing power connection is needed to correct the direction of rotation, be sure to turn off the power supply (earth leakage circuit breaker, etc.), and perform the work after making sure that the impeller has stopped completely. <b>Failure to do so may lead to electrical shock, short-circuit, or injury.</b></p> 	 <p>● When inspecting the pump, be sure to turn off the power supply (earth leakage circuit breaker, etc.) <b>so that the pump may not start accidentally.</b></p> 
 <b>CAUTION</b>	
 <p>● Do not operate the product under any voltage other than described on the nameplate with the voltage tolerance limit within <math>\pm 5\%</math>. If it is operated with a generator, it is strongly suggested not to operate other equipment with the same generator. <b>Failure to observe this caution may cause malfunction and breakdown of the product, which may lead to electrical leakage or electrical shock.</b></p> 	 <p>● Do not touch the product with bare hands during or immediate after the operation, as the product may become very hot during operation. <b>Failure to observe this caution may lead to be burned.</b></p> 
 <p>● Do not use the product in a liquid other than water. <b>Use in oil, salt water or organic solvents will damage it, which may lead to electrical leakage or electrical shock.</b></p> 	 <p>● Do not use the product for hot or warm liquid over 40°C, as <b>doing so will damage the product, which may lead to electrical leakage or electrical shock.</b></p> 




 <b>CAUTION</b>	
	<ul style="list-style-type: none"> <li>Do not run the product dry or operate it with its gate valve closed, <b>as doing so will damage the product, which may lead to electrical leakage or electrical shock.</b> </li> </ul>
	<ul style="list-style-type: none"> <li>Do not allow foreign object (pin, wire, etc.) to enter the suction inlet of the pump. <b>Failure to observe this caution could cause it to malfunction or to operate abnormally, which may lead to electrical leakage or electrical shock.</b> </li> </ul>
	
<ul style="list-style-type: none"> <li>When the product will not be used for an extended period, be sure to turn off the power supply (earth leakage circuit breaker, etc.). <b>Deterioration of the insulation may lead to electrical leakage, electrical shock, or fire.</b> </li> </ul>	

## PRECAUTIONS DURING MAINTENANCE AND INSPECTION

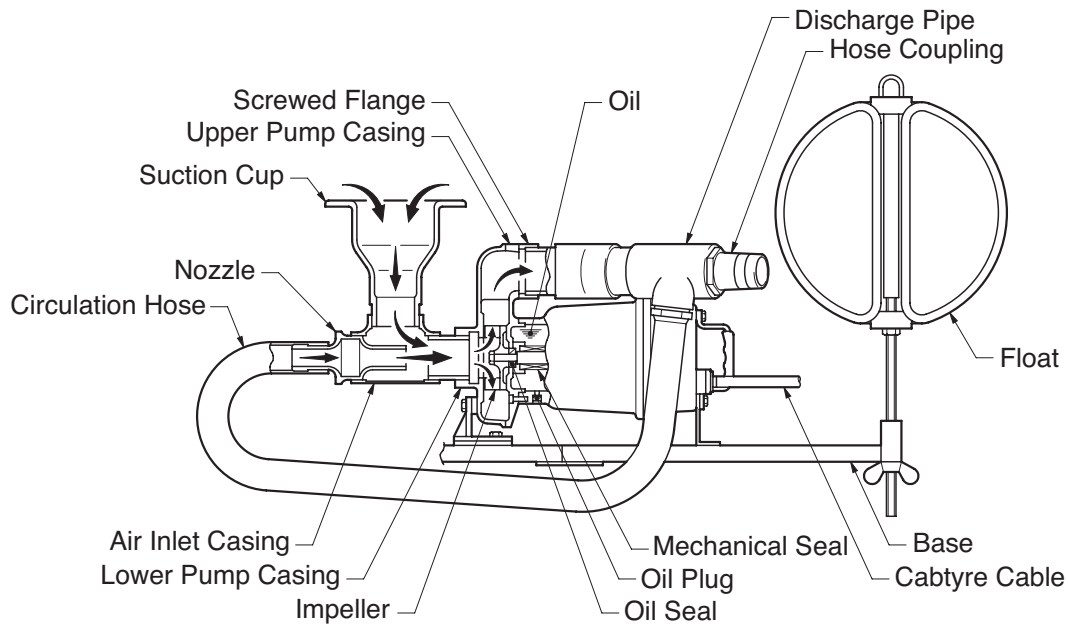
 <b>WARNING</b>	
	<ul style="list-style-type: none"> <li>Absolutely turn off the power supply or disconnect the plug before starting maintenance or inspection. Do not work with wet hands. <b>Failure to observe these cautions may lead to electrical shock or injury.</b> </li> </ul>
	<ul style="list-style-type: none"> <li>In case any abnormality (excessive vibration, unusual noise or odor) is found in the operation, turn the power off immediately and consult with the dealer where it was purchased or Tsurumi representative. <b>Continuing to operate the product under abnormal conditions may result in electrical shock, fire, or water leakage.</b> </li> </ul>
	
<ul style="list-style-type: none"> <li>Do not disassemble or repair any parts other than those designated in the operation manual. If repairs are necessary in any other than the designated parts, consult with the dealer where it was purchased or Tsurumi representative. <b>Improper repairs can result in electrical leakage, electrical shock, fire, or water leakage.</b> </li> </ul>	
 <b>CAUTION</b>	
	<ul style="list-style-type: none"> <li>After reassembly, always perform a test operation before resuming use of the product. <b>Improper assembly can result in electrical leakage, electrical shock, fire, or water leakage.</b> </li> </ul>

## PRECAUTION TO POWER OUTAGE

 <b>WARNING</b>	
	<ul style="list-style-type: none"> <li>In case of power outage, turn off the power supply. <b>The product will resume operation when the power is restored, which presents serious danger to people in the vicinity.</b> </li> </ul>

 <b>CAUTION</b>	
	<ul style="list-style-type: none"> <li>Never use the product for potable water. <b>It may present a danger to human health.</b> </li> </ul>

## 2 PART NAMES



## 3 PRIOR TO OPERATION

Unpack the package and check the following points:

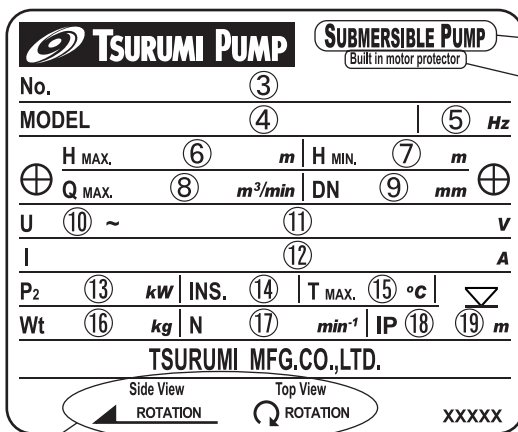
### Inspecting the product

Verify that no damage has occurred to the unit during shipment and that the bolts and nuts have not loosened.

### Inspecting the Specification

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

### Example of nameplate



1	Submersible pump	11	Rated voltage
2	Built in motor protector	12	Rated current
3	Serial number	13	Rated output power
4	Model	14	Insulation class
5	Frequency	15	Max. liquid temperature
6	Max. total head	16	Weight without cable
7	Min. total head	17	Speed of rotation
8	Max. flow rate	18	IP degree of protection
9	Discharge bore	19	Max. immersion depth
10	Phase	20	Direction of rotation

**Note:** If you discover any damage or discrepancy, please contact with the Tsurumi dealer from whom you purchased the product or the nearest Tsurumi representative office.

### Inspecting the Accessories

Verify that all accessory items are included in the package.

- Rope ..... 1 No.
- Wire Hose Band ..... 1 No.
- Operation Manual ..... 1 copy

**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

Never use the product under conditions other than those that are specified in the product specification, as they may lead to current leakage, electrical shock, fire, or water leakage.

## Major Standard Specifications

Fluid	Property	Air, Waste Water ; 0 ~ 40°C
Pump	Impeller	Non-Clogging
	Shaft Seal	Double Mechanical Seal
	Bearing	Shielded Ball Bearing
Motor	Specification	Dry type Submersible Induction Motor, 2-Pole
	Insulation	Class E
	Protection System (built-in)	Circle Thermal Protector
Lubricant		Turbine Oil, ISO VG32 (non-additive)
Discharge Connection		Hose Coupling

## Major Standard specifications (50/60Hz)

Bore (mm) (inch)	Model	Starting Method	Motor Output (kW)	Max Head (m) (Ft)	Max Capacity (m <sup>3</sup> /min) (GPM)	Weight (kg)
50 2	4-FSP	Direct-on-line	0.4	4.9 16.1	0.18 47.6	36
50 2	8-FSP	Direct-on-line	0.75	5.35/4.95 17.6/16.2	0.25 66	38

**Note:** The weight shows the weight of pump unit excluding the power cable.

## 4 INSTALLATION



### CAUTION

- Do not use the pump for pumping liquids other than plain water, such as oil, salt water, or organic solvents.
- Use with a power supply voltage tolerance within  $\pm 5\%$  of the rated voltage.
- The water temperature for operating the pump should be between 0 ~ 40°C. 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.

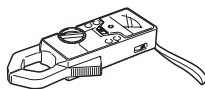
Critical Use Pressure	0.2MPa (2kgf/cm <sup>2</sup> ) - discharge pressure during use
-----------------------	--

## Preparation for Installation

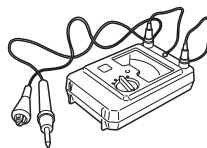
Listed below are tools and instruments that are needed to install the submersible pump for general dewatering purpose.



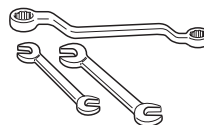
AC voltmeter  
(tester)



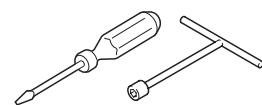
AC ammeter  
(clamp)



Insulation resistance  
tester  
(megger tester)



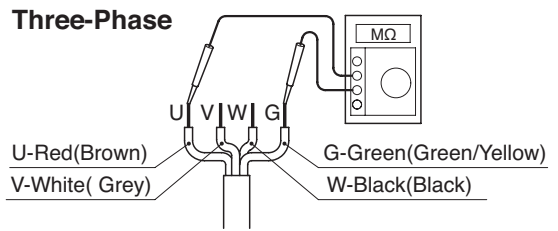
Wrenches for  
fastening  
bolts and nuts



Wrenches for connecting  
the power supply  
(a screwdriver or a box wrench)

Use a megger to measure the resistance between each core of the cabtyre cable and the (green) ground wire to verify the insulation resistance of the motor.

Insulation resistance reference value  
= 20M Ω minimum



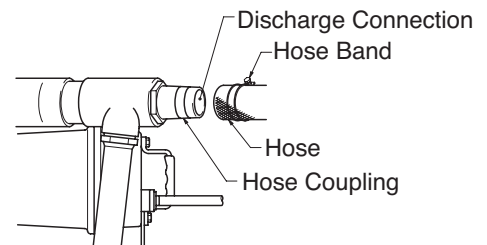
**Note:** *The insulation resistance reference value of 20M Ω minimum is based on a new or repaired pump. For reference values of a pump that has already been put into operation, refer to "7. Maintenance and Inspection" of this manual.*

## Precautions in Installation

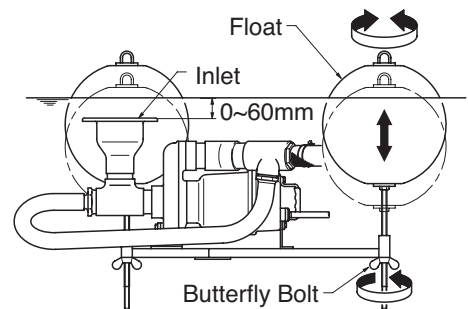
**WARNING** When installing the pump, pay close attention to its center of gravity and weight. If it is not lowered into place correctly, it may fall and be damaged or cause injury.

**CAUTION** Do not under any circumstances install or move the pump by suspending it from the cabtyre cable. The cable may be damaged, causing electrical leakage, shock, or fire.

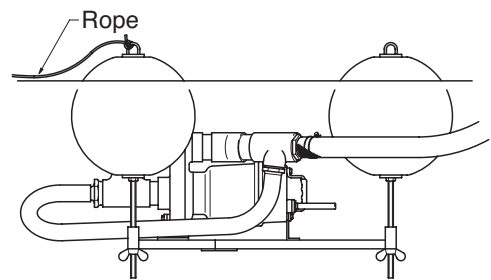
(1) First of all, connect a hose to the discharge connector. Run the discharge hose along as level a course as possible. Attach the hose to the hose coupling as far as it will go, then fasten it securely with the hose bands.



(2) Loosen the butterfly bolts under the floats, then put the skimmer in the water. Adjust the height of the three floats so the inlet is at the desired depth (0~60 mm below the water surface), keeping the skimmer level. The floats are lowered (inlet moved higher) by turning them clockwise, and are raised (inlet moved lower) by turning them counter-clockwise. After adjusting, tighten the butterfly bolts.

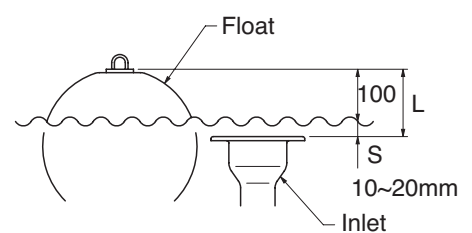


(3) Pass a rope through the loop at the top of the float and anchor it to the side of the tank.



**Note:** *Do not pull too hard on the rope, to avoid affecting the inlet position.*

(4) If S is the submerged depth of the inlet and L is the difference between the top of the float and the top of the inlet, then:  
 $S=L - 100$   
Use this as a general guide for making adjustments. (The submerged depth varies with the length of the discharge hose.)  
An optimum setting for S is 10~20mm.



**Note:** *The Maximum skimming size of model 4-FSP is 16mm, and of 8-FSP is 22mm. Remove any larger solids in advance when the pump is installed.*



# 5 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.
- Absolutely provide a dedicated earth leakage circuit breaker and a thermal overload relay suitable for the pump (available on the market). Failure to follow this warning can cause electrical shock or explosion when the product fails or an electrical leakage occurs.

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

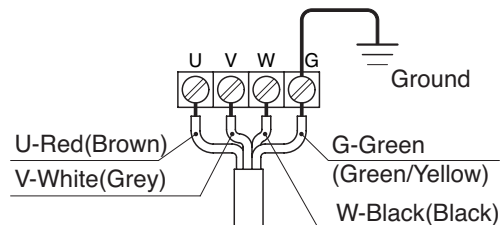
Before inserting the power plug or connecting the wires to the terminal board, make sure that the power supply (i.e. circuit breaker) is properly disconnected. Failure to do so may lead to electrical shock, short, or injury caused by the unintended starting of the pump.

### ⚠️ CAUTION

Do not use damaged cable 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 a three-phase power source is used, connect the leads to the control panel terminals as shown in the diagram, making sure they do not become twisted together.



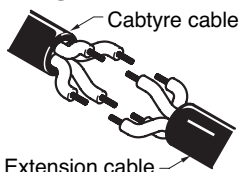
## About the Power Cable

### ⚠️ CAUTION

- If it is necessary to extend the power cable, use a core size equal to or larger than the original. This is necessary not only for avoiding a performance drop, but to prevent cable overheating which can result in fire, electrical leakage or electrical shock.
- If a cable with cut insulation or other damage is submerged in the water, there is a danger of water incursion into the motor causing a short. This may result in damage of the product, electrical leakage, electrical shock, or fire.
- Be careful not to let the cable be cut or become twisted. This may result in damage to the product, electrical leakage, electrical shock, or fire.
- If it is necessary to submerge the connected part into the water, first seal the leads completely in a molded protected sleeve, to prevent electrical leakage, electrical shock or fire.



Do not submerge the end of the power cable into water.



If it is necessary to extend the power cable, use a core size equal to or larger than the original.



If it is necessary to submerge the connected part into the water, seal the part completely.

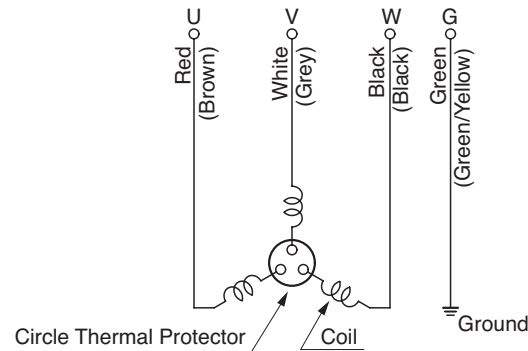


Make sure the cable does not become excessively bent or twisted, and does not rub against a structure in a way that might damage it.

## Motor Circuit Diagram

### Direct-on-line

Power Supply : Three-Phase



## Motor Protector

The pump is equipped with a built-in motor protector (circle thermal 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 open phase or binding condition

**Note:** After the motor protector has tripped, the motor automatically resumes its operation. Therefore, make sure to disconnect the cable from the terminal board or 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.

## 6 OPERATION

### Before starting

- (1) Check the model name plate to make sure once again that the product is of the correct voltage and frequency rating.



### CAUTION

Using the product at other than rated voltage and frequency will not only lower its performance but may damage the product and can cause electrical leakage, electrical shock, fire and water seepage.

- (2) Confirm the wiring, supply voltage, circuit breaker capacity, and motor insulation resistance.

Reference insulation resistance = 20 MΩ or greater

**Note:** The reference insulation resistance (20MΩ or greater) is the value when the pump is new or has been repaired. For the reference value after installation, see below at section "7.Maintenance and Inspection (p. 11)".

- (3) The setting on the circuit breaker or other surge protector should be made in accord with the rated current of the pump.

**Note:** See the model name plate on the pump for its rated current.

- (4) When powering the pump with a generator, do not share the generator with other equipment.

## Test operation



### **WARNING**

- Never operate the pump while it is suspended in the air. The recoil may result in injury or other major accident.
- Never start the pump when people are standing next to it. An electrical leak can result in electrical shock.

- (1) Run the pump for a short time(1~2 seconds) to check the direction of rotation. The rotation is correct if the pump recoil direction is counter-clockwise.



### **CAUTION**

Always perform the rotation check in air, not while the pump is submersed. Running the pump in reverse direction while it is submersed may damage the pump, resulting in electrical leakage or electrical shock.

- (2) If the direction is reversed, correct it using the countermeasure shown below.



### **WARNING**

Before changing the connections to correct the rotation, be sure to turn off the power supply (circuit breaker), and make sure the impeller has stopped completely, to avoid electrical shock or shorting.

#### **COUNTERMEASURE**

(Direct-on-line start):

Interchange connections between any two of the three leads U, V, or W.

- (3) Run the pump for a short time (3~10minutes) and confirm the following.  
Using an ammeter(clamp-on type), measure the operating current at the U, V, and W phase leads on the terminals.  
Using an AC voltmeter(tester), measure voltage at the terminals.  
■ Power supply voltage tolerance = within  $\pm 5\%$  of the rated voltage.

#### **COUNTERMEASURE**

If the operating current exceeds the rated value, pump motor overload may be a cause. Make sure the pump has been installed under proper conditions as described at the section on Installation (p.6)

#### **COUNTERMEASURE**

If the supply voltage is outside the variation, possible causes are the power supply capacity or an inadequate extension cable. Look again at the section on Electrical Wiring (p.8) and make sure the conditions are proper.



### **CAUTION**

In case of very excessive vibration, unusual noise or odor, turn off the power immediately and consult with your nearest dealer or Tsurumi representative. Continuing to operate the pump under abnormal conditions may result in electrical shock, fire, or electrical leakage.



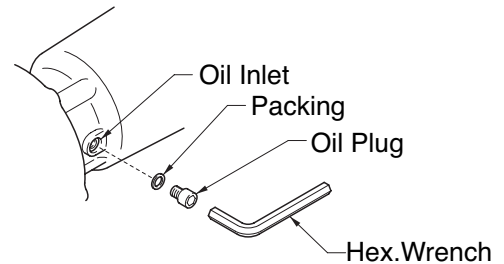
## Oil Inspection and Oil Change

### Inspecting Oil

Remove the Oil Plug(Hex.Bolt) and tilt the pump to drain a small amount of Oil. If the Oil is milky white or has water mixed in with it, the Mechanical Seal may be faulty. In this case the pump will need to be disassembled and repaired.

### Replacing Oil

Remove the Oil Plug and drain all the Oil , then replace it with the specified amount.



**Note:** *Worn oil and other waste products should be disposed of by a qualified agent, in accord with applicable laws. Do not pollute waterways or the sewage system. The Oil Plug Packing and O-Ring should be replaced each time the Oil is inspected or changed.*

Specified Oil : Turbine Oil VG32 (non-additive)  
Unit : ml

Model	Specified Volume
4-FSP	170
8-FSP	420

## Replacement Parts

The table lists the parts that need to be replaced periodically. Replace these using the recommended frequency as a guideline.

Part	Replacement Frequency
Mechanical Seal	When oil in oil compartment becomes milky.
Lubricant ; Turbine Oil VG 32 (non-additive)	Every 12 months or after 3,000 hours of use, whichever comes first.
Packing, O-Ring	Each time pump is disassembled or inspected
Oil Seal	When lip is worn, and each time pump is disassembled or inspected
Shaft Sleeve	When it becomes worn

## 8 DISASSEMBLY AND REASSEMBLY PROCEDURE

### ■ Prior to Disassembly and Reassembly

#### ⚠ WARNING

- Before disassembling the pump, first detach the cable from the terminals, after making certain the power supply (circuit breaker, etc.) is turned off. To avoid electrical shock, do not work with wet hands. Never check the operation of any parts (impeller rotation, etc.) by turning on the power while the unit is partially assembled. Failure to observe these precautions may result in serious accident.
- Do not disassemble or repair any parts other than those designated here. If repairs are necessary in any other than the designated parts, consult with your nearest dealer or Tsurumi representative. Improper repairs can result in electrical leakage, electrical shock, fire, or water leaks.
- After reassembly, always perform a test operation before resuming use of the pump. Improper assembly will cause the pump to malfunction, resulting in electrical shock or water leaks.

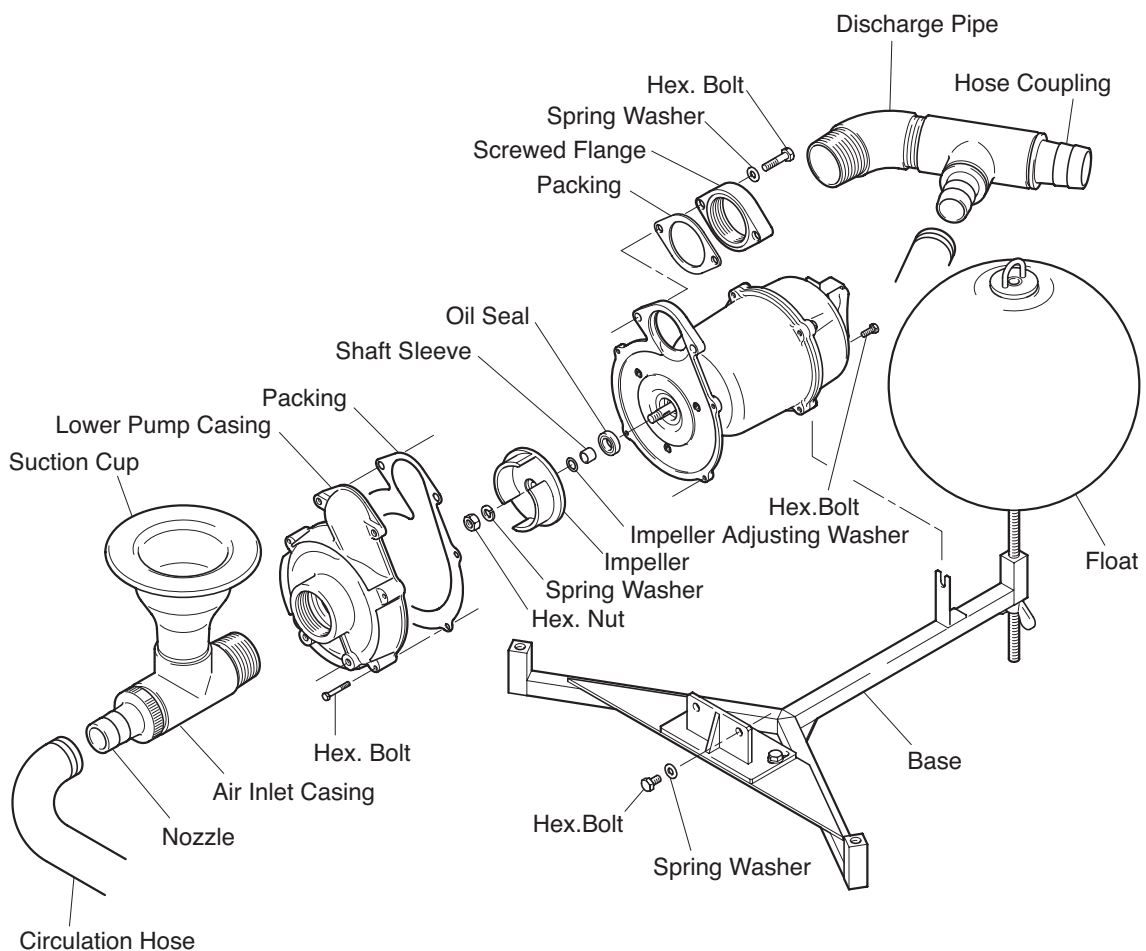
The procedure for disassembly and reassembly is shown here to the extent necessary for impeller replacement. A specialized environment and facilities are necessary for work on the mechanical seal and the motor parts. Contact your nearest dealer or Tsurumi representative in the event such repairs are necessary.

## Disassembly Procedure

**Note:** *Remove the oil prior to disassembly.*

- (1) Remove the pump body.  
Remove the Hex. Bolts and Spring Washer, then remove the pump from its Base.
- (2) Remove the Lower Pump Casing.  
Remove the Circulation Hose and Air Inlet Casing from the pump body. Next, remove the Hex. Bolts, then remove the Lower pump Casing and Packing from the Upper Pump Casing.
- (3) Remove the Impeller.  
Remove the Hex. Nut, and Spring Washer with a box wrench, then remove the Impeller, Impeller Adjusting Washer and Shaft Sleeve from the Shaft.

## Disassembly Diagram



## Reassembly Procedure

Reassembly can be performed by reversing the steps for disassembly.

**Note:** *After assembling the pump, be sure to fill it with the required amount of Oil. Replace the Packing and O-Ring each time this operation is performed. Replace any other worn or damaged parts as well.*

## 9 TROUBLESHOOTING

**WARNING** Always turn off the power before inspecting the pump. Failure to observe this precaution can result in serious accident.

Before ordering repairs, carefully read through this instruction manual, then repeat the inspection. If the problem remains, contact your nearest dealer or Tsurumi representative.

Problem	Possible cause	Countermeasure
Pump will not start	(1)Power is off. (2)Cable is cut or not connected properly. (3)Impeller is clogged. (4)Low voltage.	(1)Restore power. (2)Repair/replace the cable or fix the connection. (3)Inspect the pump and remove any debris. (4)Supply the rated voltage, or make sure the cable extension is the proper standard.
Pump stops soon after starting (Motor protector operates)	(1)Impeller is clogged. (2)Low voltage. (3)Wrong power frequency.	(1)Remove the debris. (2)Supply the rated voltage, or make sure the cable extension is proper standard. (3)Check the name plate, and replace the pump.
Performance drops	(1)Low voltage. (2)Motor direction is reversed. (3)Clogged hose. (4)Worn out impeller. (5)Wrong power frequency.	(1)Supply the rated voltage, or make sure the cable extension is the proper standard. (2)Interchange power supply leads(p.10). (3)Remove the obstruction. (4)Replace the impeller. (5)Check the nameplate and replace the pump.

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.