INTRODUCTION

Thank you for selecting the Tsurumi FHP Series floating decanter.

This operation 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 product in any way other than as described in this operation manual. Note that the manufacturer cannot be responsible for accidents arising because the product was not used as prescribed. After reading this operation 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 operation manual as well.

If this operation 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.

The contents of this document may not be copied in whole or in part without the express permission of Tsurumi Manufacturing Co., Ltd.

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</tr>
</tbody>
</table>
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:**

- **Δ**: The Δ 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 ⊗ 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 ▼ 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

<table>
<thead>
<tr>
<th>CAUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do not operate the product under any conditions other than those for which it is specified. Failure to observe the precaution can lead to electrical leakage, electrical shock, fire, or other problems.</td>
</tr>
</tbody>
</table>

### PRECAUTIONS DURING TRANSPORT AND INSTALLATION

<table>
<thead>
<tr>
<th>WARNING</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>⚠️</strong> When transporting the product, pay close attention to its center of gravity and mass. Use an appropriate lifting equipment to lift the unit. Improper lifting may result in product damage, injury, or death.</td>
</tr>
<tr>
<td><strong>⚠️</strong> Install the product properly in accordance with this operation manual. Improper installation may result in electrical leakage, electrical shock, fire, or injury.</td>
</tr>
<tr>
<td><strong>⚠️</strong> Electrical wiring should be performed in accordance with all applicable regulations in your country. Absolutely provide a dedicated earth leakage circuit breaker and a thermal overload relay suitable for the pump (available on the market). Imperfect wiring or improper protective equipment can lead to electrical leakage, fire, or explosion in the worst case.</td>
</tr>
<tr>
<td><strong>⚠️</strong> 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). If an electrical leakage occurs by due to a product failure, it may cause electrical shock.</td>
</tr>
<tr>
<td><strong>⚠️</strong> Use a power outlet that has a sufficient rating and has been exclusively provided for the pump. If the power outlet is shared with other equipment, it can lead to an abnormal heat of the outlet and can cause fire as a result.</td>
</tr>
</tbody>
</table>

- 2 -
CAUTION

- 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. Improper grounding could cause electrical shock.

- Prevent a metallic object or dust from sticking to the power plug. Adhesion of foreign object to the plug could cause electrical shock, short-circuit, or fire.

- Do not scratch, fold, twist, make alterations, or bundle the cable, or use it as a lifting device. The cable may be damaged, which may cause electrical leakage, short-circuit, electrical shock, or fire.

- Do not use the cable, power plug, or power outlet if it is damaged or it is not closely fitted. Connect every conductor of the cable securely to the terminals. Failure to observe this can lead to electrical shock, short-circuit, or fire.

- Install the discharge pipe securely so that no water leakage may occur. In addition, it is suggested to provide a stand-by pump in case of flooding. Failure to do so may result in damage to nearby walls, floors, and other equipment.

- 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. Use the knees, too, to protect your waist.

- 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. Use in such places could cause fire or explosion.

- If a hose is used for the discharge line, take a measure to prevent the hose from shaking. If the hose shakes, you may be wet or injured.

- Prevent a metallic object or dust from sticking to the power plug. Adhesion of foreign object to the plug could cause electrical shock, short-circuit, or fire.

- Do not use the cable, power plug, or power outlet if it is damaged or it is not closely fitted. Connect every conductor of the cable securely to the terminals. Failure to observe this can lead to electrical shock, short-circuit, or fire.

- Install the discharge pipe securely so that no water leakage may occur. In addition, it is suggested to provide a stand-by pump in case of flooding. Failure to do so may result in damage to nearby walls, floors, and other equipment.

- 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. Use the knees, too, to protect your waist.

- 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. Use in such places could cause fire or explosion.

- If a hose is used for the discharge line, take a measure to prevent the hose from shaking. If the hose shakes, you may be wet or injured.

PRECAUTIONS DURING TEST OPERATION AND OPERATION

WARNING

- Never try to operate the pump if somebody is present in the pump sump. If an electrical leakage occurs, it can cause electrical shock.

- Never start the pump while it is suspended, as the unit may jerk and could lead to injury.

- 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. Failure to do so may lead to electrical shock, short-circuit, or injury.

- When inspecting the pump, be sure to turn off the power supply (earth leakage circuit breaker, etc.) so that the pump may not start accidentally. Failure to do so may lead to a serious accident.

CAUTION

- Do not operate the product under any voltage other than described on the nameplate with the voltage tolerance limit within ±5%. If it is operated with a generator, it is strongly suggested not to operate other equipment with the same generator. Failure to observe this caution may cause malfunction and breakdown of the product, which may lead to electrical leakage or electrical shock.

- Do not touch the product with bare hands during or after the operation, as the product may become very hot during operation. Failure to observe this caution may lead to be burned.

- Do not run the product dry or operate it with its valve (sluice or gate valve) closed, as doing so will damage the product, which may lead to electrical leakage or electrical shock.

- Do not use the product in a liquid other than water. Use in oil, salt water or organic solvents will damage it, which may lead to electrical leakage or electrical shock.
### CAUTION

- Do not use the product in hot or warm liquid over 40°C, as doing so will damage the product, which may lead to electrical leakage or electrical shock.
- Do not allow foreign objects (metal objects such as pins or wires) to enter the suction inlet of the pump. **Failure to observe this caution could cause it to malfunction or to operate abnormally, which may lead to electrical leakage or electrical shock.**
- When the product will not be used for an extended period, be sure to turn off the power supply (earth leakage circuit breaker, etc.). **Deterioration of the insulation may lead to electrical leakage, electrical shock, or fire.**

### PRECAUTIONS DURING MAINTENANCE AND INSPECTION

### WARNING

- Absolutely turn off the power supply or disconnect the plug before starting maintenance or inspection. Do not work with wet hands. **Failure to observe these cautions may lead to electrical shock or injury.**
- 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. **Improper repairs can result in electrical leakage, electrical shock, or fire.**

### CAUTION

- After reassembly, always perform a test operation before resuming use of the product. **Improper assembly can result in electrical leakage, electrical shock, or fire.**

### PRECAUTION TO POWER OUTAGE

### WARNING

- In case of power outage, turn off the power supply. **The product will resume operation when the power is restored, which presents serious danger to people in the vicinity.**

### OTHER PRECAUTION

### CAUTION

- Never use the product for potable water. **It may present a danger to human health.**
2 NAME OF PARTS

Oil Seal
Shaft Sleeve
Oil Plug
Mechanical Seal
Handle
Pump Casing
Oil Casing
Lubricant
Impeller
Cabtyre Cable
Check Ball
Screwed Flange
Hose Coupling

Anti-sludge Sensor
Signal Cable
Amplifier Unit
Amplifier Unit Box
Fiber Glass
Support Piping
Sealing Tube
Fiber Unit
Sensor Cleaning Nozzle
Sensor Head

3 PRIOR TO OPERATION

When the unit is delivered, first perform the following checks.

Inspection

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

Specification Check

Check the model number to make sure it is the product that was ordered. Be certain it is the correct voltage and frequency.

Example of nameplate

<table>
<thead>
<tr>
<th>No.</th>
<th>Model</th>
<th>Frequency</th>
<th>Max. total head</th>
<th>Min. total head</th>
<th>Max. flow rate</th>
<th>Discharge bore</th>
<th>Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Submersible pump</td>
<td>11</td>
<td>Rated voltage</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Built in motor protector</td>
<td>12</td>
<td>Rated current</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Serial number</td>
<td>13</td>
<td>Rated output power</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Model</td>
<td>14</td>
<td>Insulation class</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Frequency</td>
<td>15</td>
<td>Max. liquid temperature</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Max. total head</td>
<td>16</td>
<td>Weight without cable</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Min. total head</td>
<td>17</td>
<td>Speed of rotation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Max. flow rate</td>
<td>18</td>
<td>IP degree of protection</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Discharge bore</td>
<td>19</td>
<td>Max. immersion depth</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Phase</td>
<td>20</td>
<td>Direction of rotation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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.
Accessory Check
Verify that all accessory items are included in the package.

<table>
<thead>
<tr>
<th>Unit Composition</th>
<th>QTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anti-sludge sensor</td>
<td>1</td>
</tr>
<tr>
<td>Hose coupling</td>
<td>1</td>
</tr>
<tr>
<td>Chain w/ Shackle (SUS304, 3m)</td>
<td>1</td>
</tr>
<tr>
<td>Ground name plate</td>
<td>1</td>
</tr>
<tr>
<td>Operation manual</td>
<td>1</td>
</tr>
</tbody>
</table>

Note: If there is any problem with the product as shipped, contact your nearest dealer or Tsurumi representative at once.

Product Specifications

CAUTION Do not operate this product under any conditions other than those for which it is specified. Failure to observe this precaution can lead to electrical shock, electrical leakage, fire, water leakage or other problems.

Major Standard Specifications

<table>
<thead>
<tr>
<th>Fluid</th>
<th>Property</th>
<th>Treated water, 0～40℃</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pump</td>
<td>Impeller</td>
<td>Channel Impeller</td>
</tr>
<tr>
<td></td>
<td>Shaft Seal</td>
<td>Double Mechanical Seal</td>
</tr>
<tr>
<td></td>
<td>Bearing</td>
<td>Shielded Ball Bearing</td>
</tr>
<tr>
<td>Motor</td>
<td>Specifications</td>
<td>Dry type submersible induction motor, 2-pole</td>
</tr>
<tr>
<td></td>
<td>Insulation</td>
<td>Class E and F</td>
</tr>
<tr>
<td></td>
<td>Protection System (built-in)</td>
<td>Circle thermal protector</td>
</tr>
<tr>
<td></td>
<td>Lubricant</td>
<td>Turbine oil VG32 (additive-free)</td>
</tr>
</tbody>
</table>

Discharge Connection
Hose coupling

Standard Specifications (50/60Hz)

<table>
<thead>
<tr>
<th>Model</th>
<th>Bore (mm)</th>
<th>Phase</th>
<th>Starting Method</th>
<th>Motor Output (kW)</th>
<th>Max.Head (m)</th>
<th>Max.Capacity (m³/min)</th>
<th>Debris Pass Dia (mm)</th>
<th>Mass (Weight) (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FHP-3</td>
<td>40</td>
<td>1</td>
<td>Capacitor-Start</td>
<td>0.25</td>
<td>8.0 / 7.8</td>
<td>0.2 / 0.194</td>
<td>15</td>
<td>29</td>
</tr>
<tr>
<td>FHP-3T</td>
<td>40</td>
<td>3</td>
<td>Direct-on-Line</td>
<td>0.25</td>
<td>8.0 / 7.8</td>
<td>0.2 / 0.194</td>
<td>15</td>
<td>27</td>
</tr>
<tr>
<td>FHP-4</td>
<td>50</td>
<td>1</td>
<td>Capacitor-Start</td>
<td>0.4</td>
<td>10.0 / 10.2</td>
<td>0.28 / 0.28</td>
<td>15</td>
<td>29</td>
</tr>
<tr>
<td>FHP-4T</td>
<td>50</td>
<td>3</td>
<td>Direct-on-Line</td>
<td>0.4</td>
<td>10.0 / 10.2</td>
<td>0.28 / 0.28</td>
<td>15</td>
<td>27</td>
</tr>
<tr>
<td>FHP-8T</td>
<td>50</td>
<td>3</td>
<td>Direct-on-Line</td>
<td>0.75</td>
<td>13.0 / 14.0</td>
<td>0.42 / 0.405</td>
<td>15</td>
<td>28</td>
</tr>
<tr>
<td>FHP-15T</td>
<td>80</td>
<td>3</td>
<td>Direct-on-Line</td>
<td>1.5</td>
<td>11.0 / 11.0</td>
<td>0.81 / 0.8</td>
<td>15</td>
<td>60</td>
</tr>
</tbody>
</table>

Note: The mass (weight) given above is the dry weight of the pump itself, not including the cable/tyre cable.

Anti-Sludge Sensor Specifications

<table>
<thead>
<tr>
<th>Type</th>
<th>Beam penetration type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply Voltage</td>
<td>DC10～30V</td>
</tr>
<tr>
<td>Consumption Amperage</td>
<td>25mA</td>
</tr>
<tr>
<td>Beam Source</td>
<td>Red LED</td>
</tr>
<tr>
<td>Response Speed</td>
<td>250µs</td>
</tr>
<tr>
<td>Operation Mode</td>
<td>Operating with beam input: selector switch at &quot;L&quot;</td>
</tr>
<tr>
<td>Control Output</td>
<td>NPN open collector output</td>
</tr>
<tr>
<td>Allowable Load Supply Voltage</td>
<td>MAX.30VDC</td>
</tr>
<tr>
<td>Allowable Load Amperage</td>
<td>MAX.100mA</td>
</tr>
<tr>
<td>Sensitivity Adjuster</td>
<td>10-turn dial</td>
</tr>
<tr>
<td>Indicator Light</td>
<td>Output indicator light: orange LED; safety indicator light: green LED</td>
</tr>
<tr>
<td>Connection Type</td>
<td>Pull-out cord</td>
</tr>
<tr>
<td>Operating Ambient Brightness</td>
<td>Sunlight: 10,000 lux max., incandescent lamp: 3,000 lux max.</td>
</tr>
<tr>
<td>Operating Ambient Temperature</td>
<td>−25°C～+55°C</td>
</tr>
<tr>
<td>Operating Ambient Humidity</td>
<td>Operation: 35 - 85%; storage: 35 - 90% (individual amp)</td>
</tr>
<tr>
<td>Insulation Resistance</td>
<td>20 MΩ min. (at DC 500V) between power line - outer case</td>
</tr>
<tr>
<td>Withstand Voltage</td>
<td>AC 1,000V 50/60Hz, 1 minute, between power line - outer case</td>
</tr>
</tbody>
</table>
4 INSTALLATION

⚠️ CAUTION
- Do not use this product in liquids other than water, such as oil, salt water, or organic solvents.
- Use with a power supply voltage tolerance within ±5% of the rated voltage.
- Do not use in water temperatures outside the range of 0 ~ 40°C, which can lead to failure, electrical leakage or shock.
- Use only in fully assembled state.

Note: Consult your local dealer or Tsurumi representative before using with any liquids other than those indicated in this document.

■ 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.

<table>
<thead>
<tr>
<th>Applicable Pump</th>
<th>Critical Use Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Models with output of 0.75kW or under</td>
<td>0.2MPa (2kgf/cm²) — discharge pressure during use</td>
</tr>
<tr>
<td>Models with output of 1.5kW</td>
<td>0.3MPa (3kgf/cm²) — discharge pressure during use</td>
</tr>
</tbody>
</table>

■ Preparing for installation

Prepare a suitable chain or rope for the pump. Refer to the weight of each pump described in the table of "Standard Specifications (50/60Hz)" on Page 6.

Before installing the product at a work site, you will need to have the following tools and instruments ready:
- Insulation resistance tester (megohmmeter)
- AC voltmeter
- AC ammeter (clamp-on type)
- Bolt and nut tighteners
- Power supply connection tools (screwdriver or box wrench)
- Cabling stakes (for use with cable and chain)

Note: Please read also the instructions that come with each of the test instruments. Please use banding bands that is made of polypropylene.

■ Checks to make before installation

■ Single-phase power supply:
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.

■ Three-phase power supply:
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.

⚠️ CAUTION
Never use a megger to measure the insulation resistance between the cores of the anti-sludge sensor wires. Using a megger could damage the built-in amplifier.
Precautions in 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. Keep the planned (effluent) water level fluctuation in mind when handling the cabtyre cable or the lifting chain. Lift it slightly and secure it to a hook (if no guide rail is used, 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 a cabtyre cable, rope, or chain dangling. Failure to observe this precaution may cause the cabtyre cable, rope, or chain to become wrapped around the pump unit, causing the pump to operate improperly or malfunction.

3. The stopper on the guide rail is intended to prevent the pump from falling. If the pump is lowered more than necessary, it will pull on the cabtyre cable, causing an open circuit. To prevent it, make sure to install the stopper on the guide rail.

4. For the guide rail, use 25A-SUS304TP-Sch10S pipes, and cut them locally to a length that is suitable for the depth of the sump.

Securing the Pump with a Chain

Securing the Pump with a Guide Rail
Pump Unit

1. Set the detector portion of the anti-sludge sensor lower than the suction inlet of the pump.

2. For the discharge hose (which is not supplied), use a braid-reinforced, suction-delivery PVC hose. Use a hose clamp to attach it securely to the discharge outlet. Keep the planned (effluent) water level fluctuation in mind when determining the length of the hose.

**CAUTION** To install the discharge hose, first lower the FHP unit until it comes in contact with the stopper. With the FHP in this position, install the discharge hose without creating slack. If there is slack in the hose, the FHP unit may become tilted.

3. For the sensor cleaning water hose (which is not supplied), use a 15mm bore, braid-reinforced PVC hose. Attach the sensor cleaning nozzle securely with a hose clamp.

Note: The sensor may operate improperly if debris becomes attached to its detector portion. Therefore, make sure to install the sensor cleaning nozzle.

4. Place the pump in an area with an ample water level or where water is likely to accumulate.

**Note:** Refer to the "Water Level" section on page 14 for the water level during operation. Do not submerge the end of the discharge hose in the water because this can cause the water to backflow due to the siphon effect. The discharge hose and the sensor cleaning water hose are not supplied with the product.

Attaching a Chain or Rope to Suspend the Pump

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

**CAUTION** Make sure the lifting chain does not become twisted during installation. Failure to observe this precaution could cause the chain to break, the pump to fall and break, which could lead to injury. When you mount shackles, be also careful so that the eye-bolt (pin) may not get dislocated, by means of providing a stainless steel wire or tying band.

**CAUTION** Make sure the lifting chain does not become loosened. If the chain comes in contact with the pump, it could cause the pump to wear, the paint to peel, or the chain to wear.

[Diagram of pump components]

[Diagram of chain and shackle attachment]
5 ELECTRICAL WIRING

Performing electrical wiring

**WARNING**
- Electrical wiring should be performed by a qualified person in accord with all applicable regulations. Failure to observe this precaution not only risks breaking the law but is extremely dangerous.
- Incorrect wiring can lead to electrical 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** Do not use the product without first grounding it properly. Failure to ground it can lead to electrical shock from an electrical leak or malfunction.

**CAUTION** Do not attach the grounding wire to a gas pipe, water pipe, lightening arrester or telephone grounding wire. Improper grounding can result in electrical shock.

**Connecting the power supply**

**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 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.

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.

**Note:** The cabtyre cable, if it is unused, is terminally processed. If there is a need to peel off the cable again, have the terminal processed.

**Electrical Circuit Diagrams**

**Condenser Starting**

- Power Supply: Single-Phase
- Operating Capacitor
- Centrifugal Switch
- Aux. Coil
- Red
- White
- Green

**Direct-on-line Starting**

- Operating Capacitor
- Centrifugal Switch
- Aux. Coil
- Red (Brown)
- White (Grey)
- Black (Black)
- Green (Green/Yellow)

**Anti-Sludge Sensor**

- Amplifier Unit
- Sensor Controller
- Beam Fiber
- Sensing Dial
- Min
- Max
- SENS.
* The sensitivity of the amplifier unit can be adjusted to suit the density of the sludge (by way of its beam penetration rate). To do so, remove the cover from the amplifier unit box and adjust the "sensing dial" located on top of the amplifier unit. The sensing dial, which is factory-set to its middle position, should be adjusted to suit the field conditions after the sludge has settled in the sump.
For a detailed procedure for adjusting the sensor, refer to the "Anti-Sludge Sensor Adjustment" section on page 18.

**Anti-Sludge Sensor**

The anti-sludge sensor, which is attached to the FHP series submersible decanting pump, senses the settled water layer. The beam emitter transmits a beam via the beam fiber. This beam passes through the sludge fluid and reaches the beam receiver. When the sludge is diffused in the fluid, the sensor's output transistor is OFF. When the sludge is settled in the fluid, the sensor's output transistor is ON. These signals are transmitted to the control circuit in the control panel in order to prevent the sludge from flowing out and allow only the upper clear water to be discharged.

**Connecting Anti-Sludge Sensor**

The diagram below shows an example of an anti-sludge sensor circuit. A similar circuit should be created in the control panel.

Using Omron S3D2-CK model controller:
Settings: IN1: NORM / MODE: OR / TIMER: ON / RANGE: 10S / TIMER MODE: ON / TIME ADJ: 3S

To use a controller other than the above, contact the dealer where this product was purchased, or the Tsurumi sales office in your area.

Connect the core wires (black, red, and white) supplied with the anti-sludge sensor to the respective terminal numbers of the sensor controller.

**Note:** When routing the cables, keep the cable tie and the anti-sludge sensor cable a minimum of 20cm apart. Also, be sure to use separate conduits for the cables.

Be sure to provide a dedicated circuit in the control panel and securely connect the shield for the anti-sludge sensor cable to that circuit.

After completing the connections, operate the pump dry. Place a barrier (hand or wooden plate) between the beam sensors to make sure the pump stops.
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.

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

Reference insulation resistance = 20MΩ or greater

Note: The reference insulation resistance (20MΩ or greater) is the value when the product is new or has been repaired. For the reference value after installation, see below at “Maintenance and Inspection” on page 14.

(3) The setting on the circuit breaker or other overload protector should be made in accord with the rated currency of the product.

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

Test operation

⚠️ WARNING • Never operate the product while it is suspended in the air. The recoil may result in injury or other major accident.

• Never start the product when people are standing next to it. An electrical leak can result in electrical shock.

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

⚠️ CAUTION Always perform the rotation check in air, not while the product is submerged. Running the product in reverse direction while submerged may damage the product, 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 models):

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

(3) Run the product for a short time (3~10 minutes) 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.

Supply voltage tolerance: within ± 5% of rated voltage.

COUNTERMEASURE

If the operating current exceeds the rated value, motor overload may be a cause. Make sure the product has been installed under proper conditions as described in the section on Installation (p. 7).

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. 10) 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 product under abnormal conditions may result in electrical shock, fire, or electrical leakage.
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.

A frequent ON/OFF will shorten the lifetime of the pump.

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

Note: A large amount of amperage flows when a submersible 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.

Actuating the Anti-Sludge Sensor

The anti-sludge sensor prevents sludge from being discharged out of the sump when it senses a sludge layer while the pump is discharging the upper layer of clear water.

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Pump</th>
<th>Level Sensor</th>
<th>Water Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beam penetrating</td>
<td>Starts</td>
<td>ON</td>
<td>Level sensor</td>
</tr>
<tr>
<td>Beam not penetrating (senses sludge layer)</td>
<td>Stops</td>
<td>ON</td>
<td></td>
</tr>
<tr>
<td>Beam penetrating</td>
<td>Restarts</td>
<td>ON</td>
<td>After 10 minutes</td>
</tr>
<tr>
<td>Beam penetrating</td>
<td>Stops</td>
<td>OFF</td>
<td></td>
</tr>
</tbody>
</table>

*The flow rate per discharge is determined by the control range of the level sensor.

Cleaning the Anti-Sludge Sensor

The sensor of this pump may operate improperly if sludge becomes attached to its detector portion. Be sure to attach a cleaning hose to ensure proper cleaning.

Note: The sensor lenses are self-cleaned through the convection of water pressure. Do not attempt to check this operation on the ground.

1. Use a soft, 15mm flexible hose for piping.
2. Take cleaning water from defoamed (or clear) water supply.
3. Clean for 5 minutes hourly at operating temperature. Regulate the valve to the cleaning water to attain a flow rate of 10 to 20 L/min and a pressure of 0.05 to 0.1 MPa.
**Water Level During Operation**

Adjust the sensor to a position of the sludge layer level that is being detected. There is no risk of the pump drawing the settled sludge, provided that the sensor is positioned below the bottom of the float. However, the adjustable range (H1) is 50 to 170mm below the bottom of the float. After the pump starts and the sensor detector has reached the sludge layer level, the water depth (H2) will be 260 to 390mm.

*Note:* For a detailed procedure for adjusting sensor sensitivity, refer to the "Anti-Sludge Sensor Adjustment" section on page 18.

**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 cabling 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.

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**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 "9. Troubleshooting" 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 cabling cable from the power outlet or remove it from the terminal board. Failure to do so may cause electrical shock or unintended starting of the pump, which may lead to serious accidents.

1. **Washing**
   Remove accumulated matter from the surface of the unit and wash it with clean water. Take special care to remove any debris from the impeller.

2. **Inspecting the exterior**
   Look for any peeling or chipped paint, and make sure the nuts and bolts are fastened securely. Any cracks in the surface should be repaired by cleaning that area, drying it and then applying a touchup coating.

*Note:* Touchup is not supplied. Some kinds of damage or looseness may require that the unit be disassembled for repairs. Please consult with your nearest dealer or Tsurumi representative.
# Daily and Periodic Inspection

<table>
<thead>
<tr>
<th>Interval</th>
<th>Inspection Item</th>
</tr>
</thead>
</table>
| Daily          | ■ Measure operating current  
                 | To be below the rated current.  
                 | ■ Measure power voltage  
                 | Power supply voltage tolerance (within ±5% of the rated voltage)  
| Monthly        | ■ Measure insulation resistance  
                 | Reference insulation resistance = 1MΩ or greater  
                 | *Note: If the insulation resistance has become notably lower than the precious inspection, an inspection of the motor will be necessary.*  
| Semi-Annually  | ■ Inspecting the pump  
                 | A noticeable drop in performance may indicate wear in the impeller, etc., or else clogging of the impeller, etc. Remove the clogged debris, and replace any worn parts.  
                 | ■ Hose inspection  
                 | Check that the hose connectors are free of cracks.  
                 | ■ Checking the detector portion of the sensor  
                 | Make sure there is no debris wound around or attached to the sensor. Also, check that the beam emitting and receiving faces have not shifted. The orange lamp in the amplifier unit box will illuminate if the sensor is receiving the beam.  
                 | ■ Checking the sensor cleaning nozzle  
                 | Make sure the cleaning nozzle is not clogged. If it is clogged, increase the cleaning frequency.  
                 | ■ Inspection of lifting chain or rope  
                 | Replace if damage, corrosion, or wear has occurred to the chain or the rope. Remove if foreign object is attaching to it.  
                 | ■ Oil inspection  
                 | Check the oil every 12 months or after 1,500 hours of use, whichever comes first.  
                 | *Note: Refer to details of oil inspection and oil change (p.15)*  
| Yearly         | ■ Change oil  
                 | Change the oil every 24 months or after 3,000 hours of use, whichever comes first.  
                 | Designated oil : Turbine Oil VG32 (Additive-free)  
                 | *Note: Refer to details of oil inspection and oil change (p.15)*  
|                | ■ Change mechanical seal  
                 | *Note: Specialized know-how is required for inspecting and replacing the mechanical seal. Consult with your nearest dealer or Tsurumi representative.*  
| Every 2 to 5 years | ■ Overhaul  
                 | This should be carried out even if there are no problems with the product.  
                 | The frequency depends on how continuously the product is in use.  
                 | *Note: Consult with your nearest dealer or Tsurumi representative.*  

*Note:* In case the pumping liquid contains oil, paint, or slurry, it may cause the swelling of cable jacket or abrasion of the mechanical seal’s sealing face, which will result in the pump fault. It is strongly recommended to inspect earlier.

## Storage

*Note:* When the unit is out of use for an extended period, wash it and dry it thoroughly, then store it indoors. Always run a test operation before putting the unit back into service.

If the unit is left in the water, it should be run at a minimum of once a week.

## Oil inspection and Oil change

**Inspecting Oil**

Remove the oil plug and tilt the unit 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 unit 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 of oil as shown in the table.

*Note:* Worn oil and other waste products should be disposed of by a qualified agent, in accord with applicable laws. The oil plug packing and O-ring should be replaced each time the oil is inspected or changed.

### Applicable Model

| Model with 0.25 – 0.4kW power output | 190 |
| Model with 0.75kW power output      | 420 |
| Model with 1.5kW power output        | 1,050 |
Replacement Parts
The table lists the parts that need to be replaced periodically. Replace these using the recommended frequency as a guideline.

<table>
<thead>
<tr>
<th>Part</th>
<th>Recommended Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanical Seal</td>
<td>When oil becomes milky.</td>
</tr>
<tr>
<td>Oil (Turbine Oil VG 32 (Additive-free) )</td>
<td>Every 12 mouths or after 3,000 hours of use, whichever comes first.</td>
</tr>
<tr>
<td>Packing, O-Ring</td>
<td>Each time unit is disassembled or inspected</td>
</tr>
<tr>
<td>Oil Seal</td>
<td>When lip is worn, and each time unit is disassembled or inspected</td>
</tr>
<tr>
<td>Shaft Sleeve</td>
<td>If worn</td>
</tr>
</tbody>
</table>

8 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:** Before disassembling, be sure to drain the oil from the pump.

1. Removing the pump unit
   - Remove the eyenut, hex nut, spring washer, and adapter. Then, take out the pump unit from the float set.
2. Removing the pump casing
   - Remove the supporter, water suction pipe, and check ball from the pump unit. Remove the hex bolts, and take out the pump casing and packing from the oil casing.
3. Removing the impeller
   - Using a box wrench, remove the impeller nut and spring washer; then, remove the impeller and the impeller adjustment washer from the main shaft.
Disassembly Diagram

Note: The above disassembling block diagram is a typical one, and there may be some differences from actual shapes or compositions depending on models.

Reassembly Procedure

Reassembly can be performed by reversing the steps for disassembly.

Note: After reassembling the pump, be sure to fill it with the required amount of oil. Replace the packing with new parts. Replace any other worn or damaged parts as well.

After attaching the impeller, and again after assembly is completed, check to make sure the impeller rotates smoothly and that it does not rub against the pump casing.
**Anti-Sludge Sensor Adjustment**

Adjust the sensing dial as follows:

![Sensitivity Indicator Diagram]

## ADJUSTMENT METHOD

<table>
<thead>
<tr>
<th>Step</th>
<th>Beam Penetrating Or Not Penetrating</th>
<th>Adjustment Method</th>
<th>Sensitivity Indicator</th>
<th>Output Indicator Light</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>Adjust the sensing dial to &quot;Min&quot;.</td>
<td><img src="image" alt="Min Max SENS." /></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Beam not penetrating</td>
<td>This step is performed while the beam is not penetrating. Turn the sensing dial to the right to find the point (referred to as &quot;point A&quot;) at which the output indicator light turns ON. (If the light does not turn ON or OFF, the point at which the sensing dial stops turning is referred to as &quot;point A&quot;).</td>
<td><img src="image" alt="Min Max SENS." /></td>
<td><img src="image" alt="Orange" /></td>
</tr>
<tr>
<td>3</td>
<td>Beam penetrating</td>
<td>The next step is performed while the beam is penetrating. Turn the sensing dial to the left to find the point (referred to as &quot;point B&quot;) at which the output indicator light turns OFF. (If the light does not turn OFF or ON, the point at which the sensing dial stops turning is referred to as &quot;point B&quot;).</td>
<td><img src="image" alt="Min Max SENS." /></td>
<td><img src="image" alt="Orange" /></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>Adjust the sensing dial so that the sensitivity indicator comes between points A and B.</td>
<td><img src="image" alt="Min Max SENS." /></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Check that the stable detection level indicator light turns ON regardless of whether the beam is penetrating or not.</td>
<td><img src="image" alt="Set Position" /></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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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.

<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible cause</th>
<th>Countermeasure</th>
</tr>
</thead>
</table>
| Pump fails to start | (1) No power supply (power outage, etc.)
(2) Disconnection or inadequate connection of cabtyre cable.
(3) Foreign object lodging on impeller
(4) Low voltage.
(5) Anti-sludge sensor circuit has tripped. | (1) Contact the power company or an electrical repair ship.
(2) Check if the cabtyre cable or wiring is disconnected.
(3) Check and remove any debris.
(4) Provide the rated voltage.
(5) Check the circuit. |
| Pump stops during operation. | (1) Pump's built-in motor protector trips cyclically.
(2) Anti-sludge sensor circuit has tripped. | (1) Remove the debris jammed in the impeller.
(2) Check the circuit. |
| Low performance or performance decreases | (1) Low voltage or voltage drop.
(2) Impeller rotates in reverse direction.
(3) The piping is partially blocked.
(4) Impeller is worn.
(5) Suction inlet is clogged. | (1) Provide the rated voltage.
(2) Interchange the power supply leads (p. 12).
(3) Remove the blockage.
(4) Replace the worn parts.
(5) Remove the blockage. |
| Sensor detector is not effecting control. | (1) Control circuit is improper.
(2) Debris is adhering onto the beam emitting and receiving faces.
(3) Beam emitting and receiving faces have shifted.
(4) There is an open circuit in the optical fibers.
(5) There is an open circuit in the cable. | (1) Correct the circuit.
(2) Clean the faces.
(3) Realign the faces.
(4) Replace the fibers.
(5) Replace or reconnect the cable. |

Disposal Product

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

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

<table>
<thead>
<tr>
<th>Product model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturing number</td>
</tr>
<tr>
<td>Purchase date</td>
</tr>
<tr>
<td>Remarks</td>
</tr>
</tbody>
</table>

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