WATER BATH
MODEL TBS451PA
AC1 120V

OPERATION MANUAL
No. TS45P-0601

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ADVANTEC TOYO KAISHA, LTD.
TOYO SEISAKUSHO KAISHA, LTD.
1. Safety instructions

Before installation or use, read the following Safety Instructions. Not complying with the instructions in this manual will void the manufacturer’s warranty and may pose dangerous risks to the user.

Safety instructions are illustrated in the following way:

⚠️ WARNING  Failure to observe WARNING signs could result in serious injury or possible death.

⚠️ CAUTION  Failure to observe CAUTION signs could result in personal injury and/or damage to the unit and associated property.

Symbols shown:

⚠️  means caution (includes warning).

🚫  means an action is prohibited.

★★★  means an instruction must be followed.
WARNING

Confirm the unit is electrically grounded.
DO NOT ground the unit through a gas pipe, a water pipe, a lightning rod nor a telephone line. An incomplete grounding may cause an electric shock.

Supply a power source through a dedicated outlet. A multiple outlet or multiple connections may cause an electric shock hazard or a fire. Power line sharing with the other electric appliances might lead to voltage drop of the line and cause a failure of the unit.

To avoid an electric leakage and an electric shock hazard, DO NOT use in a humid place nor outdoors.

DO NOT spray nor splash the unit with water or any other liquid. Seepage of water or other liquids into the unit would cause a short circuit or an electric shock hazard.

The unit is not of an anti-explosive design. DO NOT use inflammables nor volatile materials around the unit. Those materials may cause an explosion or a fire.

To avoid burns, DO NOT touch the bath nor water in it when the unit is operated at more than 40°C or just after operation. Attention is also necessary when handling samples in the bath or when making up water in the bath.

DO NOT attempt to disassemble, to repair nor to modify the unit. The unit contains no user-serviceable parts. Repairs must be performed by qualified engineers only.

DO NOT apply acidic, alkaline nor corrosive materials including brine, because the unit is not of an anti-corrosive design. Corrosion might result in water leakage, electric leakage, an electric shock hazard, a fire or a unit failure.
CAUTION

⚠️ **DO NOT** operate the unit **without water in the bath**. Absence of water may result in a fire, electric leakage and/or a unit failure.

⚠️ **DO NOT** operate with wet hands to avoid electric shock hazards.

⚠️ Before maintenance or inspection, **turn OFF the power switch and leakage breaker**, and **unplug the unit** to avoid an electric shock hazard.
## 2. Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Temp. range*</td>
<td>[Ambient temp.+7 °C] ~ 80 °C **</td>
</tr>
<tr>
<td>Control accuracy*</td>
<td>± 0.5 °C at 50 °C</td>
</tr>
<tr>
<td>Temp. deviation*</td>
<td>± 1.5 °C at 50 °C</td>
</tr>
<tr>
<td>Temp. climb rate*</td>
<td>approx. 100min (20 °C ~ 80 °C)</td>
</tr>
<tr>
<td>Temp. controller</td>
<td>Microprocessor-PID control, Pt100</td>
</tr>
<tr>
<td>Safety device</td>
<td>Overheat prevention (in Temp. controller, setpoint + 5 °C)</td>
</tr>
<tr>
<td>Heater</td>
<td>1kW in SUS316L pipe</td>
</tr>
<tr>
<td>Agitation</td>
<td>Propeller drive</td>
</tr>
<tr>
<td>Bath</td>
<td>Stainless steel (SUS304)</td>
</tr>
<tr>
<td>Dimensions</td>
<td></td>
</tr>
<tr>
<td>Ext.</td>
<td>W560mm H D320mm H 275mm</td>
</tr>
<tr>
<td>Bath</td>
<td>W450mm D307mm H 100mm</td>
</tr>
<tr>
<td>Bath capacity</td>
<td>approx. 16L</td>
</tr>
<tr>
<td>Power source (50Hz/60Hz)</td>
<td>AC 120V, 8.75A</td>
</tr>
<tr>
<td>Weight</td>
<td>approx. 9.5kg</td>
</tr>
<tr>
<td>Attachment (No. of pieces)</td>
<td>Grounding adaptor (1), Operation manual (1)</td>
</tr>
</tbody>
</table>

* Performances are measured at the ambient temperature of 20 °C with no workload.

** Apply an optional lid when operating at 70 °C or higher.
3. Wiring diagram & Parts

![Wiring Diagram]

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Quantity</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>SW</td>
<td>Power switch</td>
<td>1</td>
<td>HLN-116A</td>
</tr>
<tr>
<td>SSR</td>
<td>Solid state relay</td>
<td>1</td>
<td>C-21, AC100V</td>
</tr>
<tr>
<td>H</td>
<td>heater</td>
<td>1</td>
<td>1kW AC120V</td>
</tr>
<tr>
<td>M</td>
<td>Agitation propeller motor</td>
<td>1</td>
<td>C-25</td>
</tr>
<tr>
<td>TC</td>
<td>Temperature controller</td>
<td>1</td>
<td>PXW4NCY2-1Y500</td>
</tr>
<tr>
<td>Pt</td>
<td>Platinum thermoresistor</td>
<td>1</td>
<td>SP-12-1</td>
</tr>
<tr>
<td>TB</td>
<td>Terminal base board</td>
<td>1</td>
<td>ML-1765-2P</td>
</tr>
<tr>
<td>RY1</td>
<td>Relay</td>
<td>1</td>
<td>LY-2F, AC100V</td>
</tr>
<tr>
<td>RY2</td>
<td>Relay</td>
<td>1</td>
<td>MY-2F, AC100V/110V</td>
</tr>
<tr>
<td>PT</td>
<td>Transformer</td>
<td>1</td>
<td>UD11-100A</td>
</tr>
</tbody>
</table>
4. Before use
Please read carefully before attempting to operate the unit.

4.1 Installation area
- Do not install at the following locations:
  - outdoors
  - where exposed to direct sunlight
  - with high humidity
  - with ambient temperatures below 5°C or above 35°C
  - where exposed to inflammable or corrosive gases
  - with excessive dust
  - without sufficient clearance around the unit
  - where the unit cannot be maintained in a flat and stable position.

4.2 Sample loading
- The unit is not of an anti-explosive, nor of anti-corrosive design. Therefore, absolutely do not use in the presence of the followings:
  - Explosive materials
  - Acidic materials
  - Volatile materials
  - Alkaline materials
  - Inflammable materials
  - Other corrosive materials
4.3 Power source connecting

- Confirm that the power source breaker is rated for the appropriate voltage and amperage.
- Confirm the unit is electrically grounded. Grounding prevents accidents such as short-circuits and electrical shocks.
  
  **Never connect the grounding wire to gas lines.**
- Check the plug once a month or shorter intervals. Dust accumulation in the plug might cause a tracking between the blades and finally a fire.
- Loose plug might result in heat generation in the plug. Confirm that the plug is tightly connected to the power outlet.

4.4 Cautions in operation

- The unit is not designed to operate beyond the temperature range specified in Specification table.
- The unit is not of anti-explosive nor anti-corrosive design. Do not use other than water in the bath, and keep inflammable materials off the unit.
- An appropriate water level is 2cm~3cm lower than the top ridge of the bath. Pay attention to the water level especially in operation at high temperatures.
- Empty-bath-heating troubles are apt to occur in the following situations:
  - Water level is low in the bath.
  - The unit is operated at high temperatures.
  - The unit is operated for a long period of time.
  
  Make up water in the bath considering water evaporation rate.
- For the sake of safety do not operate the unit unattended to.
- To avoid burns, pay close attention to hot samples in the bath when handling them.
- Scales on the temperature sensor and/or the heater might cause a unit failure.
  
  Clean the bath once a week or shorter intervals.
- Unplug the unit and drain the bath when the unit is out of use for a week or longer.
4.5 Care and maintenance

- Be sure the unit is unplugged before conducting any maintenance action.
- Do not spray nor splash the unit with water or any other liquid. The seepage of liquids into the unit would result in serious accidents.
- Do not apply alcohol, paint thinner, benzine nor other solvents in order to clean the unit, because these solvents may cause damage to its coating, etc.
- Clean the bath in the following manner:
  - Drain the bath after the water temperature cools close to ambient.
  - Remove the heating block from the bath by releasing the fixing screws.
  - Clean inside of the bath with a soft cloth damped with neutral detergent aqueous solution followed by the other cloth damped with clean water.
  - Do not give stress or damage to the heater and the sensor during cleaning.
  - Reassemble the unit by mounting the heating block and tightening the fixing screws when cleaning is finished.
- Never modify nor disassemble the unit. Modification and/or disassembly may cause a functional failure, an electrical leakage, a fire, etc.
5. External views

- Bath
- Temperature controller
- Power switch
- Power cord
- Grounding adaptor
- Fixing screw
- Temperature sensor
- Agitation propeller
- Pipe heater
6. Operation

6.1 Operation panel

- Overheat indicator
  Illuminates when the overheat preventive function in the temperature controller is active, that is, when the bath temperature exceeds [Setpoint+5 °C].

- Heater indicator
  Illuminates when the heater is energized.

- Set indicator
  Illuminates when SV display reads set temperature.

- Select key
  Out of use in this unit.

- Up key
  Setting value (SV) increases by one (1) when pressed. A long press makes continuous increase of Setting value.

- Down key
  Setting value (SV) decreases by one (1) when pressed. A long press makes continuous decrease of Setting value.

- SV display
  Indicates set temperature (SV, Setting value).

- PV display
  Indicates bath temperature (PV, Process value).
6.2 Operation procedure

1. Place the Bath on a horizontally stable surface or other level and stable surface. Put Temperature controller on the Bath and fix it with the two Fixing screws.

2. Confirm that Power switch is at 0 position.

3. Fill the bath with water. An appropriate water level is 2cm—3cm lower than the top ridge of the bath.

4. Plug the unit. Select the proper power outlet having proper capacities of amperage and voltage, and also a grounding slot.

5. Turn 0 Power switch, then PV display and SV display read and shift to the bath temperature (17) and to the set temperature (SV) respectively in five (5) seconds.

6. Set the bath working temperature by pressing Up key (.MESSAGE) and/or Down key (MESSAGE) on SV display. Indicated value become valid in three (3) seconds, and the operation starts.

7. When the bath temperature reaches the setpoint (working temperature), it is controlled at the point and Heater indicator informs of energizing status of the heater.

8. Turn 0 Power switch to finish operation. Unplug the unit and drain the bath when the unit is out of use for a week or longer.

[Note] Do not press Select key (MESSAGE). When key is pressed for longer than three (3) seconds, Overheat indicator will flashes. In such a case, turn 0 Power switch and again. No key operation for longer than thirty (30) seconds has the same clearing effect.

6.3 Safety devices

- Overheat preventive function (programmed in Temperature controller)
  When the bath temperature exceeds the setpoint temperature by 5, Overheat indicator illuminates, the heater and the agitation propeller motor are de-energized. To clear the activated function, turn 0 Power switch, remove the cause of overheating and restart the unit.
### 7. Troubleshooting

<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible cause</th>
<th>Corrective action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display panel indicates nothing.</td>
<td>Power switch is turned  ᵇ , ᵉ</td>
<td>Turn ᵇ the switch.</td>
</tr>
<tr>
<td>Temperature does not climb.</td>
<td>Power source is incorrectly connected.</td>
<td>Connect the appropriate power source.</td>
</tr>
<tr>
<td>Setpoint temperature (47) is not proper.</td>
<td>Set appropriate working temperature.</td>
<td></td>
</tr>
<tr>
<td>Overheat indicator illuminates.</td>
<td>Remove the cause of the alarm.</td>
<td></td>
</tr>
<tr>
<td>Heater fails unless the terminal connection is loose.</td>
<td>Replace the failed heater.</td>
<td></td>
</tr>
<tr>
<td>Temperature climbs too high.</td>
<td>Setpoint temperature (47) is not proper.</td>
<td>Set appropriate working temperature.</td>
</tr>
<tr>
<td>Agitation propeller does not work.</td>
<td>Water level is low.</td>
<td>Adjust the water level.</td>
</tr>
<tr>
<td></td>
<td>Propeller is not fixed to the driving shaft.</td>
<td>Fix the propeller tightly.</td>
</tr>
</tbody>
</table>
8. Self-diagnostic function

<table>
<thead>
<tr>
<th>Indication</th>
<th>Defective part</th>
<th>Cause</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bath temperature (PV) exceeds 84 °C.</td>
<td>Samples in the bath generate heat. Too much samples are loaded in the bath.</td>
<td></td>
</tr>
<tr>
<td>Temperature sensor A-line (red) is open.</td>
<td>Sensor fails unless terminal connection is loose.</td>
<td></td>
</tr>
<tr>
<td>Temperature sensor B-line (white) is open. Short circuit between A- and B-lines of the sensor wiring.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bath temperature exceeds ([\text{Setpoint} + 5 °C]). Setpoint is settled lower than the present bath temperature by 5 °C or more.</td>
<td>Samples in the bath generate heat. Too much samples are loaded in the bath. SSR fails.</td>
<td></td>
</tr>
<tr>
<td>Temperature controller fails.</td>
<td>Temperature controller should be replaced.</td>
<td></td>
</tr>
</tbody>
</table>

[Note] When overheat preventive function in the temperature controller is activated, Overheat indicator illuminate, the heater and the agitation propeller motor are de-energized. Overheat indicator will be automatically cleared when the bath temperature descends. Remove the cause and restart the unit.