High Pressure Steam Sterilizer

SM200    SM300
SM310    SM510

Second Edition

Read and apprehend the important warnings in this instruction manual prior to use.

Yamato Scientific America Inc.
Santa Clara, CA
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## Specifications

### SM200/300

<table>
<thead>
<tr>
<th></th>
<th>SM200</th>
<th>SM300</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Model</strong></td>
<td>SM200</td>
<td>SM300</td>
</tr>
<tr>
<td><strong>System</strong></td>
<td>Automatic high pressure steam sterilizer</td>
<td></td>
</tr>
<tr>
<td><strong>Temperature</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sterilization</td>
<td>105 °C ~ 123 °C</td>
<td>105 °C ~ 128 °C</td>
</tr>
<tr>
<td>Drying</td>
<td>150 °C ~ 180 °C</td>
<td></td>
</tr>
<tr>
<td><strong>Maximum Operational Pressure</strong></td>
<td>0.18MPa (26.1psi)</td>
<td>0.2MPa (29.0psi)</td>
</tr>
<tr>
<td><strong>Power Requirement</strong></td>
<td>AC115V 13A (50/60Hz)</td>
<td>AC115V 17A (50/60Hz)</td>
</tr>
<tr>
<td><strong>Controller</strong></td>
<td>HiTec IV CR Type Microprocessor Control</td>
<td>Self-diagnostic circuitry; Monitors any abnormality of the temp sensor, Low water sensor, SSR, and heater</td>
</tr>
<tr>
<td><strong>Sensor 1 (Chamber Temp.)</strong></td>
<td>Pt100 resistance thermometer sensor</td>
<td>Thermmocouple (Type T)</td>
</tr>
<tr>
<td><strong>Sensor 2 (Water Temp.)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Timer</strong></td>
<td>1min. ~ 99hours and 59min. 100 ~ 999hours</td>
<td></td>
</tr>
<tr>
<td><strong>Heater 1 (Sterilization)</strong></td>
<td>1.3kW</td>
<td>1.7kW</td>
</tr>
<tr>
<td><strong>Heater 2 (Drying)</strong></td>
<td>1.0kW</td>
<td>1.5kW</td>
</tr>
<tr>
<td><strong>Safety</strong></td>
<td>Main circuit breaker, Over pressure safety valve, Self-diagnostic circuitry; Monitors any abnormality of the temp sensor, Low water sensor, SSR, and heater</td>
<td></td>
</tr>
<tr>
<td><strong>External Dimensions</strong></td>
<td>(W x D x H): 16.1&quot; x 18.5&quot; x 37.4&quot;</td>
<td>17.3&quot; x 20.9&quot; x 38.0&quot;</td>
</tr>
<tr>
<td></td>
<td>41cm x 47cm x 95.3cm</td>
<td>44cm x 53cm x 96.5cm</td>
</tr>
<tr>
<td><strong>Internal Dimensions</strong></td>
<td>(Diameter, Depth): 9.4&quot;, 17.5&quot;</td>
<td>11.8&quot;, 17.5&quot;</td>
</tr>
<tr>
<td></td>
<td>24cm, 44.5cm</td>
<td>30cm, 44.5cm</td>
</tr>
<tr>
<td><strong>Capacity (cu. ft):</strong></td>
<td>0.8</td>
<td>1.2</td>
</tr>
<tr>
<td><strong>Capacity (liters):</strong></td>
<td>22</td>
<td>36</td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>143.3 pounds</td>
<td>176.4 pounds</td>
</tr>
<tr>
<td></td>
<td>65kg</td>
<td>80kg</td>
</tr>
<tr>
<td><strong>Accessories</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bottle</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Basket</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Bottom Plate</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Steam Saucer</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Instruction Manual</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Warranty</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>
## Specifications

### SM310/510

<table>
<thead>
<tr>
<th>Model</th>
<th>SM310</th>
<th>SM510</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>System</strong></td>
<td>Automatic High pressure steam sterilizer</td>
<td></td>
</tr>
<tr>
<td><strong>Temperature</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sterilization</td>
<td>105 °C ~ 128 °C</td>
<td></td>
</tr>
<tr>
<td>Drying</td>
<td>150 °C ~ 180 °C</td>
<td></td>
</tr>
<tr>
<td><strong>Maximum Operational Pressure</strong></td>
<td>0.2MPa (29.0psi)</td>
<td></td>
</tr>
<tr>
<td><strong>Power Requirement</strong></td>
<td>AC220V 11A (50/60Hz)</td>
<td></td>
</tr>
<tr>
<td><strong>Controller</strong></td>
<td>HiTec IV CR Type Microprocessor Control</td>
<td></td>
</tr>
<tr>
<td><strong>Sensor 1 (Chamber Temp.)</strong></td>
<td>Pt100 resistance thermometer sensor</td>
<td></td>
</tr>
<tr>
<td><strong>Sensor 2 (Water Temp.)</strong></td>
<td>Thermocouple (Type T)</td>
<td></td>
</tr>
<tr>
<td><strong>Timer</strong></td>
<td>1min. ~ 99hours and 59min, 100 ~ 999hours</td>
<td></td>
</tr>
<tr>
<td><strong>Heater 1 (Sterilization)</strong></td>
<td>2.0kW</td>
<td></td>
</tr>
<tr>
<td><strong>Heater 2 (Drying)</strong></td>
<td>1.5kW</td>
<td></td>
</tr>
<tr>
<td><strong>Safety</strong></td>
<td>Main circuit breaker, Over pressure safety valve, Self-diagnostic circuitry; Monitors any abnormality of the temp sensor, Low water sensor, SSR, and heater</td>
<td></td>
</tr>
<tr>
<td><strong>Intend Dimensions (W × D × H):</strong></td>
<td>17.3&quot; × 20.9&quot; × 38.0&quot;</td>
<td>17.3&quot; × 20.9&quot; × 42.7&quot;</td>
</tr>
<tr>
<td></td>
<td>44cm × 53cm × 96.5cm</td>
<td>44cm × 53cm × 108.5cm</td>
</tr>
<tr>
<td><strong>Internal Dimensions</strong></td>
<td>11.8&quot;, 17.5&quot;</td>
<td>11.8&quot;, 26.2&quot;</td>
</tr>
<tr>
<td>(Diameter, Depth):</td>
<td>30cm, 44.5cm</td>
<td>30cm, 66.5cm</td>
</tr>
<tr>
<td><strong>Capacity (cu. ft):</strong></td>
<td>1.2</td>
<td>1.8</td>
</tr>
<tr>
<td><strong>Capacity (liters):</strong></td>
<td>36</td>
<td>51</td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>176.4 pounds 80kg</td>
<td>187.4 pounds 85kg</td>
</tr>
</tbody>
</table>

### Accessories

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bottle</td>
<td>1</td>
</tr>
<tr>
<td>Basket</td>
<td>2</td>
</tr>
<tr>
<td>Bottom Plate</td>
<td>1</td>
</tr>
<tr>
<td>Steam Saucer</td>
<td>1</td>
</tr>
<tr>
<td>Instruction Manual</td>
<td>1</td>
</tr>
<tr>
<td>Warranty</td>
<td>1</td>
</tr>
</tbody>
</table>
Safety Information

This instruction manual contains various symbols and safety information. Ignoring safety information can cause such situations as listed below. Please read the following warning and caution signs in this manual prior to use.

**Warning**
Indicates the possibility of serious or fatal injury. **(Note 1)**

**Caution**
Indicates the possibility of injury (Note 2) or damage (Note 3) to the equipment.

(Note 1) Serious injury: Bodily harm by electric shock, bone fracture or poisoning which may require hospitalization.
(Note 2) Injury: Bodily harm by electric shock, bone fracture or poisoning which may require hospitalization.
(Note 3) Damage: Any damage on equipment, facility, structure, etc.

Meaning of graphic indications

⚠️ Shows warnings or caution.
Specific contents are described aside each sign.

⭕ Shows users important information.
Specific contents are described aside each sign.

❗ Shows users important information.
Specific contents are described aside each sign.
Safety Information

Safety Precautions

Do not use this unit for any purpose other than its intended use, described in this manual.

This unit is not explosion proof. Never use in flammable or explosive gas environments.

Be sure to ground the unit. Electric leak could cause electrical shock or fire.

Be sure to use a power supply with more than the rated capacity specified in this manual. Use of a power supply without the correct rated voltage and current could cause fire or electric shock.

If smoke or any strange odor should disburse from this unit, turn the breaker off immediately and pull out the main power cord. Then contact Yamato Scientific. Neglecting this procedure can result in fire or electric shock. Never try repairing the unit yourself.

Forcibly bending, pulling, wrenching or extending the power cord can cause a fire or electric shock.

Overheat or fire can occur if the power cord is bundled or if an object is on the cord.

The use of explosive, flammable or such compounds can cause explosion or fire. (See Pg.7)

Disassembling this unit can cause fire, electric shock or other crisis’s.

The exhaust is located on the right side of the unit. Possibility of personal injury if you come in contact with this area during operation or for a period of time after use.
Safety Information

Safety Precautions

Do not plug the exhaust. Any obstruction in the exhaust may cause the tank to build pressure and become hotter than normal.

Do not attempt to open the sterilizer lid until the pressure is at “0psi”. If you attempt to open the lid when pressurized high pressure steam could cause serious bodily injury. Do not stand close to the lid since steam will exhaust once opened.

Do not open drain when vessel is pressurized. Since sterilization water is hot just after sterilization, let the water cool before draining.

The bottle, located in the inside of the front door contains hot water after operation. Let the water cool prior to removing the bottle. To avoid possible bodily injury, do not open the door during operation.

The plate, lid and surrounding areas are hot after operation. To avoid bodily injury, do not touch these areas. Always wear protective gear when removing a processed load.

Once the lid is open and all steam has exhausted remove sterilized material with heat-resistant gloves to prevent bodily injury.

Hot steam will disperse out of the louvers located in the back of this unit if a malfunction occurs. Do not close the louvers.

When using the pressure relief switch be sure not to touch the exhaust areas of the sterilizer since high pressure steam will exhaust.

Do not operate this unit without a basket.
Safety Information

Safety Precautions

In the event of electrical storm turn off the main circuit breaker. Neglecting this procedure can result in fire, electric shock or other troubles due to thunderbolts.

In the event of a power interruption or the main circuit breaker is switched off during operation the sterilizer solenoid exhaust valve will remain closed once power has been restored. The solenoid exhaust valve will not open until the chamber temperature reaches below boiling point.

Do not attempt to open the sterilizer lid until the pressure is at 0psi.

Use the pressure relief switch to reduce the pressure inside the chamber to “0psi”. (refer to page 35 for instruction how to use the pressure relief switch)
### Safety Information

#### Hazardous Material

**The following material is not recommended for use on the sterilizer**

| Explosive Substance | Explosive
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitroglycerin, Nitroglycerin, Nitrocellulose and other explosive nitric esters.</td>
<td></td>
</tr>
<tr>
<td>Trinitrobenzene, Trinitrotoluene, Picric acid, and other explosive nitro compounds.</td>
<td></td>
</tr>
<tr>
<td>Peracetic acid, Methyl ethyl ketone peroxide, Benzoyl peroxide and other organic peroxides.</td>
<td></td>
</tr>
<tr>
<td>Sodium azide and any other metallic azide compound.</td>
<td></td>
</tr>
</tbody>
</table>

| Combustible Substance | Combustible
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Metallic lithium, Metallic potassium, Metallic sodium, Yellow phosphorus, Phosphorus sulfide, Red phosphorus, Celluloid, Calcium carbide(Carbide), Phosphide lime, Megnesium powder, Aluminum powder, other combustible metal powders and Sodium dithionite (Hydrosulfite).</td>
<td></td>
</tr>
</tbody>
</table>

| Oxidant | Oxidant
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Potassium chlorate, Sodium chlorate, Ammonium chloride and other perchlorate.</td>
<td></td>
</tr>
<tr>
<td>Potassium perchlorate, Sodium perchlorate, Ammonia perchlorate, and other perchlorates.</td>
<td></td>
</tr>
<tr>
<td>Potassium peroxide, Sodium peroxide, Barium peroxide and other inorganic peroxides.</td>
<td></td>
</tr>
<tr>
<td>Potassium nitrate, Sodium nitrate, Ammonia nitrate and other nitrates.</td>
<td></td>
</tr>
<tr>
<td>Sodium chlorite and other chlorites.</td>
<td></td>
</tr>
</tbody>
</table>

| Ignitable Substance | Ignitable
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethyl ether, Gasoline, Acetaldehyde, Propylene chloride, Carbon disulfide and other substance with the flash point below minus 30ºC.</td>
<td></td>
</tr>
<tr>
<td>Normal hexane, Ethylene oxide, Acetone, Benzene, Methyl ethyl ketone and any other substance with the flash points not lower than minus 30ºC and below 0ºC.</td>
<td></td>
</tr>
<tr>
<td>Methanol, Ethanol, Xylene, Pentyl acetate (Amyl acetate) and other substance with the flash point not lower than 0ºC and below 30ºC.</td>
<td></td>
</tr>
<tr>
<td>Kerosene oil, Light oil, Turpentine oil and Isopentyl alcohol(Isomyl alcohol), Acetic acid and other substances with the flash point not lower than 30ºC and below 65ºC.</td>
<td></td>
</tr>
</tbody>
</table>

| Flammable Gas | Flammable
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrogen, Acetylene, Ethylene, Methane, Ethane, Propane, Butane and other flammable gas at 15ºC and under 1 atmosphere.</td>
<td></td>
</tr>
</tbody>
</table>
Identification of Parts

External

- Arm
- Handle
- Panel Guard
- Control Panel
- Pressure Gauge
- Door Latch
- Lid
- Exhaust (U-shaped Pipe)
- Steam Saucer
- Bottle Water Window Viewer

- Louver
- Pressure Relief Switch
- Circuit Breaker
- Louver
- Terminal (Optional)
- Power Cord
Identification of Parts

Internal

- Thermal Insulator
- Safety Valve
- Filter
- Heater 1 (For Sterilization)
- Sensor 2 (For Water Temperature)
- Sensor 1 (For Chamber Temperature)
- Service Plug
- Chamber
- Solenoid Exhaust Valve
- Solenoid Drain Valve
- Micro Switch
- Heater 2 (For Drying)
- Bottom Plate

- Sensor 1
- Heater 2 (For Drying)
Identification of Parts

Internal

- Micro Switch
- Silencer
- Drain Valve
- Exhaust Hose
- Plug

Sensor 2 (For Water Temperature)

Flange

Clamp

Solenoid Exhaust Port

Filter

Heater 1 (For Sterilization)

Sensor 1 (For Chamber Temperature)
### Identification of Parts

#### Control Panel

<table>
<thead>
<tr>
<th>Part</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ENTER key</strong></td>
<td>Start and stop operation, fix the set point/function changed.</td>
</tr>
<tr>
<td><strong>(up down) key</strong></td>
<td>Change set point/function.</td>
</tr>
<tr>
<td><strong>MENU key</strong></td>
<td>Choose “STERILIZE” or “STERILIZE &amp; DRY” before operation.</td>
</tr>
<tr>
<td><strong>MODE key</strong></td>
<td>Use at the beginning/end to change or confirm set point/function.</td>
</tr>
<tr>
<td><strong>Main display</strong></td>
<td>Shows mainly chamber temperature and set temperature.</td>
</tr>
<tr>
<td><strong>Sub display</strong></td>
<td>Shows mainly time left and set time.</td>
</tr>
<tr>
<td><strong>Heater lamp</strong></td>
<td>Stays lit or blinks when heater is on.</td>
</tr>
<tr>
<td><strong>STERILIZE lamp</strong></td>
<td>Stays lit or blinks in sterilization process.</td>
</tr>
<tr>
<td><strong>DRY lamp</strong></td>
<td>Stays lit or blinks in drying process.</td>
</tr>
<tr>
<td><strong>END lamp</strong></td>
<td>Stays lit in the end of operation.</td>
</tr>
<tr>
<td><strong>STERILIZE lamp</strong></td>
<td>Blinks when “STERILIZE” menu is selected before operation, and stays lit during operation.</td>
</tr>
<tr>
<td><strong>STERILIZE &amp; DRY lamp</strong></td>
<td>Blinks when “STERILIZE &amp; DRY” menu is selected before operation, and stays lit during operation.</td>
</tr>
<tr>
<td><strong>TROUBLE lamp</strong></td>
<td>Stays lit when the unit is out of order.</td>
</tr>
<tr>
<td><strong>SET lamp</strong></td>
<td>Stays lit when pushing MODE key to check set point etc.,</td>
</tr>
</tbody>
</table>
Area of installation

Never install sterilizer near any flammable, explosive, or corrosive gas components. Fire, explosion, or other troubles may occur when turning the breaker on and off.

Area of installation

The sterilizer should not be installed in the following environments.

- Under direct sun
- In temperatures below 5 °C, or above 35 °C
- Where severe changes in temperature occur
- In very humid or dusty locations
- Under water
- In vibrating or shock areas

Level surface

If the sterilizer is not on a level surface the heater will reach a high temperature causing an interruption of the operation.
Installation

Environmental Requirements

Provide ample space surrounding the sterilizer

Provide ample space surrounding the unit as indicated below.

- Space for lid to open...13 inches or more
- Space to open door.....10.2 inches or more
- Space for ventilation...5.9 inches or more

Do not install under a low ceiling

An abundant amount of steam will spout out of the lid just after operation. Do not install the sterilizer under any electrical components such as an alarm.

Lock casters

Be sure to fasten the two front casters after positioning the unit.
### Ground

To prevent shock from electric current leak, be sure to connect the ground lead. Contact Yamato Scientific or an electrician if a power source with a ground terminal is needed. Never connect ground to with gas pipe, water pipe, telephone line, or lighting conductor.

#### SM200/300

- Ground outlet is recommended for use.

#### SM310/510

- No power plug is attached to these types of units. Ground properly according to power source.

---

### Connect to sufficient power source

Be sure to connect the power cord to sufficient power source. (See right table)

<table>
<thead>
<tr>
<th>Type</th>
<th>Power Source</th>
<th>Necessary Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>SM200</td>
<td>AC115V single-phase</td>
<td>13A or more</td>
</tr>
<tr>
<td>SM300</td>
<td>AC115V single-phase</td>
<td>17A or more</td>
</tr>
<tr>
<td>SM310</td>
<td>AC220V single-phase</td>
<td>11A or more</td>
</tr>
<tr>
<td>SM510</td>
<td>AC220V single-phase</td>
<td>11A or more</td>
</tr>
</tbody>
</table>

---

### Attaching the power cord

Be sure that the breaker is turned off prior to connecting the power cord. The power cord plug is not attached to the SM310 and 510. Select an adequate capacity plug and terminal according to the connecting power source.
**Installation**

**Initial Set Up**

**Filter Installation**

Be sure to install the filter prior to operation.

**Install the bottom plate**

The bottom plate balances the material in the chamber and protects heater 1 and sensor 2. Be sure to install the plate.

**Close the drain valve**

Be sure to close the drain valve.
Install the bottle

The sterilizer drains water forcibly during the “STERILIZE & DRY” process. Hot and high pressure water will spout out to the bottle. To prevent the user from operating the sterilizer without the drain bottle a micro switch will not allow the sterilizer to operate without the bottle.

1. Open the front door of the sterilizer and remove the bottle. The display will flash **bottle** indicating the bottle is not in place.
2. Pour 1500ml of water into the bottle. This water is used to cool the hot steam coming out of the chamber. The unit drains water forcibly out of the container into the bottle during the “STERILIZE & DRY” process. If too much water is poured into the bottle, the drained hot water can overflow. Follow the water volume specified.
3. Put the silencer into the bottle that contains 1500ml water.
4. After the silencer is placed into the bottle, push the bottle upward, inside the door while putting the exhaust hose into the bottle.
5. Once the bottle is set, the micro switch is pushed, which allows the sterilizer to operate.
**Installation**

**Initial Set Up**

*Pour water into the chamber*

Pour water into the chamber according to the gauge on the bottom plate. Failing to pour adequate water will result in an interruption of operation. Confirm the water level after each sample run.

See table on right for water volume information. Using over the maximum level of water will result in hot water spouting from the bottle.

<table>
<thead>
<tr>
<th>Requirement</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>SM200</td>
<td>1900–2000ml</td>
</tr>
<tr>
<td>SM300</td>
<td>2800–3000ml</td>
</tr>
<tr>
<td>SM310</td>
<td>2800–3000ml</td>
</tr>
<tr>
<td>SM510</td>
<td>2800–3000ml</td>
</tr>
</tbody>
</table>

*Use distilled water for sterilization*

Use distilled water to prevent collection of mineral deposits and corrosion of chamber components. Under ground water is not recommended.

*Placing materials into sterilizer*

Place the material into the basket and insert into the chamber. Never block the steam exhaust port. Always use a basket for material being sterilized.
**Installation**

**Initial Set Up**

---

**Close the door before operation**

⚠️ Be sure to close the front door of the sterilizer before operation. An open door may cause the bottle to fall during operation. Do not open the front door during operation.

---

**Close the lid**

⚠️ Be sure to close the lid completely by turning the handle clockwise in a 1/4-1/2 circle after it touches the chamber. If it is not closed properly, steam will escape from the chamber.

---

**Set the steam saucer**

⚠️ This unit comes equipped with a steam saucer to prevent any steam from dropping to the floor. See right illustration to place the saucer under the exhaust.
Operational Precautions

Opening lid

⚠️ When opening the lid, be sure that the pressure gauge reads “0psi”. Proceed to open slowly. If the lid is opened at high pressure, hot steam will spout out.

Drainage

⚠️ After operation, the water in the chamber is very hot. Please let the water cool before draining. Place a drain pan less than 2 inches in height under the drain valve or connect a drain hose.

⚠️ Never drain water during operation. If you open the drain valve at high pressure, hot water will spout out.

Water bottle window viewer

⚠️ Check the water level window. If water level is close to the upper limit indicated with the caution label, be sure to drain some water before using.
**Operational Precautions**

**Certain areas become very hot**

⚠️ During and following operation, the areas around the lid become very hot. Be careful not to touch these areas.
- Gray areas in the illustration on the right become especially hot.

**Lid gasket**

⚠️ Any damage or dust on the lid gasket/flange of the chamber (gray area in illustration on right) will allow steam to escape. Be sure to keep this area clean and avoid contacting with baskets, etc. when installing or removing materials from the chamber.

The gasket may deteriorate according to use. If steam escapes frequently, you may need to change the gasket.

**Panel guard**

⚠️ The panel guard was designed to protect the display/keypad. Do not hold the panel guard to move the sterilizer.

**“ENTER” key**

⚠️ The “ENTER” key will interrupt the program operation.
**Sample Run Examples**

**How to operate the “STERILIZE” process**

Sterilize operation using a waste bag.

- Be sure to open the mouth of the bag to let steam.
- Keep the bag approximately 2/3” height of the total depth of the chamber (Example: SM200 is 17.5” deep, so the bag should be placed 11.5” from the bottom). If the bag is placed higher than this point, steam will not disperse easily and may result in incomplete sterilization, in addition, the bag can easily cover the exhaust in the upper part of the container.
- Set the temperature lower than the heat resisting point of the bag.
- Set time depends on quality and quantity of the material being sterilized. (See chart below)

Example:

<table>
<thead>
<tr>
<th>Sample</th>
<th>Temperature</th>
<th>Time</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gauze</td>
<td>121°C</td>
<td>30min.</td>
<td>5 dry gauze’s</td>
</tr>
<tr>
<td>Petri Dish</td>
<td>121°C</td>
<td>40min.</td>
<td>30 petri dishes with lid</td>
</tr>
</tbody>
</table>

- The above data is only for reference use. The outcome of sterilization varies according to quality and quantity of substance and types of containers. The result of sterilization shall be checked using a chemical indicator.

**NOTE:** Never operate this unit without a basket.
Program “MODE”
“MODE” key Information

How to use the “MODE” key

1. Turn the circuit breaker on.
   The sterilizer automatically starts in stand-by mode, and the display show current set point.

2. Push the “MODE” key.
   Main display starts blinking $StnP$ (Sterilization Temp.)

Setting other parameters

- Turn the circuit breaker on.
- Push the “MODE” key.
- Use the $\uparrow \downarrow$ keys to select desired parameter.
### Program “MODE”

#### Display Symbols

**List of Symbols in the display**

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Word</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td><strong>bott</strong>e</td>
<td>Bottle: Bottle isn’t set.</td>
</tr>
<tr>
<td>D</td>
<td><strong>dRT</strong>e</td>
<td>DRY TEMPERATURE: Function of setting drying temperature.</td>
</tr>
<tr>
<td></td>
<td><strong>dRT t</strong>ime</td>
<td>DRY TIME: Function of setting drying time.</td>
</tr>
<tr>
<td>E</td>
<td><strong>End</strong></td>
<td>END: To indicate the end of operation.</td>
</tr>
<tr>
<td></td>
<td><strong>Er</strong>r ****</td>
<td>ERROR: To indicate the occurrence of trouble.</td>
</tr>
<tr>
<td>O</td>
<td><strong>off</strong></td>
<td>OFF: Signal function is switched off.</td>
</tr>
<tr>
<td></td>
<td><strong>on</strong></td>
<td>ON: Signal function is switched on.</td>
</tr>
<tr>
<td>S</td>
<td><strong>stRT</strong>e</td>
<td>STERILIZE TEMPERATURE: Function of setting sterilization temperature.</td>
</tr>
<tr>
<td></td>
<td><strong>stRT t</strong>ime</td>
<td>STERILIZE TIME: Function of setting sterilization time.</td>
</tr>
<tr>
<td></td>
<td><strong>stop</strong></td>
<td>STOP: To indicate operation stop.</td>
</tr>
<tr>
<td></td>
<td><strong>s</strong>iGNAL</td>
<td>SIGNAL: Signal: Buzzer (at the end of operation).</td>
</tr>
</tbody>
</table>
Program “MODE”

Flowchart

You can push "MODE" key anytime during above procedure to get the unit stand by.
**Setting sterilization temp/time**

- Used to set the sterilization temp/time.
- Simply push the “MODE” key to cancel the set up at any point.
- The sterilizer automatically sets in stand-by mode if it is untouched for more than a minute during set up.

<table>
<thead>
<tr>
<th>Stand-by</th>
<th><img src="image" alt="Image" /></th>
<th>Turn the breaker on. The main display blinks sterilization temperature, and the sub display blinks sterilization time.</th>
</tr>
</thead>
<tbody>
<tr>
<td>S. Temp.</td>
<td><img src="image" alt="Image" /></td>
<td>Push the “MODE” key. The main display blinks ( \text{Step}), and the sub display flashes sterilization temperature.</td>
</tr>
<tr>
<td>S. Temp.</td>
<td><img src="image" alt="Image" /></td>
<td>Push the “ENTER” key. At this time, you can change the sterilization temperature.</td>
</tr>
<tr>
<td>S. Temp.</td>
<td><img src="image" alt="Image" /></td>
<td>Input the sterilization temperature desired by pushing the ( \text{Tr}) (\text{P}) keys. (\text{Tr}) key (\text{P}) To lower temperature. (\text{P}) key (\text{TR}) To raise temperature.</td>
</tr>
<tr>
<td>S. Temp.</td>
<td><img src="image" alt="Image" /></td>
<td>Push the “ENTER” key. The changed sterilization temperature is fixed, and the panel shows the next function, sterilization time set-up.</td>
</tr>
<tr>
<td>S. Temp.</td>
<td><img src="image" alt="Image" /></td>
<td>Push the “ENTER” key again. You can now change the sterilization time.</td>
</tr>
<tr>
<td>S. Temp.</td>
<td><img src="image" alt="Image" /></td>
<td>Input sterilization time you desire by ( \text{Tr}) (\text{P}) key. (\text{Tr}) key (\text{P}) To reduce time. (\text{P}) key (\text{TR}) To increase time.</td>
</tr>
<tr>
<td>D. Temp.</td>
<td><img src="image" alt="Image" /></td>
<td>Push the “ENTER” key. The changed sterilization time is fixed, and the panel blinks the next function, dry temperature set-up.</td>
</tr>
<tr>
<td>D. Temp.</td>
<td><img src="image" alt="Image" /></td>
<td>Push the “MODE” if the dry mode will not be in use. If the dry mode will be in use, press the “ENTER” key and continue to the next page.</td>
</tr>
</tbody>
</table>
## Dry Mode Temperature and Time

| D. Temp. | Input the dry temperature you desire by ₀ ₉ key.  
 ₀ key To lower temperature to 150 ₀ .  
₉ key To raise temperature up to 180 ₀ .  
Push the “ENTER” key.  
The changed dry temperature is fixed, and the panel blinks the next function, dry time set-up. |
|-----------|------------------------------------------------------------------------------------------------|
| D. Time   | Push the “ENTER” key again.  
You can now change the dry time.  
Input the dry time you desire by ₀ ₉ key.  
₀ key To reduce time.  
₉ key To increase time.  
Push the “ENTER” key. The changed dry time is fixed and the panel display automatically returns to stand-by. The displays blinks newly set sterilization temperature and time. |

---

26
**Buzzer**

Signal on - buzzer at the end of a cycle.

Signal off - no sound alert at the end of a cycle prior to or during operation.

You may select the “Signal on/off”.

### Selection of “signal on/off”

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. <img src="image1.png" alt="MODE key" /></td>
<td>Push the “MODE” key. The main display blinks $S\pi\tilde{n}\tilde{P}$, and the sub display blinks sterilization temperature.</td>
</tr>
<tr>
<td>2. <img src="image2.png" alt="key1" /> <img src="image3.png" alt="key2" /></td>
<td>Push either the $\Delta$ $\tilde{P}$ keys to search the panel display (illustrated on left) to the desired setting.</td>
</tr>
<tr>
<td>3. <img src="image4.png" alt="ENTER key" /></td>
<td>Push the “ENTER” key. The panel display changes places and the setting can be changed.</td>
</tr>
<tr>
<td><img src="image2.png" alt="key1" /> <img src="image3.png" alt="key2" /></td>
<td>Push either $\Delta$ $\tilde{P}$ keys to display your selection.</td>
</tr>
<tr>
<td><img src="image4.png" alt="ENTER key" /></td>
<td>Push the “ENTER” key. The change on signal is fixed, and the panel display returns to standby.</td>
</tr>
</tbody>
</table>
Selecting operation
The following procedure allows the user to select the desired operation.

- Turn on main circuit breaker.
- Push “MENU” key to select sterilize. Push “MENU” key again to select sterilize & dry.
- Menu change can only be made during stand-by mode. Once operation begins you can not change menu setting.
Run “MENU”

“STERILIZE” Procedure

Check the following:
- Is the drain valve closed? Pg.10
- Is the drain filter in place? Pg.15
- Is the bottom plate set? Pg.15
- Is the bottle set? Pg.16
- Is water in chamber? Pg.17
- Is the lid closed? Pg.18

\[\text{Turn on the main circuit breaker (located on the left side of the unit).}\]
\[\text{Push the “MENU” key and select “STERILIZE”. (See P28)}\]
\[\text{Set the sterilization temperature and time as you desire. (See P25)}\]

- The main display blinks the set temperature.
- The sub display blinks the set time.
- The sterilize menu lamp comes on and off.

\[\text{Push the “ENTER” key}\]

Operation begins. The sterilization heater turns on. The solenoid exhaust valve remains open. Air purges out of the chamber. (Approximately 20-25 minutes)

- The main display shows water temperature and heater lamp.
- The sub display goes off.
- Sterilize lamp comes on and off.
- Sterilize menu lamp blinks.

At the end of air purge, the solenoid exhaust valve closes, and pressurization starts. (Approximately 20-25 minutes)

- The main display shows the chamber temperature.
- Sterilize lamp blinks.
- Sterilize menu lamp is lit.
When the chamber temperature reaches the set temperature, sterilization process begins and the time counter starts. At this time, the sub display will show the sterilization time remaining.

- The main display shows chamber temperature.
- The sub display shows the remaining sterilization time.
- Sterilize lamp is lit.
- Sterilize menu lamp is lit.

Natural cooling begins when the set sterilization time is complete. At this time, the heater will automatically shut off.

- The main display shows chamber temperature.
- The sub display blinks cool.
- Sterilize lamp is lit.
- Sterilize menu lamp is lit.

To prevent bumping, the solenoid exhaust valve opens once the chamber temperature drops below boiling point.

- The main display shows chamber temperature.
- The sub display shows End.
- End lamp is lit.
- Sterilize menu lamp is lit.

- Push the "ENTER" key.
  The "ENTER" key resets the microprocessor. You may now run another cycle.
Run “MENU”

“STERILIZE & DRY” Procedure

“STERILIZE & DRY” procedure

Check the following.
- Is the drain valve closed? Pg.10
- Is the drain filter in place? Pg.15
- Is the bottom plate set? Pg.15
- Is the bottle set? Pg.16
- Is water in chamber? Pg.17
- Is the kid closed? Pg.18

⚠️

In “STERILIZE & DRY” operation, the water is automatically drained from the chamber to the bottle before the drying process. Be sure to check the water level prior to operation or an overflow can occur.

- Turn on the main circuit breaker.
- Push the “MENU” key to select “STERILIZE & DRY”.
  (See P28)
- Set the temperature and time you desire.
  (See P25 and 26)

- The main display blinks the set temperature.
- The sub display blinks the set time.
- Sterilize & Dry menu lamp blinks.

- Push the “ENTER” key.
  Operation begins. The sterilization heater turns on.
  The solenoid exhaust valve remains open to exhaust air from the chamber.

- The main display shows water temperature.
- The sub display goes off.
- Sterilize lamp blinks.
- Sterilize & Dry menu lamp is lit.

After air purge, the solenoid exhaust valve is closed, and pressurization starts. (Approximately 20-25 minutes)

- The main display shows chamber temperature.
- Sterilize lamp blinks.
- Sterilize & Dry menu lamp is lit.
Run “MENU”

“STERILIZE & DRY” Procedure

After chamber temperature reaches the set temperature, sterilization process starts. The sub display shows the sterilization time.
- The main display shows chamber temperature.
- The sub display shows the remaining sterilization time.
- Sterilize lamp blinks.
- Sterilize & Dry menu lamp is lit.

When the sterilization time is complete. The solenoid drain valve opens and drains all water and the dry heater turns on.
- The main display shows chamber temperature.
- The sub display blinks 🌿 🌿.
- Dry lamp blinks.
- Sterilize & Dry menu lamp is lit.

When forced drainage ends, the solenoid drain valve is closed. The solenoid exhaust valve opens to exhaust air out of the chamber.
- The main display shows chamber temperature.
- The sub display blinks 🌿 🌿.
- Dry lamp blinks.
- Sterilize & Dry menu lamp is lit.

After the air exhausted out of the chamber the dry heater raises the chamber temperature.
- The main display shows chamber temperature.
- The sub display goes off.
- Dry lamp is lit.
- Sterilize & Dry menu lamp is lit.

Drying process starts when the chamber temperature reaches to temperature, which is less than 4 degrees C from the set temperature.
- The main display shows chamber temperature.
- The sub display shows the remaining time.
- Dry lamp is lit.
- Sterilize & Dry menu lamp is lit.
Run “MENU”
“STERILIZE & DRY” Procedure

When the drying time is completed, the heater is turned off and natural cooling starts.

- The main display shows chamber temperature.
- The sub display blinks $End$.
- End lamp is lit.
- Sterilize & Dry menu lamp is lit.

Push the “ENTER” key.
The “ENTER” key resets the cycle. You may now run another cycle.

Drain the water bottle after “STERILIZE & DRY” process. The remaining water can cause hot water to spout out during the next operation.

Since the bottle contains hot water after operation, wait for the water to cool before draining it.
To check set temperature and time during the operation, push the "MODE" key. Set points can only be viewed, not changed.

- Push the "MODE" key.
- The main display blinks $\text{S&AP}$ (set Temp).
- The sub display shows the set temperature.
- Set lamp is lit.

To check the other set points, push key to flash the indication you desire in the main display and view the set points in the sub display.

To end the function, push the "MODE" key. The display returns to the original state.
## Special Control Functions

### Interrupt Program during Operation

<table>
<thead>
<tr>
<th>ENTER</th>
<th>98</th>
<th>Stop</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENTER</td>
<td>12:1</td>
<td>00:20</td>
</tr>
</tbody>
</table>

- Push the “ENTER” key.
  - Operation is interrupted. Steam will exhaust when pressurized.
- The main display shows current chamber temp.
- The sub display blinks `Stop`.
- Push the “ENTER” key twice to resume operation.
- The main display blinks the set temperature.
- The sub display blinks the set time.

**NOTE:**

Always drain the excess water from the chamber after a cycle has been interrupted. Failure to drain the excess water from the chamber after a cycle interrupt can result in subsequent unsterile loads as a result of contact with water in the chamber.

### Pressure Relief Switch

#### How to use the pressure relief switch

- Push the Pressure Relief Switch.

  By pushing this switch, open the solenoid exhaust valve opens. Steam inside the chamber is exhausted into the bottle, decreasing the chamber pressure and temperature.

  The pressure relief switch can be used only when the solenoid exhaust valve is closed.

  Be sure the material will not bump. Be careful not to touch the exhaust areas of the sterilizer since high pressure steam will exhaust. Bumping or steam spouting due to sudden pressure decrease could damage the container or cause bodily injury.

#### Checking chamber temperature during stand-by mode

- Push either † ‡ keys.
  - The main display shows temperature inside the chamber. If you release your finger from the key, the display returns stand-by.
**Self-diagnostic Circuitry**

The Yamato sterilizer was designed with self-diagnostic circuitry capable of monitoring operation of the sterilizer. If a malfunction occurs, the display panel blinks the error code and an alarm is sounded. The microprocessor disables power to the heater element. If this occurs, check the error code and immediately shut off the main breaker.

The safety valve is activated if pressure inside the chamber is abnormal. No special alarm is given when the safety valve is activated. However, a significant amount of steam will spout out of the louvers or spaces on the exterior. In this situation, there can be some problems such as an air purge or problems with the temperature controller. Push the “ENTER” key immediately to stop the operation. Turn off the main breaker after the steam spouting out settles down.

**Error Code List**

<table>
<thead>
<tr>
<th>Indication</th>
<th>Cause</th>
<th>Alarm in emergency</th>
<th>Quick measure</th>
<th>Final measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Er.01</td>
<td>Sensor-related trouble</td>
<td>Display and buzzer</td>
<td>Disconnected heater circuit</td>
<td>Exchange sensor etc.,</td>
</tr>
<tr>
<td>Er.02</td>
<td>Triac-related trouble</td>
<td>Display and buzzer</td>
<td>Disconnected heater circuit</td>
<td>Exchange triac etc.,</td>
</tr>
<tr>
<td>Er.03</td>
<td>Heater-related trouble</td>
<td>Display and buzzer</td>
<td>Disconnected heater circuit</td>
<td>Exchange heater etc.,</td>
</tr>
<tr>
<td>Er.10</td>
<td>Main relay-related trouble</td>
<td>Display and buzzer</td>
<td>Disconnected heater circuit</td>
<td>Exchange relay etc.,</td>
</tr>
<tr>
<td>Er.14</td>
<td>Run-down of back-up battery</td>
<td>Display and buzzer</td>
<td>The unit stays stand-by condition.</td>
<td>Turn on the breaker and charge the battery</td>
</tr>
<tr>
<td>Er.20</td>
<td>Heating low water</td>
<td>Display and buzzer</td>
<td>Disconnected heater circuit</td>
<td>Supply water</td>
</tr>
</tbody>
</table>

**In case of power failure**

- If the main circuit breaker is turned off during operation or main power is temporarily interrupted during operation.
  1. The sterilizer will remain in the state it was disabled at. A power failure will result in the chamber remaining pressurized if it was under pressure at the time of the failure.
  2. When power is restored the operation program is lost and the solenoid exhaust valve will remain closed until the chamber temperature is below boiling point.

**Do not open the lid in this situation or hot and high pressure steam will spout out.**

If you want to open the lid, use the pressure relief switch to reduce pressure inside the chamber to “0psi”.

---

**Troubleshooting Guide**

*Safety*
## Problem Solving Chart

<table>
<thead>
<tr>
<th>Fault Indication</th>
<th>Check Points</th>
</tr>
</thead>
</table>
| Display does not come up when the breaker is turned on | - Is the power supply cord connected?  
- Is there any power failure?  
- Is the voltage of the power source adequate? |
| Air is not exhausted.  
The safety valve is activated. | - Is the hose to the bottle bent or clogged?  
- Is the exhaust clogged by material etc.,? |
| Water is not drained.  
Water is not drained in drying process. | - Is the filter clogged? |
| Sterilization temperature does not go up.  
The pressure does not increase. | - Is the lid securely closed?  
- Is the packing or flange damaged? |
| The pressure increases when the solenoid valve is not closed. | - Is the exhaust vent clogged? |
| The temperature changes during operation. | - Is there considerable changes of the outside temperature? |
| Steam spouts rapidly. | - Is there water in the bottle?  
- Is the exhaust hose out of place or damaged? |
| Water leaks. | - Is the drain valve securely closed?  
- Is there too much water in the bottle? |
| The operation does not start from stand-by. | - Is bottle installed? |
| Noise during air purge is loud. | - Is the silencer out of place? |

If you require further technical assistance, please call Yamato Scientific at (800) 292-6286 Ext. 235
Inside of dashed line is option
### Symbol & Name of Parts

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Name of Parts</th>
<th>Symbol</th>
<th>Name of Parts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tr</td>
<td>Transformer</td>
<td>PIO2</td>
<td>Pio2 Board</td>
</tr>
<tr>
<td>X</td>
<td>Relay</td>
<td>POWER2</td>
<td>Power2 Board</td>
</tr>
<tr>
<td>CT</td>
<td>Current Transformer</td>
<td>SW1</td>
<td>Pressure Relief Switch</td>
</tr>
<tr>
<td>SSR</td>
<td>Solid State Relay</td>
<td>SW2</td>
<td>Micro Switch</td>
</tr>
<tr>
<td>MCB</td>
<td>Circuit Breaker</td>
<td>TC</td>
<td>Sensor 2 (Thermocouple)</td>
</tr>
<tr>
<td>T</td>
<td>Terminal</td>
<td>PT</td>
<td>Sensor 1 (Pt100 resistance thermometer)</td>
</tr>
<tr>
<td>MV1</td>
<td>Solenoid Exhaust Valve</td>
<td>H1</td>
<td>Heater 1 (Sterilization)</td>
</tr>
<tr>
<td>MV2</td>
<td>Solenoid Drain Valve</td>
<td>H2~4</td>
<td>Heater 2 (Drying)</td>
</tr>
<tr>
<td>PLANAR</td>
<td>Planar Board</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Inside of dashed line is option
Maintenance

For maintenance

⚠️ For maintenance, turn the breaker and power supply off for safety. If the chamber is hot, wait for it to cool. Wipe off any dirt on the exterior with a damp cloth. Do not use benzene, thinner or cleanser to wipe, nor scrub with a brush.

Daily Maintenance

Cleaning after liquid loads

⚠️ Biological media tends to boil at a higher rate compared to other liquids. This can cause media to be splattered inside the chamber. Therefore, the chamber must be cleaned daily with a damp cloth after temperature has cooled.

Weekly Maintenance

Cleaning the inside of the chamber

⚠️ Clean the inside of the chamber with a clean damp cloth. Do not pull the filter out, located in the bottom center when cleaning the inside of the chamber. If cleaned without the filter inside, the pipe can get clogged with debris.

Filter cleaning

⚠️ If the filter in the bottom center of the chamber is clogged, drainage is prevented. Clean the filter in appropriate intervals, according to frequency of use.

Pull the filter out, from the bottom drain port. The filter may be cleaned under the water faucet.

Cleaning the Door Gasket

⚠️ The door gasket, located under the lid of the sterilizer can be wiped clean with a clean damp cloth. The gasket should be examined for cracks or damage that can result in a poor pressure seal. If replacement is needed, contact Yamato Scientific.

Cleaning the Pipe Heater

⚠️ The pipe heater should be cleaned twice a month.

Accumulation of scale build up results in poor heat transfer and high sheath temperatures.
Cleaning the silencer

The unit is set up with a silencer at the end of the exhaust hose to reduce noise occurring from air purge. Remove the silencer and clean with water once a month.

- A ball is set in the silencer to prevent back flow of water. Do not misplace the ball when removing the silencer.
When you request repair

If any troubles should occur, stop the operation immediately, turn the breaker off, pull the power cord out and contact Yamato Scientific’s Technical Service Department.

Necessary information

- Model Number
- Serial Number
- Date of Purchase
- Distributor Name
- Information on difficulties

See the warranty or nameplate on the unit

To reach Yamato’s Technical Service Department, please call (800) 292-6286 Ext. 235

Warranty

- Keep your warranty card for future references. Check the name of the distributor, date of purchase and any other contents of the warranty.

- The terms of the warranty is two year limited commencing the date of purchase. Repair is made without charge according to the contents of warranty.

- Decontamination Statement:
  We can not accept any products or parts returned to us for repair or credit that is contaminated with or has been exposed to potentially infectious agents or radioactive materials.
  If you need repair, please call Yamato Scientific at (800) 292-6286 Ext. 221 for a Return Authorization Number. No product will be accepted without this number.
## Replacement Parts List

### Common for all SM series

<table>
<thead>
<tr>
<th>Part Name</th>
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<td>CPU</td>
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<td>Transformer (Tr1; SM200/300)</td>
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*The solenoid valve is usable for exhaust band drain.*
Responsibility
Please follow the instructions in this document when using this unit. Yamato Scientific has no responsibility for the accidents or breakdown of device if it is used with a failure to comply. Never conduct what this document forbids. Unexpected accidents or breakdown may result in.

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◆ The contents of this document may be changed in future without notice.
◆ Any books with missing pages or disorderly binding may be replaced.