

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

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

Accessories

Bottle	1
Basket	2
Bottom Plate	1
Steam Saucer	1
Instruction Manual	1
Warranty	1

Specifications

SM310/510

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

Accessories

Bottle	1
Basket	2
Bottom Plate	1
Steam Saucer	1
Instruction Manual	1
Warranty	1

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.



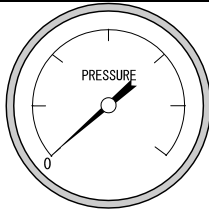
The exhaust is located on the right side of the unit. Possibility of personal injury if you come in contact with this area during operation or for a period of time after use.

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

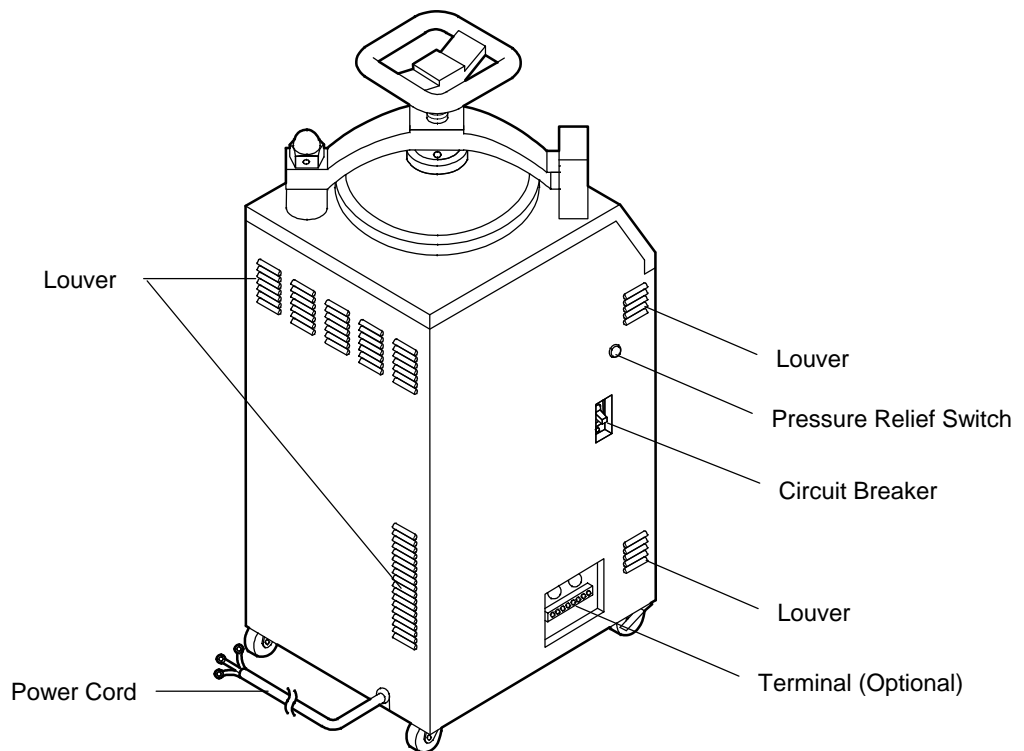
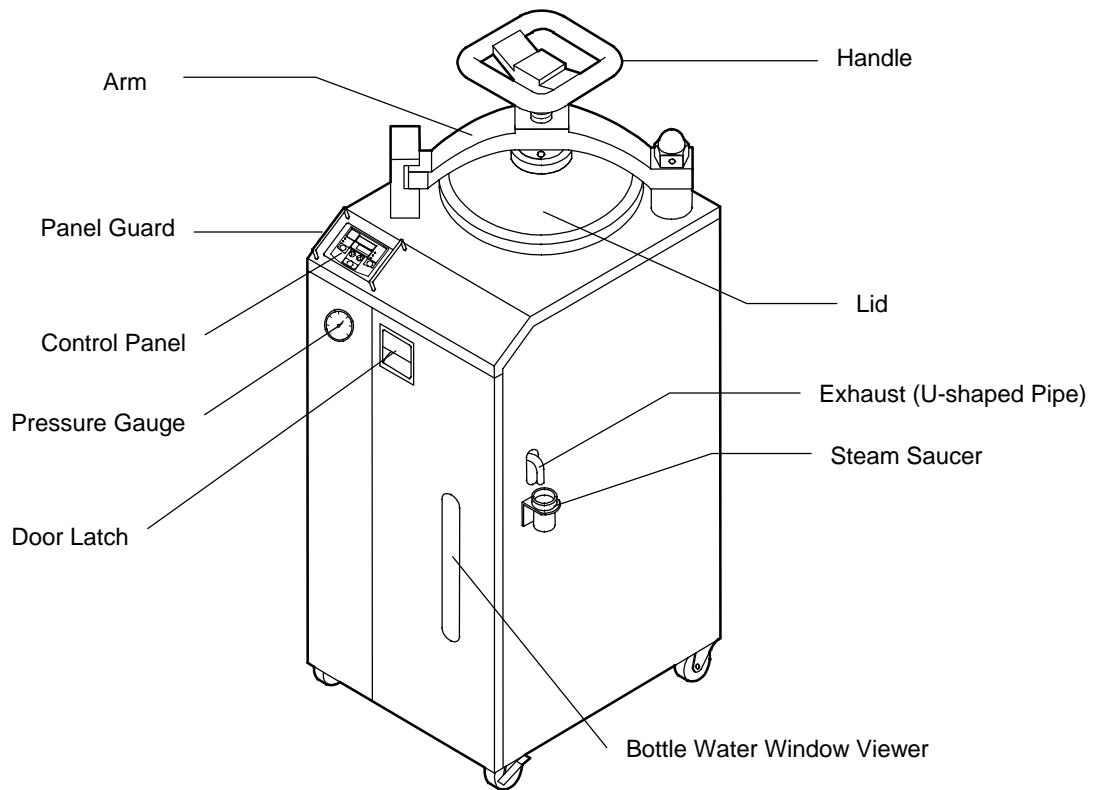
Hazardous Material

The following material is not recommended for use on the sterilizer

Explosive	Explosive Substance	Nitroglycol, Nitroglycerin, Nitrocellulose and other explosive nitric esters.
		Trinitrobenzene, Trinitrotoluene, Picric acid, and other explosive nitro compounds.
		Peracetic acid, Methyl ethyl ketone peroxide, Benzoyl peroxide and other organic peroxides.
		Sodium azide and any other metallic azide compound.
Flammable	Combustible Substance	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).
	Oxidant	Potassium chlorate, Sodium chlorate, Ammonium chlorate and other perchlorate.
		Potassium perchlorate, Sodium perchlorate, Ammonia perchlorate, and other perchlorates.
		Potassium peroxide, Sodium peroxide, Barium peroxide and other inorganic peroxides.
		Potassium nitrate, Sodium nitrate, Ammonia nitrate and other nitrates.
		Sodium chlorite and other chlorites.
	Calcium hypochlorite and other hypochlorites.	
	Ignitable Substance	Ethyl ether, Gasoline, Acetaldehyde, Propylene chloride, Carbon disulfide and other substance with the flash point below minus 30°C.
		Normal hexane, Ethylene oxide, Acetone, Benzene, Methyl ethyl ketone and any other substance with the flash points not lower than minus 30°C and below 0°C.
		Methanol, Ethanol, Xylene, Pentyl acetate (Amyl acetate) and other substance with the flash point not lower than 0°C and below 30°C.
Kerosene oil, Light oil, Turpentine oil and Isopentyl alcohol(Isoamyl alcohol), Acetic acid and other substances with the flash point not lower than 30°C and below 65°C		
Combustible Gas	Hydrogen, Acetylene, Ethylene, Methane, Ethane, Propane, Butane and other flammable gas at 15°C and under 1 atmosphere.	

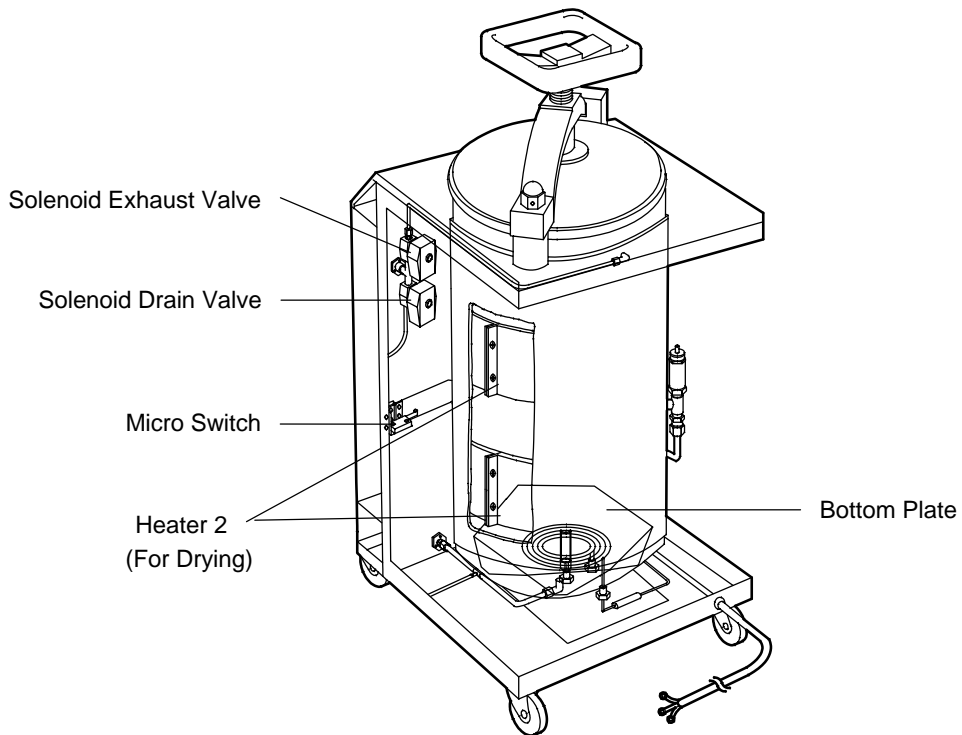
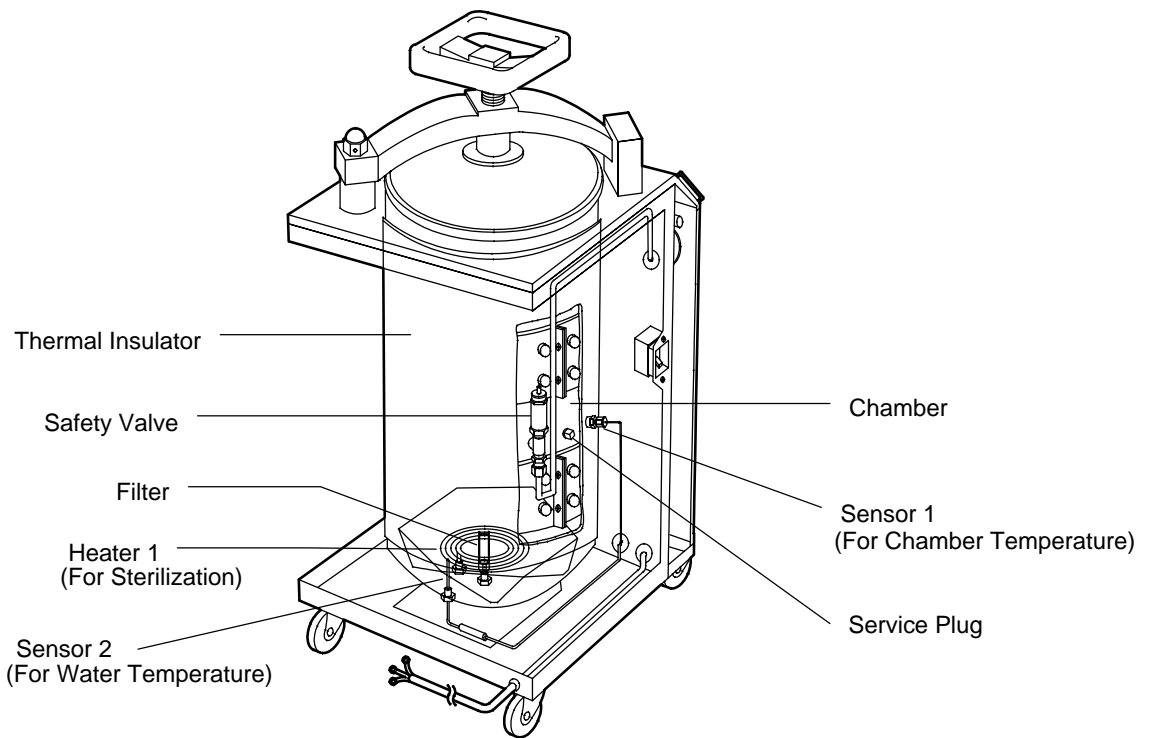
Identification of Parts

External



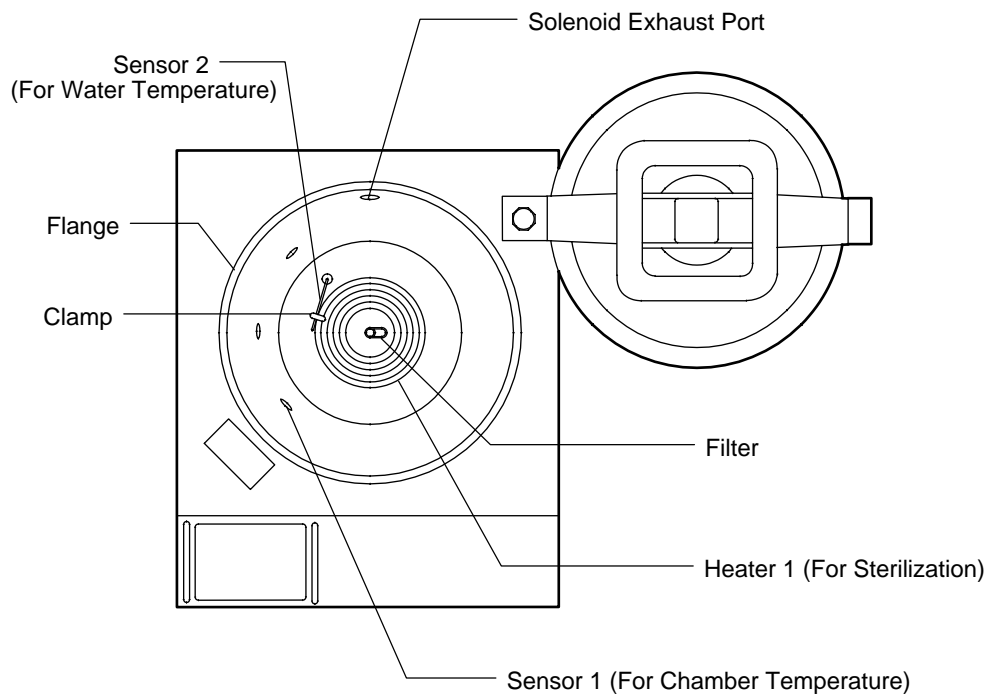
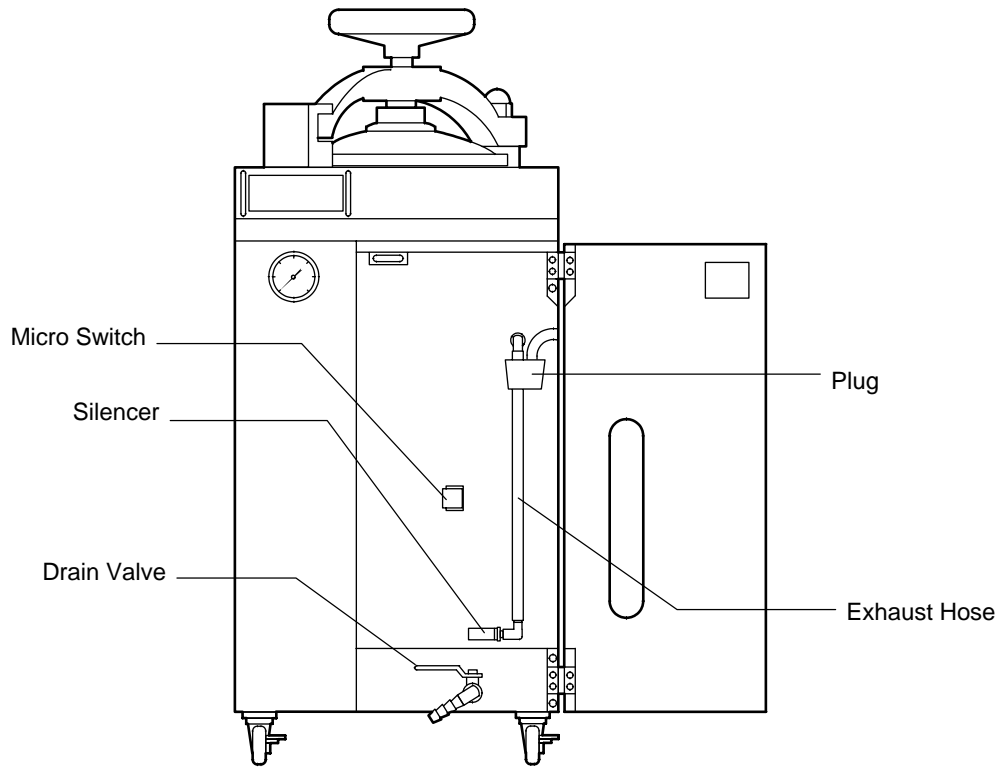
Identification of Parts

Internal



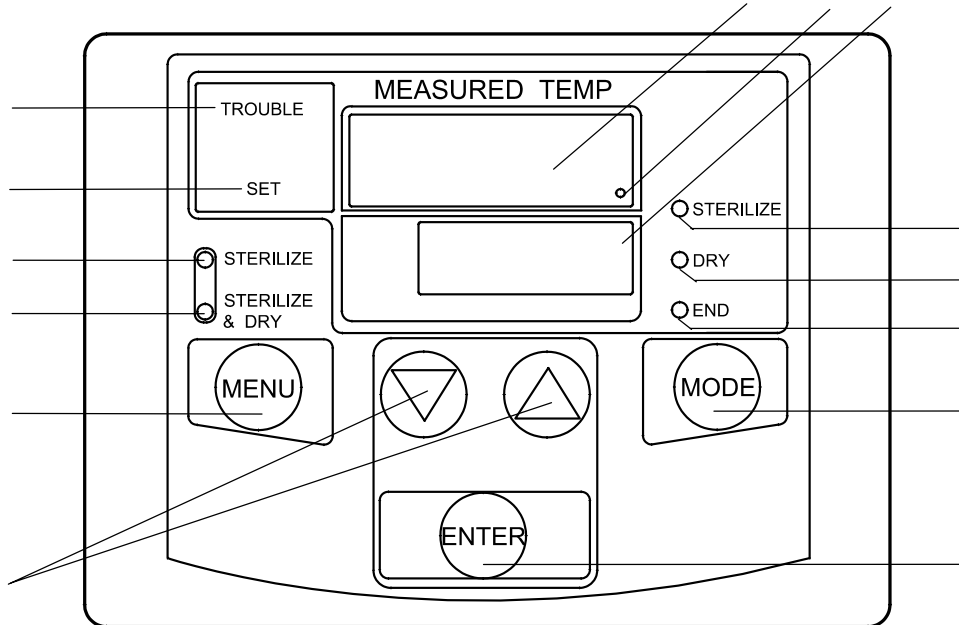
Identification of Parts

Internal



Identification of Parts

Control Panel



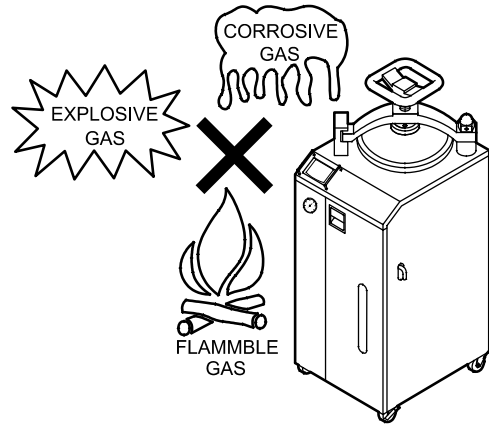
ENTER key	Start and stop operation, fix the set point/function changed.
(up down) key	Change set point/function.
MENU key	Choose "STERILIZE" or "STERILIZE & DRY" before operation.
MODE key	Use at the beginning/end to change or confirm set point/function.
Main display	Shows mainly chamber temperature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

Installation

Environmental Requirements

Area of installation

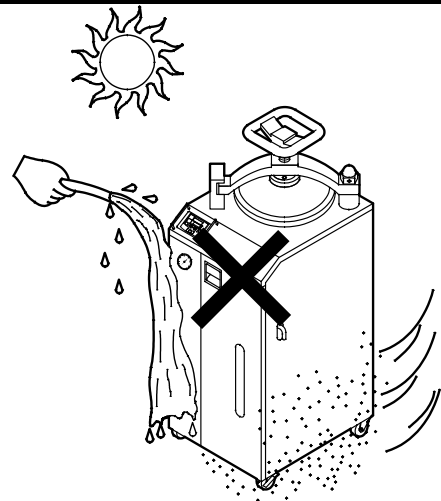
- ⊘ Never install sterilizer near any flammable, explosive, or corrosive gas components. Fire, explosion, or other troubles may occur when turning the breaker on and off.



Area of installation

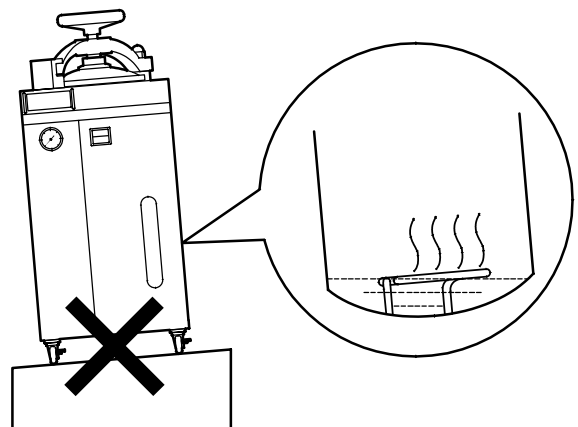
- ⊘ The sterilizer should not be installed in the following environments.

- 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

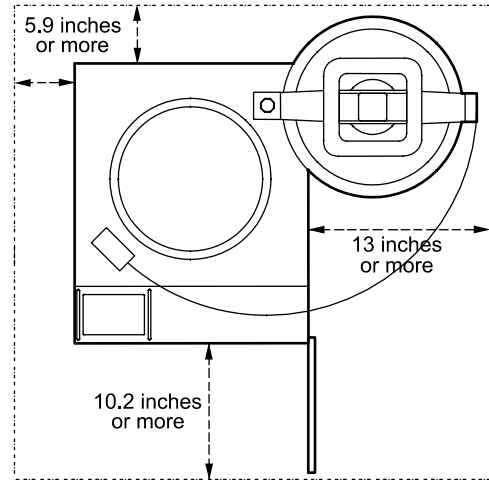
- ⚠ If the sterilizer is not on a level surface the heater will reach a high temperature causing a interruption of the operation.



Provide ample space surrounding the sterilizer

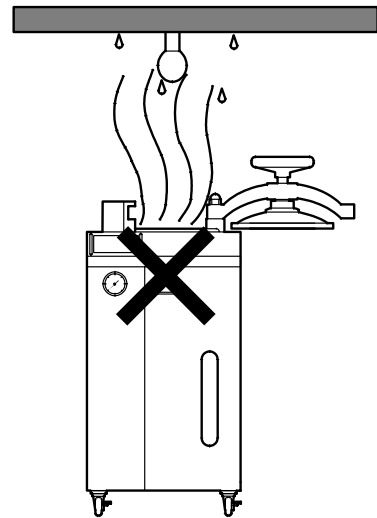
! Provide ample space surrounding the unit as indicated below.

- 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



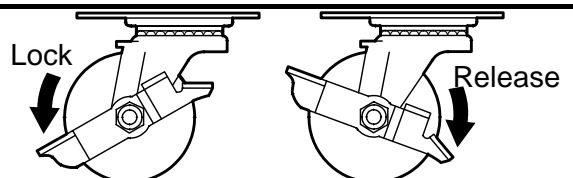
Do not install under a low ceiling

⊘ 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.



Installation

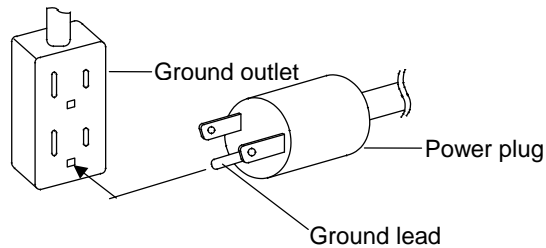
Power Requirements

Ground



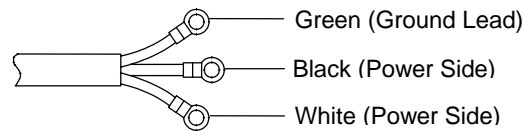
To prevent shock from electric current leak, be sure to connect the ground lead.
 Contact Yamato Scientific or an electrician if a power source with a ground terminal is needed.
 Never connect ground to with gas pipe, water pipe, telephone line, or lighting conductor.

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)

Type	Power Source	Necessary Capacity
SM200	AC115V single-phase	13A or more
SM300	AC115V single-phase	17A or more
SM310	AC220V single-phase	11A or more
SM510	AC220V single-phase	11A or more

Attaching the power cord

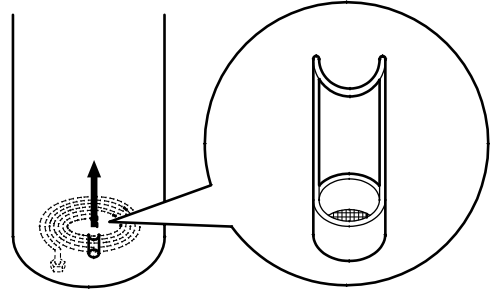


Be sure that the breaker is turned off prior to connecting the power cord. The power cord plug is not attached to the SM310 and 510. Select an adequate capacity plug and terminal according to the connecting power source.

Filter Installation



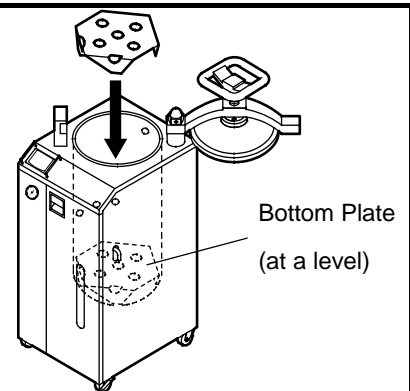
Be sure to install the filter prior to operation.



Install the bottom plate



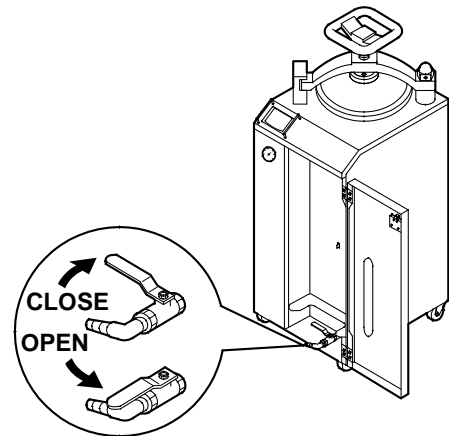
The bottom plate balances the material in the chamber and protects heater 1 and sensor 2. Be sure to install the plate.



Close the drain valve



Be sure to close the drain valve.

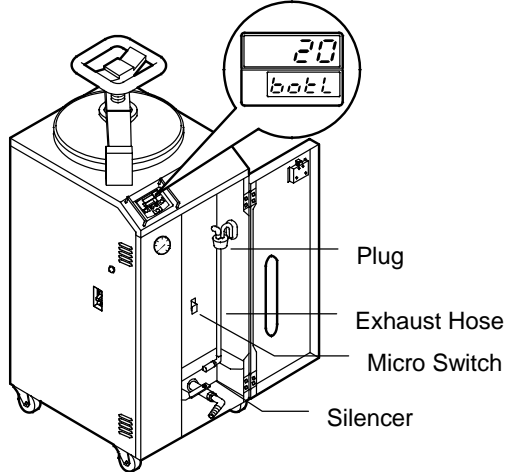


Install the bottle



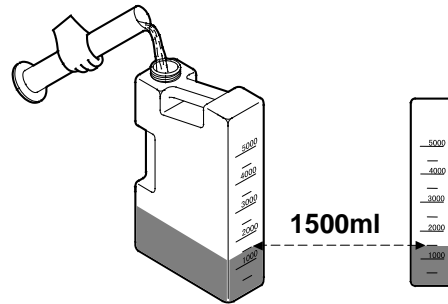
The sterilizer drains water forcibly during the "STERILIZE & DRY" process. Hot and high pressure water will spout out to the bottle. To prevent the user from operating the sterilizer without the drain bottle a micro switch will not allow the sterilizer to operate without the bottle.

Open the front door of the sterilizer and remove the bottle. The display will flash **botL** indicating the bottle is not in place.

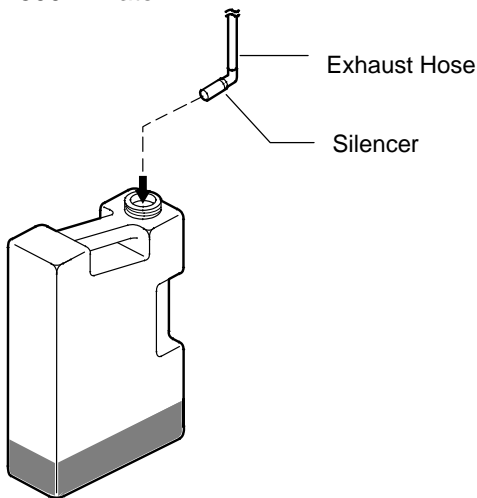


Pour 1500ml of water into the bottle. This water is used to cool the hot steam coming out of the chamber.

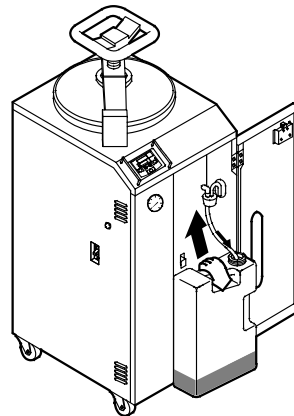
The unit drains water forcibly out of the container into the bottle during the "STERILIZE & DRY" process. If too much water is poured into the bottle, the drained hot water can overflow. Follow the water volume specified.



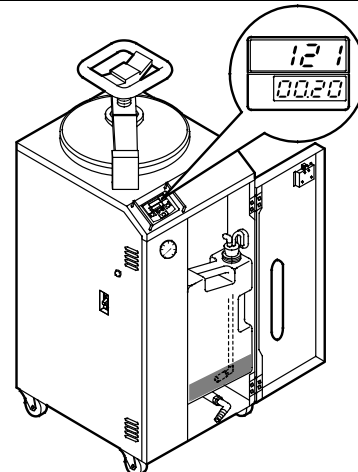
Put the silencer into the bottle that contains 1500ml water.



After the silencer is placed into the bottle, push the bottle upward, inside the door while putting the exhaust hose into the bottle.



Once the bottle is set, the micro switch is pushed, which allows the sterilizer to operate.

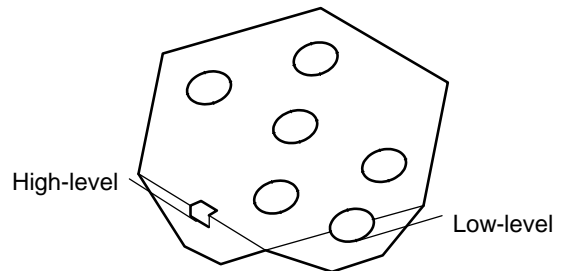


Installation

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.

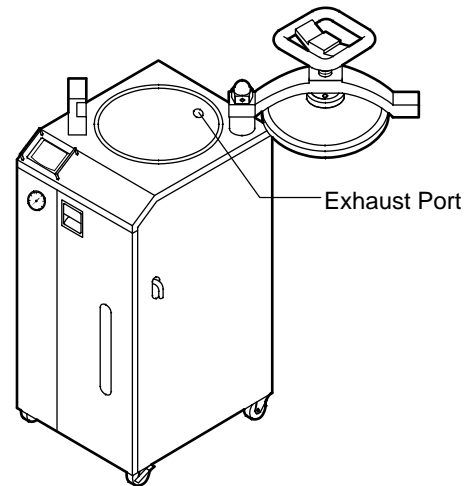
Requirement	
SM200	1900 ~ 2000ml
SM300	2800 ~ 3000ml
SM310	2800 ~ 3000ml
SM510	2800 ~ 3000ml

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.



Close the door before operation

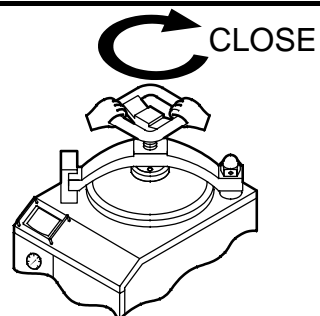


Be sure to close the front door of the sterilizer before operation. An open door may cause the bottle to fall during operation. Do not open the front door during operation.

Close the lid



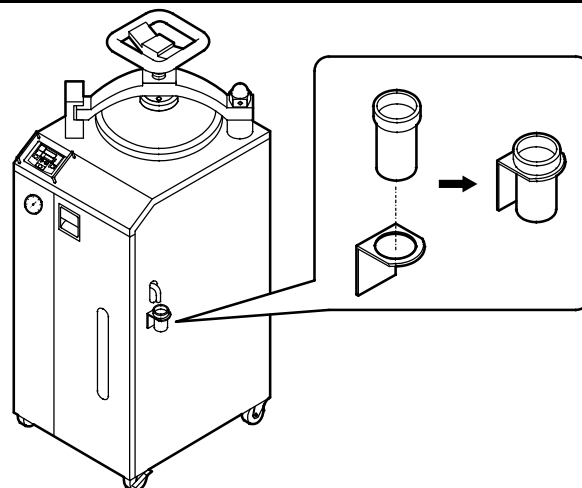
Be sure to close the lid completely by turning the handle clockwise in a 1/4-1/2 circle after it touches the chamber. If it is not closed properly, steam will escape from the chamber.



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.

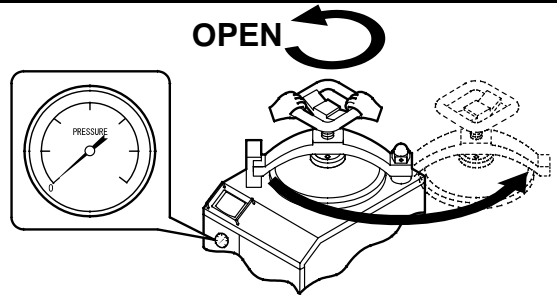


Operational Precautions

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.



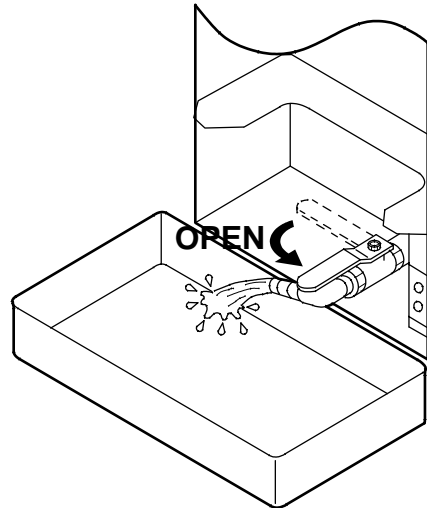
Drainage



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.



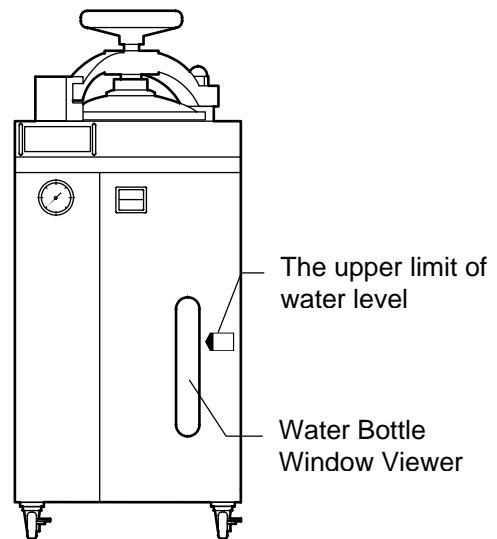
Never drain water during operation. If you open the drain valve at high pressure, hot water will spout out.



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.

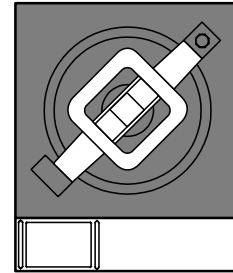


Operational Precautions

Certain areas become very hot

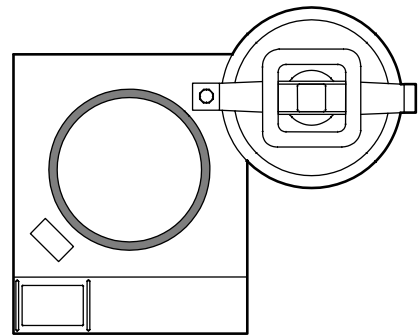
! During and following operation, the areas around the lid become very hot. Be careful not to touch these areas.

Gray areas in the illustration on the right become especially hot.



Lid gasket

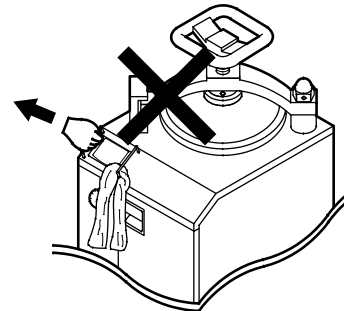
⊘ Any damage or dust on the lid gasket/flange of the chamber (gray area in illustration on right) will allow steam to escape. Be sure to keep this area clean and avoid contacting with baskets, etc. when installing or removing materials from the chamber.



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:

Sample	Temperature	Time	Notes
Gauze	121	30min.	5 dry gauze's
Petri Dish	121	40min.	30 petri dishes with lid

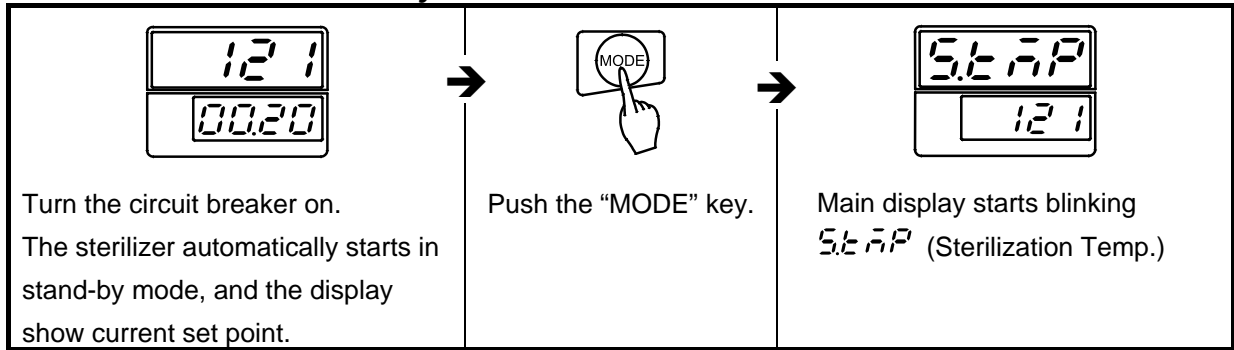
The above data is only for reference use. The outcome of sterilization varies according to quality and quantity of substance and types of containers. The result of sterilization shall be checked using a chemical indicator.

NOTE: Never operate this unit without a basket.

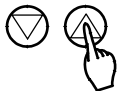
Program "MODE"

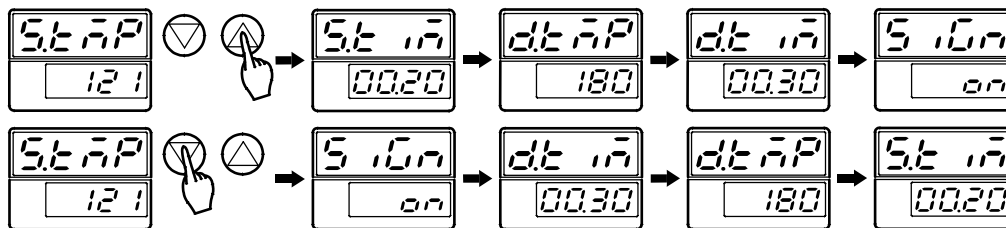
"MODE" key Information

How to use the "MODE" key



Setting other parameters

- Turn the circuit breaker on.
- Push the "MODE" key.
- Use the  keys to select desired parameter.



Program "MODE"

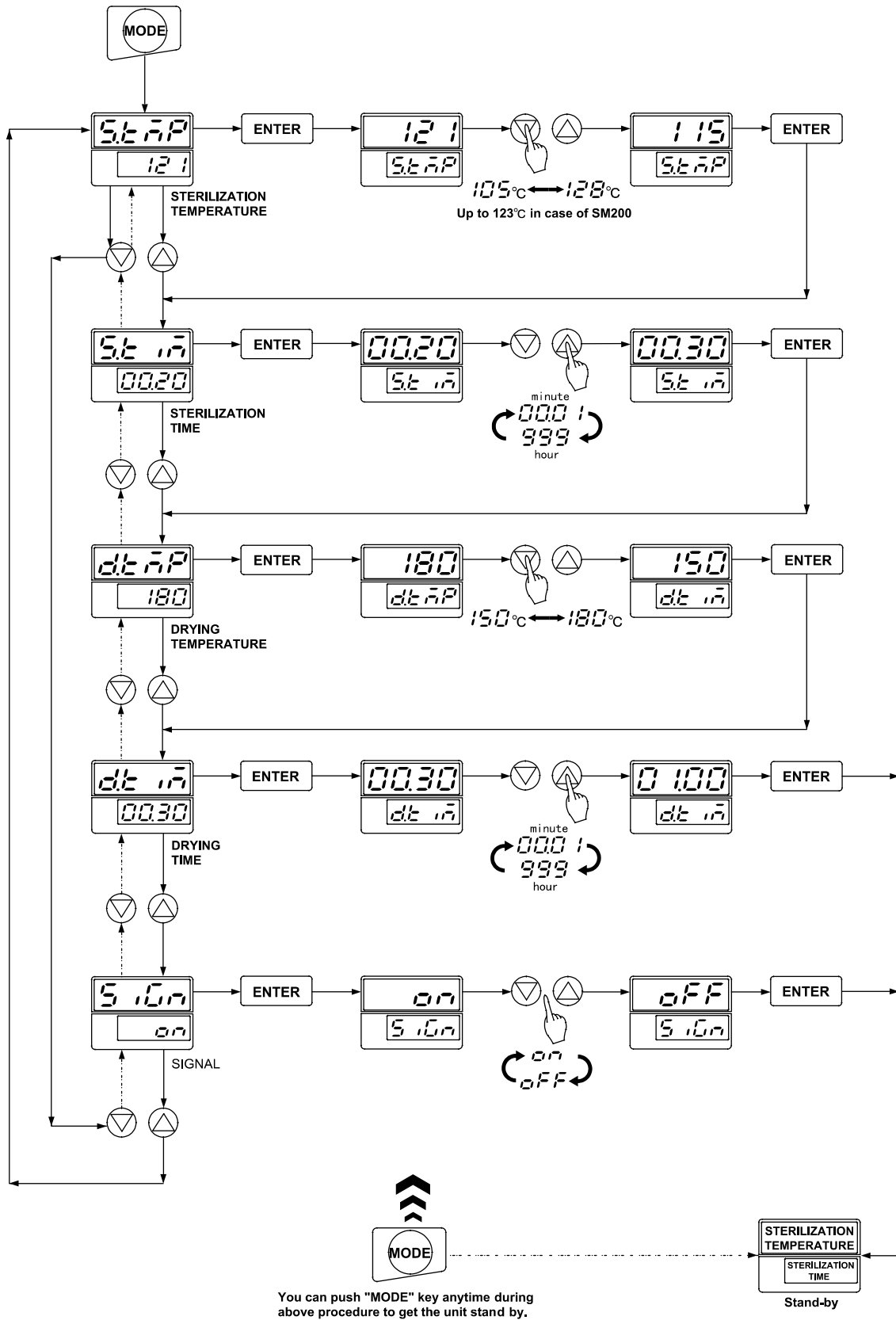
Display Symbols

List of Symbols in the display

	Symbol	Word	Meaning
B	<i>bobl</i>	BOTTLE	Bottle : Bottle isn't set.
D	<i>dtāP</i>	DRY TEMPERATURE	Function of setting drying temperature.
	<i>dt ā</i>	DRY TIME	Function of setting drying time.
E	<i>End</i>	END	End : To indicate the end of operation.
	<i>Er.**</i>	ERROR	Error : To indicate the occurrence of trouble.
O	<i>off</i>	OFF	Off : Signal function is switched off.
	<i>on</i>	ON	On : Signal function is switched on.
S	<i>StāP</i>	STERILIZE TEMPERATURE	Function of setting sterilization temperature.
	<i>St ā</i>	STERILIZE TIME	Function of setting sterilization time.
	<i>Stop</i>	STOP	Stop : To indicate operation stop.
	<i>Siā</i>	SIGNAL	Signal : Buzzer (at the end of operation)

Program "MODE"

Flowchart



Program "MODE"

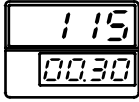
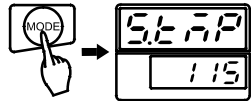
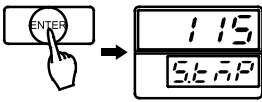
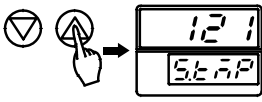
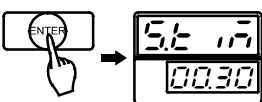
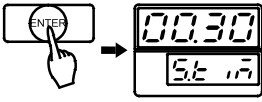
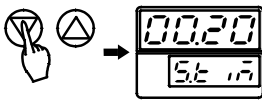
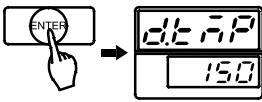
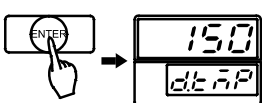
Setting Sterilization Temperature and Time

Setting sterilization temp/time

Used to set the sterilization temp/time.

Simply push the "MODE" key to cancel the set up at any point.

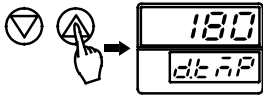
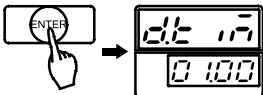
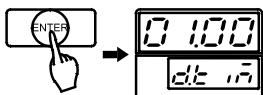
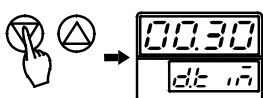
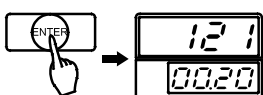
The sterilizer automatically sets in stand-by mode if it is untouched for more than a minute during set up.

Stand-by		<p>Turn the breaker on.</p> <p>The main display blinks sterilization temperature, and the sub display blinks sterilization time.</p>
S. Temp.		<p>Push the "MODE" key.</p> <p>The main display blinks 5t 115, and the sub display flashes sterilization temperature.</p>
		<p>Push the "ENTER" key. At this time, you can change the sterilization temperature.</p>
		<p>Input the sterilization temperature desired by pushing the keys.</p> <p>key...To lower temperature.</p> <p>key...To raise temperature.</p>
		<p>Push the "ENTER" key.</p> <p>The changed sterilization temperature is fixed, and the panel shows the next function, sterilization time set-up.</p>
S. Time		<p>Push the "ENTER" key again.</p> <p>You can now change the sterilization time.</p>
		<p>Input sterilization time you desire by key.</p> <p>key...To reduce time.</p> <p>key...To increase time.</p>
		<p>Push the "ENTER" key.</p> <p>The changed sterilization time is fixed, and the panel blinks the next function, dry temperature set-up.</p>
D. Temp.		<p>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.</p>

Program "MODE"

Setting Dry Temperature and Time

Dry Mode Temperature and Time

D. Temp.		<p>Input the dry temperature you desire by key.</p> <p>key...To lower temperature to 150 .</p> <p>key...To raise temperature up to 180 .</p>
		<p>Push the "ENTER" key.</p> <p>The changed dry temperature is fixed, and the panel blinks the next function, dry time set-up.</p>
D. Time		<p>Push the "ENTER" key again.</p> <p>You can now change the dry time.</p>
		<p>Input the dry time you desire by key.</p> <p>key...To reduce time.</p> <p>key...To increase time.</p>
		<p>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.</p>

Program "MODE"

Special Program Features

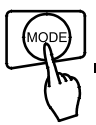
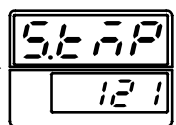
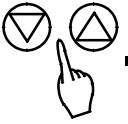
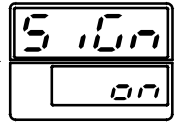
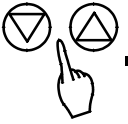
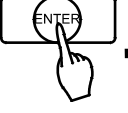
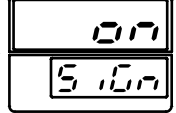
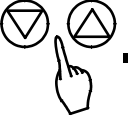
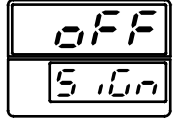
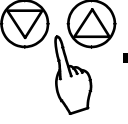
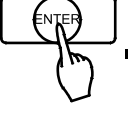

Buzzer

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"

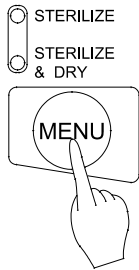
		<p>Push the "MODE" key. The main display blinks <i>StAP</i>, and the sub display blinks sterilization temperature.</p>
		<p>Push either the  keys to search the panel display(illustrated on left) to the desired setting..</p>
		<p>Push the "ENTER" key. The panel display changes places and the setting can be changed.</p>
		<p>Push either  keys to display your selection.</p>
		<p>Push the "ENTER" key. The change on signal is fixed, and the panel display returns to stand by.</p>

Run "MENU"

Selection of Operation

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.

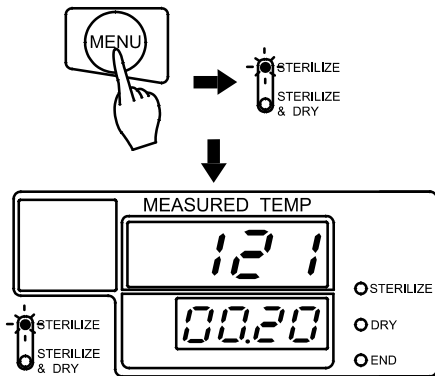
Run "MENU" "STERILIZE" Procedure

"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

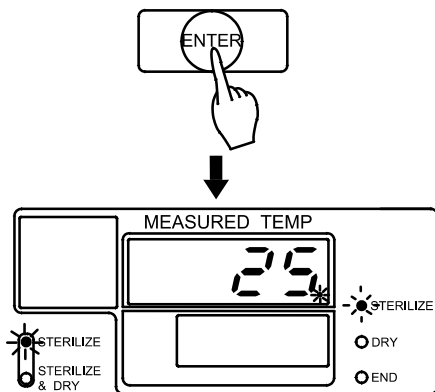


Turn on the main circuit breaker (located on the left side of the unit).

Push the "MENU" key and select "STERILIZE".
(See P28)

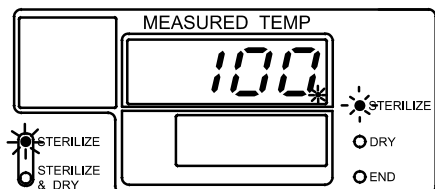
Set the sterilization temperature and time as you desire.
(See P25)

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



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)

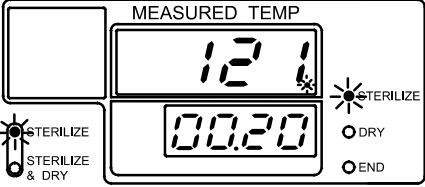
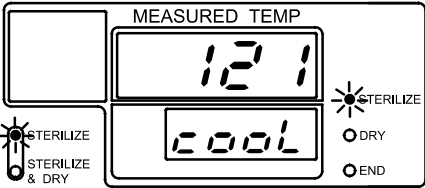
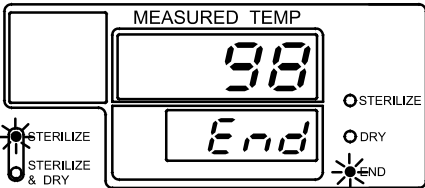
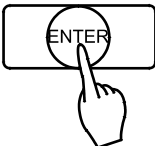
The main display shows water temperature and heater lamp.
The sub display goes off.
Sterilize lamp comes on and off.
Sterilize menu lamp blinks.



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.

Run "MENU" "STERILIZE" Procedure

	<p>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.</p> <p>The main display shows chamber temperature. The sub display shows the remaining sterilization time. Sterilize lamp is lit. Sterilize menu lamp is lit.</p>
	<p>Natural cooling begins when the set sterilization time is complete. At this time, the heater will automatically shut off.</p> <p>The main display shows chamber temperature. The sub display blinks <i>COOL</i>. Sterilize lamp is lit. Sterilize menu lamp is lit.</p>
	<p>To prevent bumping, the solenoid exhaust valve opens once the chamber temperature drops below boiling point.</p> <p>The main display shows chamber temperature. The sub display shows <i>End</i>. End lamp is lit. Sterilize menu lamp is lit.</p>
	<p>Push the "ENTER" key. The "ENTER" key resets the microprocessor. You may now run another cycle.</p>

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

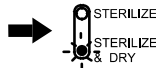
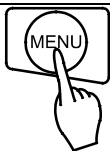
Is the bottle set? Pg.16

Is water in chamber? Pg.17

Is the lid 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.



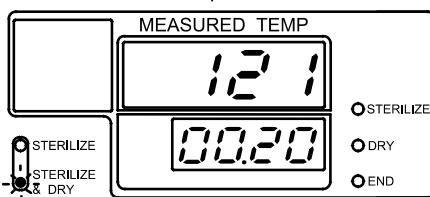
Turn on the main circuit breaker.

Push the "MENU" key to select "STERILIZE & DRY".

(See P28)

Set the temperature and time you desire.

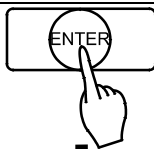
(See P25 and 26)



The main display blinks the set temperature.

The sub display blinks the set time.

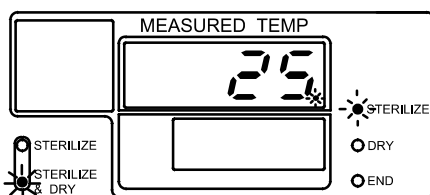
Sterilize & Dry menu lamp blinks.



Push the "ENTER" key.

Operation begins. The sterilization heater turns on.

The solenoid exhaust valve remains open to exhaust air from the chamber.

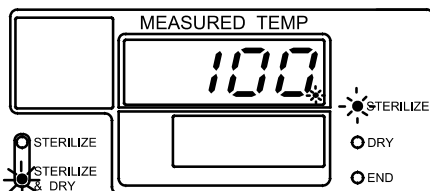


The main display shows water temperature.

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)

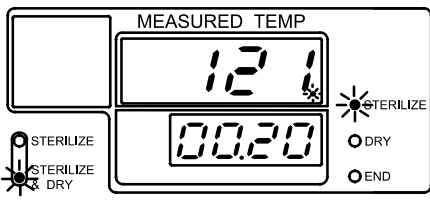
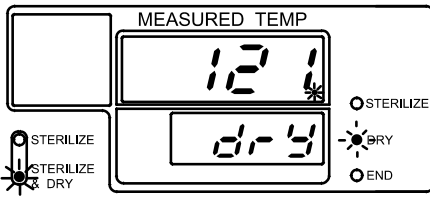
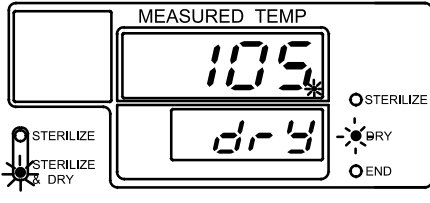
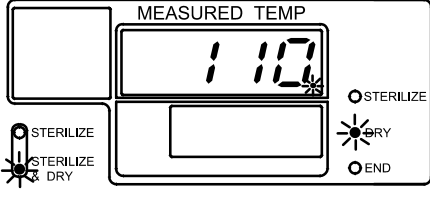
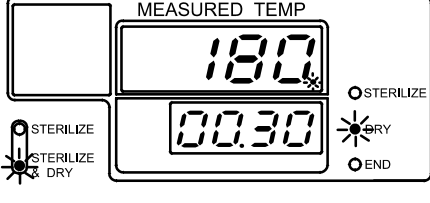
The main display shows chamber temperature.

Sterilize lamp blinks.

Sterilize & Dry menu lamp is lit.

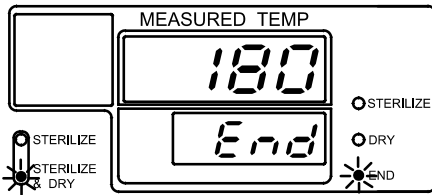
Run "MENU"

"STERILIZE & DRY" Procedure

	<p>After chamber temperature reaches the set temperature, sterilization process starts. The sub display shows the sterilization time.</p> <p>The main display shows chamber temperature.</p> <p>The sub display shows the remaining sterilization time.</p> <p>Sterilize lamp blinks.</p> <p>Sterilize & Dry menu lamp is lit.</p>
	<p>When the sterilization time is complete. The solenoid drain valve opens and drains all water and the dry heater turns on.</p> <p>The main display shows chamber temperature.</p> <p>The sub display blinks <i>dry</i>.</p> <p>Dry lamp blinks.</p> <p>Sterilize & Dry menu lamp is lit.</p>
	<p>When forced drainage ends, the solenoid drain valve is closed. The solenoid exhaust valve opens to exhaust air out of the chamber.</p> <p>The main display shows chamber temperature.</p> <p>The sub display blinks <i>dry</i>.</p> <p>Dry lamp blinks.</p> <p>Sterilize & Dry menu lamp is lit.</p>
	<p>After the air exhausted out of the chamber the dry heater raises the chamber temperature.</p> <p>The main display shows chamber temperature.</p> <p>The sub display goes off.</p> <p>Dry lamp is lit.</p> <p>Sterilize & Dry menu lamp is lit.</p>
	<p>Drying process starts when the chamber temperature reaches to temperature, which is less than 4 degrees C from the set temperature.</p> <p>The main display shows chamber temperature.</p> <p>The sub display shows the remaining time.</p> <p>Dry lamp is lit.</p> <p>Sterilize & Dry menu lamp is lit.</p>

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.

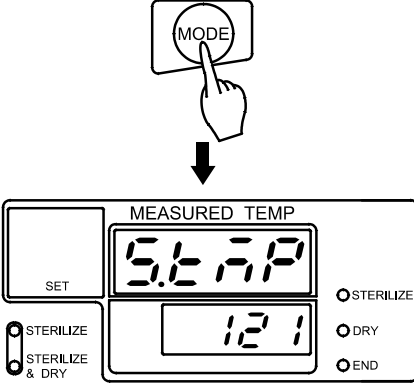
Since the bottle contains hot water after operation, wait for the water to cool before draining it.

Special Control Functions

View Parameter during Operation

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.

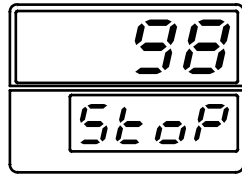
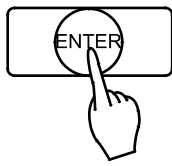
The main display blinks *5.67P* (set Temp).
The sub display shows the set temperature.
Set lamp is lit.

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.

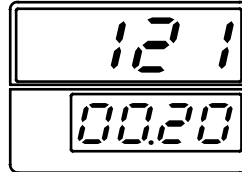
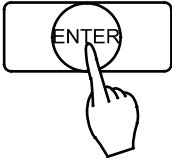
To end the function, push the "MODE" key. The display returns to the original state.

Special Control Functions

Interrupt Program during Operation



Push the "ENTER" key.
Operation is interrupted. Steam will exhaust when pressurized.
The main display shows current chamber temp.
The sub display blinks *Stop*.



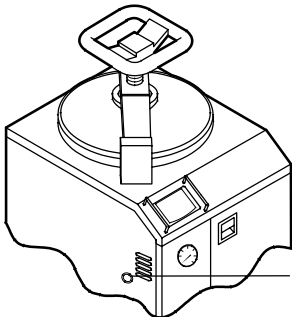
Push the "ENTER" key **twice** to resume operation.
The main display blinks the set temperature.
The sub display blinks the set time.

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



Pressure Relief switch

Push the Pressure Relief Switch.

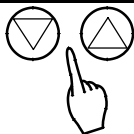
By pushing this switch, open the solenoid exhaust valve opens. Steam inside the chamber is exhausted into the bottle, decreasing the chamber pressure and temperature.

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

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

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

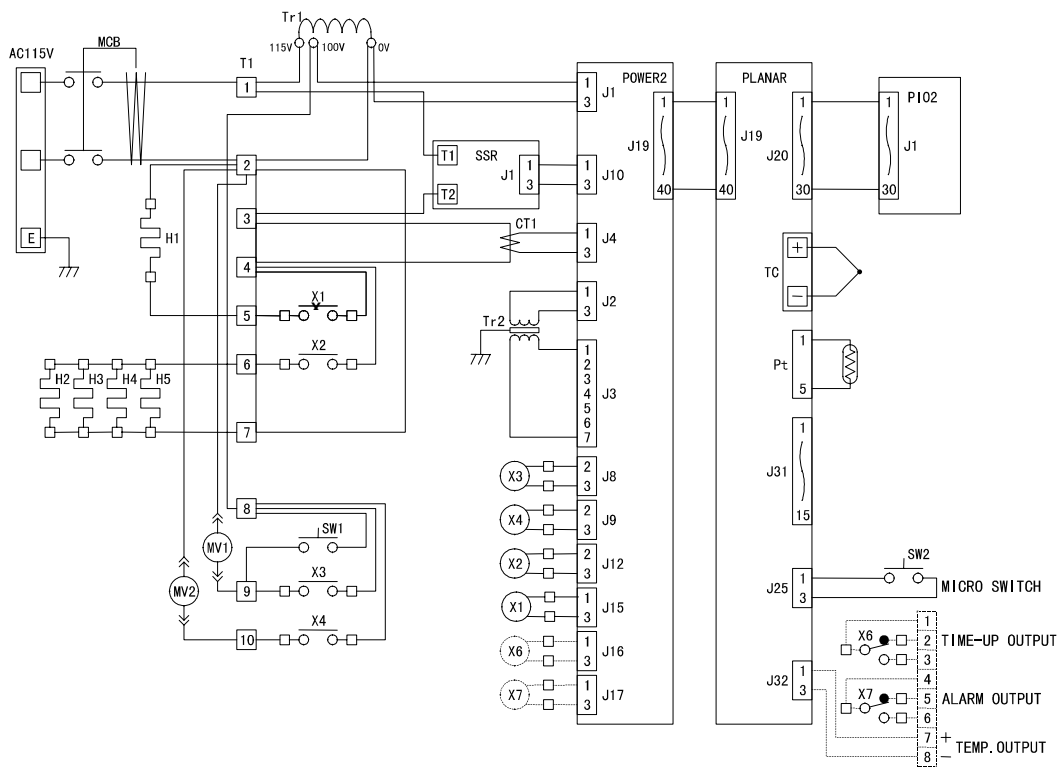
Problem Solving Chart

Fault Indication	Check Points
Display does not come up when the breaker is turned on	<ul style="list-style-type: none"> • 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.	<ul style="list-style-type: none"> • 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.	<ul style="list-style-type: none"> • Is the filter clogged?
Sterilization temperature does not go up. The pressure does not increase.	<ul style="list-style-type: none"> • Is the lid securely closed? • Is the packing or flange damaged?
The pressure increases when the solenoid valve is not closed.	<ul style="list-style-type: none"> • Is the exhaust vent clogged?
The temperature changes during operation.	<ul style="list-style-type: none"> • Is there considerable changes of the outside temperature?
Steam spouts rapidly.	<ul style="list-style-type: none"> • Is there water in the bottle? • Is the exhaust hose out of place or damaged?
Water leaks.	<ul style="list-style-type: none"> • Is the drain valve securely closed? • Is there too much water in the bottle?
The operation does not start from stand-by.	<ul style="list-style-type: none"> • Is bottle installed?
Noise during air purge is loud.	<ul style="list-style-type: none"> • Is the silencer out of place?

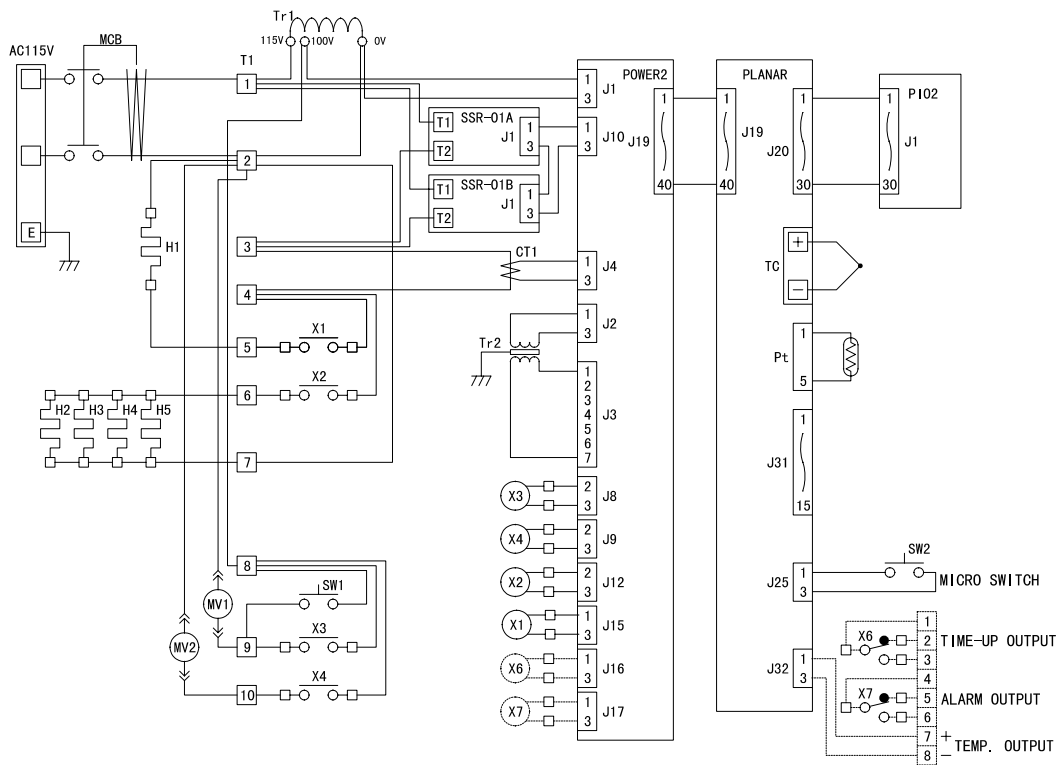
If you require further technical assistance, please call Yamato Scientific at (800) 292-6286 Ext. 235

Wiring Diagram

SM200



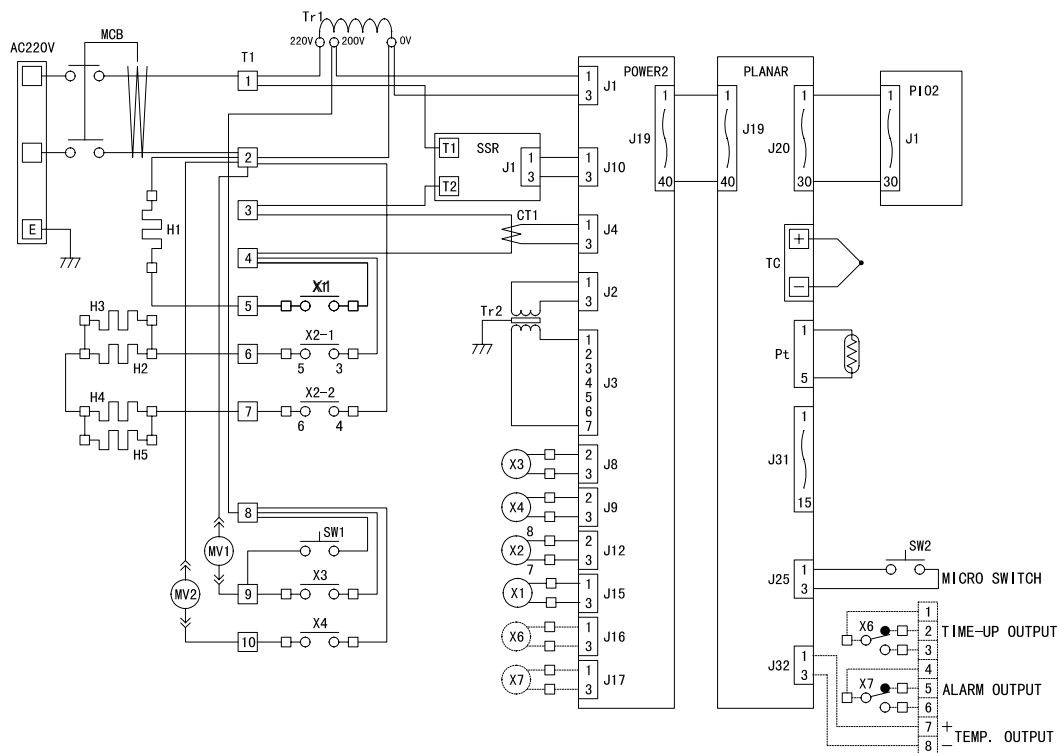
SM300



Inside of dashed line is option

Wiring Diagram

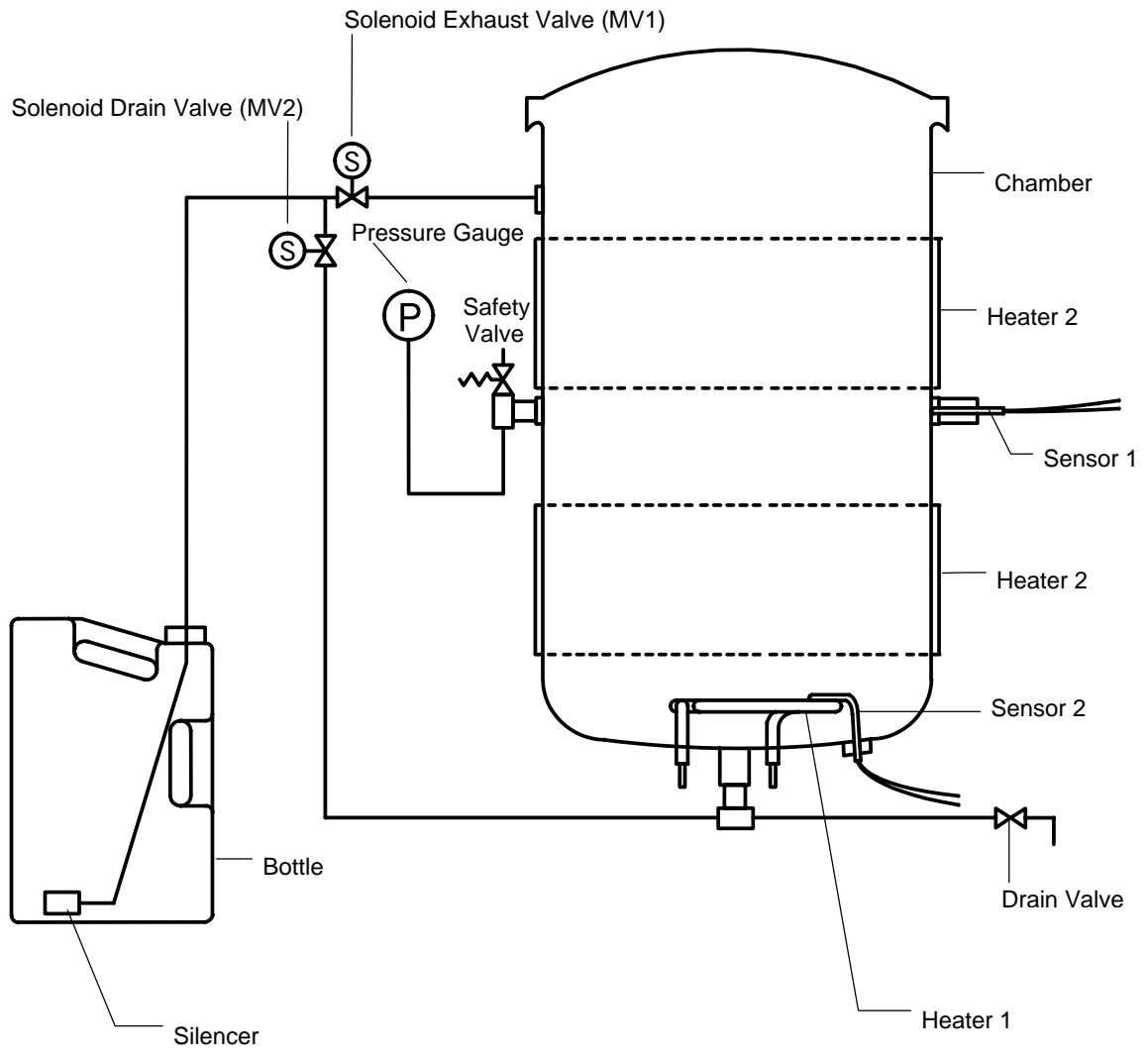
SM310/510



Inside of dashed line is option

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

Piping Chart



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.

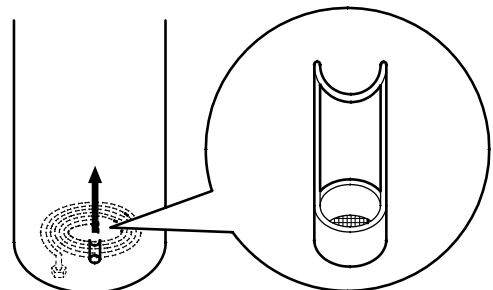
Weekly Maintenance

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

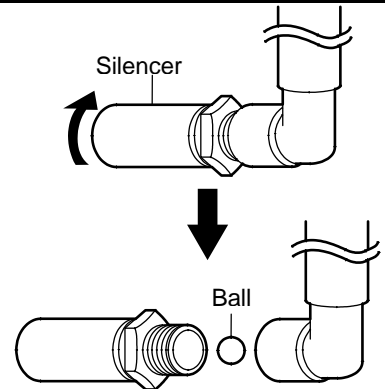
- ! The pipe heater should be cleaned twice a month.
Accumulation of scale build up results in poor heat transfer and high sheath temperatures.

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.



After Sale Service and Warranty

Request for Repair

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	}	See the warranty or nameplate on the unit
Serial Number		
Date of Purchase		
Distributor Name		
Information on difficulties		

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

Part Name	Part No.	Specifications
Planar Board	1-24-000-0059	CR
PIO Board	1-24-000-0028	FR
Power Board	1-24-000-0026	CR
SSR1 (SM300)	2-16-000-0020	YLT-SSR-01A
SSR2 (SM300)	2-16-000-0021	YLT-SSR-01B
SSR (SM200/310/510)	2-16-000-0010	YLT-SSR-01
CPU	1-18-001-0006	
Transformer(Tr1; SM200/300)	2-18-000-0035	AD21-100A 115V
Transformer(Tr2; SM200/300)	2-18-000-0022	AC100V
Transformer(Tr1; SM310/510)	2-18-000-0035	AD21-100A 220V
Transformer(Tr2; SM310/510)	2-18-000-0023	AC200V
Relay (SM200/310/510)	2-05-000-0031	LY2F-DC12V
Relay (SM300)	2-05-000-0019	HE1a-DC12V
Relay	2-05-012-0001	JR1aF-TM-DC12V
Stick Keypad	SM51A-30490	W467
Current Transformer	2-17-001-0002	URP CTL-6-5-400
Pressure Relief Switch	2-01-001-0014	A2A-4W
Circuit Breaker (SM200/310/510)	2-06-001-0003	BS2021
Circuit Breaker (SM300)	2-06-001-0004	BS2022
Heater 1 (SM200)	2-24-000-0057	AC115V 1.3kw
Heater 1 (SM300)	2-24-000-0058	AC115V 1.7kw
Heater 1 (SM310/510)	2-24-000-0059	AC220V 2.0kw
Heater 2 (SM200)	2-26-000-0003	AC115V 500W
Heater 2 (SM300/310/510)	2-26-000-0004	AC115V 750W
Sensor 1	1-16-003-0035	Pt100 Resistance Thermometer Sensor
Sensor 2	1-16-003-0034	T type Thermometer
Solenoid Exhaust Valve (SM200/300)	3-02-001-0016	AB41-02-7-C4A PT1/4 AC100V CKD
Solenoid Exhaust Valve (SM310/510)	3-02-001-0017	AB41-02-7-C4A PT1/4 AC200V CKD
Solenoid Drain Valve (SM200/300)	3-02-001-0016	AB41-02-7-C4A PT1/4 AC100V CKD
Solenoid Drain Valve (SM310/510)	3-02-001-0017	AB41-02-7-C4A PT1/4 AC200V CKD
Micro Switch	2-02-001-0005	ABV163661
Safety Valve (SM200)	3-18-001-6003	M3D-B1.6 ± 0.2Kgf/cm ²
Safety Valve (SM300/310/510)	3-18-001-6002	M3D-B2.0 ± 0.2Kgf/cm ²
Plug	SM500-30280	
Silencer	SM500-30340	
Lid Gasket (SM200)	241022-180	SH75UN
Lid Gasket (SM300/310/510)	241024-180	SH75UN
Bottom Plate (SM200)	SM200-30750	
Bottom Plate (SM 300/310/510)	SM500-30750	
Filter	SM500-30700	
Drain Valve	3-15-0003-6002	Type BSB PT3/8
Mesh	(WG)253003-172-2	
Bottle	7-26-000-0006	5000cc
Pressure Gauge	5-05-000-0002	GS58-201

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.

Note

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

Instruction Manual for
High Pressure Steam Sterilizer
Model SM200/300/310/510
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