

OPERATOR'S MANUAL

AUTOCLAVE

SX-300

SX-500

SX-700

- Before starting operation, read this manual thoroughly for a complete understanding of the autoclave and its correct operation.
- Carefully store this operation manual conveniently to hand so that the operator can consult it at any time.

FOR RESEARCH USE

TOMY

TABLE OF CONTENTS

1. FOR SAFE OPERATION·····	P.2	6. CONVENIENT FUNCTIONS·····	P.33
2. EXPLANATION OF THE AUTOCLAVE·P.7		6-1.Liquid sterilization function·····	P.33
2-1.Operating Principle·····	P.7	6-2.Sterilizing-warming function·····	P.34
2-2.Name and function of each·····	P.8	6-3.Heating-warming function·····	P.35
3. INSTALLATION·····	P.16	6-4.Memory function·····	P.35
3-1.Method of movement and installation·P.16		6-5.Timer function·····	P.36
3-2.Power supply connection and protective grounding (earthing)·····	P.18	6-6.Checking function·····	P.36
4. FLOW OF OPERATION·····	P.19	6-7.Setting the temperature which releases the interlock of the chamber lid·····	P.37
5. OPERATING PROCEDURES·····	P.20	6-8.Setting the warming time·····	P.37
5-1.Turning ON/OFF the power supply switch·····	P.20	6-9.Setting the time display form·	P.38
5-2.Opening/closing the chamber lid·	P.21	6-10.Setting the exhaust mode for liquid sterilization operation·····	P.38
5-3.Checking the pressure gauge·	P.23	7. OPTIONAL FUNCTIONS·····	P.39
5-4.Checking the volume of water in the exhaust bottle·····	P.24	7-1.Temperature sensor for materials to be sterilized·····	P.40
5-5.Checking sterilizing water·····	P.25	7-2.Data output function (temperature/ pressure)·····	P.41
5-6.Placing articles to be sterilized·	P.26	7-3.External temperature sensor/recorder·	P.42
5-7.Setting operating conditions·	P.28	8. PREVENTIVE MAINTENANCE·	P.43
5-8.Starting operation·····	P.29	8-1.Cleaning and disinfecting the main unit·	P.43
5-9.Operation completion·····	P.30	8-2.Preventive maintenance to be carried out every week·····	P.44
5-10.Removing sterilized articles·	P.31	8-3.Replacing the chamber lid gasket·	P.46
5-11.Draining sterilizing water·····	P.32	9. WHEN A MALFUNCTION IS SUSPECTED·	P.49
		9-1.Problems and countermeasures·	P.49
		9-2.Error code table·····	P.50
		9-3.Contact addresses of business institutions·	P.52
		10. SPECIFICATIONS·····	P.53

1. FOR SAFE OPERATION

During operation of the autoclave, the inside is subjected to high temperature and pressure. Should the autoclave be installed or operated incorrectly, there is danger of death or serious injury to staff, including the operator and personnel in the vicinity. Severe damage to other equipment near to the autoclave could occur. Before commencing operation, read this operation manual thoroughly for a complete understanding.



● Explanation of safety indications

In this manual, pictorial indications are used to ensure safe operation of the autoclave.

Safety indications are classified into "Warnings" and "Cautions" depending on the level of potential injury to personnel or equipment.

⚠WARNING	Indicates that misuse may cause death or serious injury.
⚠CAUTION	Indicates that misuse may cause injury or physical damage.

<Pictorial symbols>

	Indicates prohibition (actions which must not be carried out). Specific contents are indicated using a picture or sentence near the symbol.
	Indicates enforcement (actions that shall be carried out). Specific contents are indicated using a picture or sentence near the symbol.

⚠WARNING
<div style="display: flex; align-items: center; margin-bottom: 10px;"> <p>DO NOT OPEN DRAIN VALVE DURING OPERATING.</p> </div> <p>DO NOT TOUCH TO AVOID THE BURN. Leave the autoclave longer than for two hours after operating for draining.</p>

⚠CAUTION
<div style="display: flex; align-items: center; margin-bottom: 10px;"> <p>DO NOT GET NEAR TO THE AUTOCLAVE DURING OPERATING.</p> </div> <p>Do not get near within 50cm from each side of autoclave to avoid the burn during operating.</p>

WARNING



Do not modify the autoclave or any associated parts.

Contravention is dangerous with likelihood of serious accident or malfunction.



Do not use parts other than those specified by our company.

Contravention is dangerous with likelihood of serious accident or malfunction.



Do not allow foreign matter to enter the internal parts of the autoclave.

Contravention is dangerous with likelihood of electric leakage, fire, or malfunction. These may occur when metal fittings, flammable material, or water enter via the air intake or exhaust openings.



Do not open the outer panel.

Contravention is dangerous with likelihood of electric shock, burns, fire, or malfunction when the internal parts are touched.



Do not touch the power plug with wet hands.

Contravention is dangerous with likelihood of electric shock when the power cable is contacted by wet hands.



Do not operate the autoclave when the power cable or plug is damaged or when the plug is not firmly connected to the outlet.

Contravention is dangerous with likelihood of fire, electric leakage, or breakdown due to ignition.



Do not permit the power cable to be caught under heavy equipment.

Contravention is dangerous with likelihood of fire, electric leakage, or breakdown due to ignition.



Do not use power cable extensions.

Contravention is dangerous with likelihood of fire, electric leakage, or breakdown due to ignition.



Do not pull by the cord.

Contravention is dangerous with likelihood of fire, electric shock or injury to persons due to deterioration of insulation.



Unplug the power plug from the outlet when the autoclave is not to be used for a prolonged time.

Contravention is dangerous with likelihood of electric shock/leakage or fire due to deterioration of insulation. For models with which a power plug is not provided, turn OFF the breaker to which the power cable is connected.



Do not install the autoclave in a place where chemicals such as flammable or corrosive gases are stored.

Contravention is dangerous with likelihood of fire or electric leakage and shock due to corrosion of electrical parts.



Do not install the autoclave in a dusty or wet place.

Contravention is dangerous with likelihood of short circuit or ignition of electrical parts.



Do not install the autoclave near a sink or water pipe or any place where spillage of water is likely.

Contravention is dangerous with likelihood of electric leakage or shock.



Install the autoclave on a firm and level surface such as a concrete floor.

Contravention is dangerous with likelihood of injury or physical damage should the autoclave fall.



Connect the power plug singly to the specified power supply.

Contravention is dangerous with likelihood of fire, electric leakage, or breakdown due to ignition.

WARNING



Be sure to provide protective grounding.

Contravention is dangerous with likelihood of explosion, electric shock, or malfunction.



Do not use a gas pipe or water pipe etc. for protective grounding.

Contravention is dangerous with likelihood of explosion, electric shock, or malfunction.



Do not touch the power supply switch with wet hands.

Contravention is dangerous with likelihood of electric shock.



Do not open the chamber lid until the pressure falls to 0 MPa.

Contravention is dangerous with likelihood of death or serious accident due to blowout from sterilized articles or steam when the lid is opened while raised pressure remains.



When the pressure gauge is not working normally, cease operation.

Contravention is extremely dangerous because any abnormality of the inside of the chamber cannot be detected. Contact the dealer or business institution of our company.



Be extremely careful of steam emanating from the inside of the chamber when opening the chamber lid.

Contravention is dangerous with likelihood of scalds or injury because steam emanating from the inside of the chamber has an extremely high temperature.



Do not bend the exhaust hose.

Contravention is dangerous with likelihood of damage to parts and burns, injury, or serious accident due to explosive breakage because the pressure will rise abnormally when exhaustion is not carried out smoothly.



Do not sterile sealed articles.

Contravention is dangerous with likelihood of burns or serious accident due to explosive breakage during removal of articles. In addition, contravention is dangerous with likelihood of damage to parts, or burns or serious accident due to explosive breakage because the pressure in the chamber may rise abnormally.



Do not sterilize glass equipment having cracks or scratches.

Contravention is dangerous with likelihood of burns or serious accident due to blowout during removal of equipment.



Do not block the hole in the inside of the chamber with articles to be sterilized.

Contravention is dangerous with likelihood of serious accident such as blowout from the chamber because the pressure in the chamber cannot be controlled when the exhaust hole in the inside of the chamber is blocked by articles to be sterilized such as a sterilizing bag. Make sure that articles to be sterilized are placed in the basket provided etc. so that the vicinity of the hole is not blocked.



Stop operation immediately when the pointer of the pressure gauge reads above the red line during operation.

Contravention is dangerous with likelihood of damage to parts and burns or serious accident due to explosive breakage. Stop operation immediately and contact the dealer or business institution of our company.



Do not obstruct the vicinity of the safety valve during operation.

Do not block the safety valve hole. Contravention is dangerous with likelihood of serious accident such as blowout from the chamber because the pressure in the chamber cannot be controlled.

WARNING

Be careful of high-temperature liquid because it may boil suddenly.

The temperature of liquid falls more slowly than that of the chamber and liquid may boil as a result of a trigger such as physical shock. When liquid is not dealt with carefully, there is likelihood of scalds or unexpected accident.

Do not operate the autoclave with flammable or explosive articles in place.

Contravention is dangerous with likelihood of fire or explosion.

Do not leave contamination in the inside of the chamber or sterilizing water.

Contravention is dangerous with likelihood of corrosion or damage of the chamber. In addition, the water level sensor may malfunction and cause deterioration of the empty heating prevention function, which may result in fire in case of empty heating.

Before carrying out preventive maintenance work, remove the power plug of the autoclave from the outlet.

Contravention is dangerous with likelihood of electric shock. For models with which a power plug is not provided, turn OFF the breaker to which the power cable is connected.

Stop operation when corrosion, damage, or deformation is found in the chamber, chamber lid, hinges, hinge shafts, cover rings, lid hooks, or lid hook catches.

Contravention is dangerous with likelihood of death or serious accident due to blowout during rise of the pressure. When an abnormality is found, contact the dealer or business institution of our company.

Stop operation when damage such as cracks or deformation is found in the chamber lid gasket.

Contravention is dangerous with likelihood of scalds due to steam leakage. When an abnormality is found, contact the dealer or business institution of our company.

Unplug and check the power plug regularly.

Failure to do so may cause a fire or burnout.

After replacing the chamber lid gasket, be sure to make a test run.

Make sure the chamber lid gasket is properly replaced. Failure to do so may cause burns as the unexpected hot steam is escaping through the lid.

When returning the autoclave or its parts, or requesting repairs, disinfect the autoclave or parts whenever condition 1 or 2, given below, applies.

- 1: When the autoclave or any part of the autoclave has been subjected to infectious and dangerous material or radioactive material.
- 2: When blood or other chemicals have pooled in the autoclave or any part of the autoclave, of a type judged to be dangerous to personnel.

CAUTION



Do not place the hands on the top plate.

Contravention is dangerous with likelihood of injury because hands may be caught by the chamber lid.



Drain water after sterilizing water cools down sufficiently.

Contravention is dangerous with likelihood of scalds because the sterilizing water is heated immediately after operation.



Carry out preventive maintenance work only after the temperature in the chamber has fallen sufficiently.

Contravention is dangerous with likelihood of burns due to high temperature.



Be careful of steam coming from the vicinity of the steam exhaust opening during operation.

Contravention is dangerous with likelihood of scalds due to high temperature.



Be careful of steam coming from the vicinity of the safety valve during operation.

Contravention is dangerous with likelihood of scalds due to high temperature.



Handle the spring band of the gasket gland with extra care since the elastic force may cause unexpected injuries.

Be sure no other people are in the immediate vicinity when handling the spring band.

2. EXPLANATION OF THE AUTOCLAVE

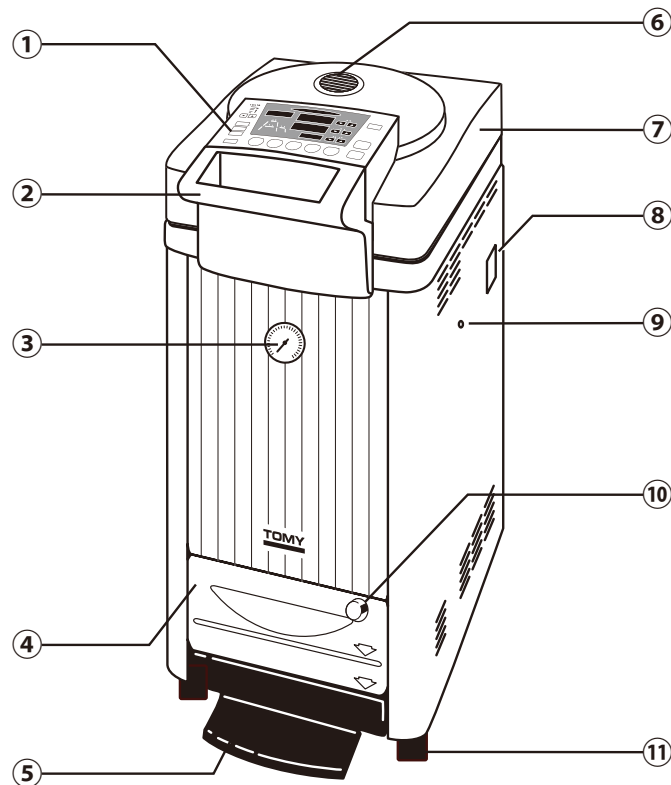
The high-pressure steam sterilizer is a autoclave used for sterilizing articles with saturated steam under a pressure which is higher than atmospheric pressure.

2-1. Operating Principle

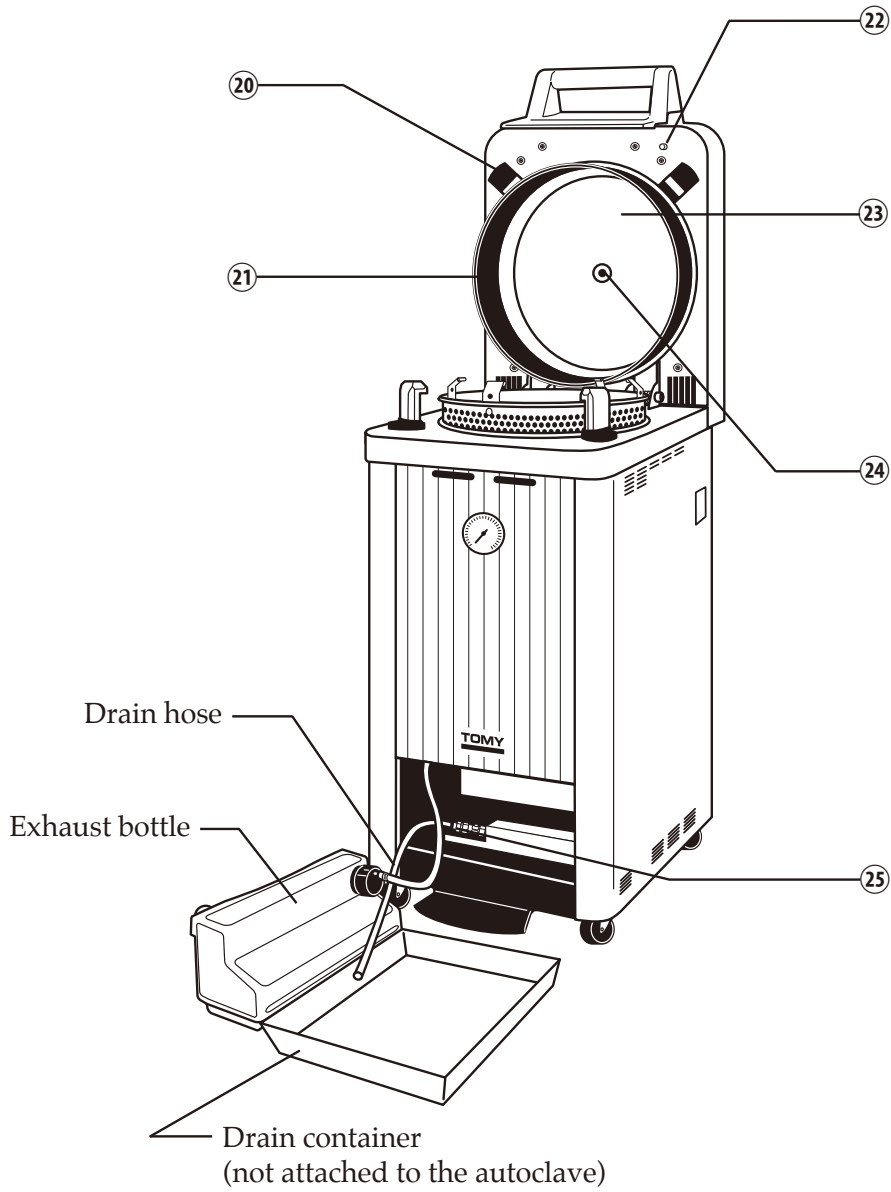
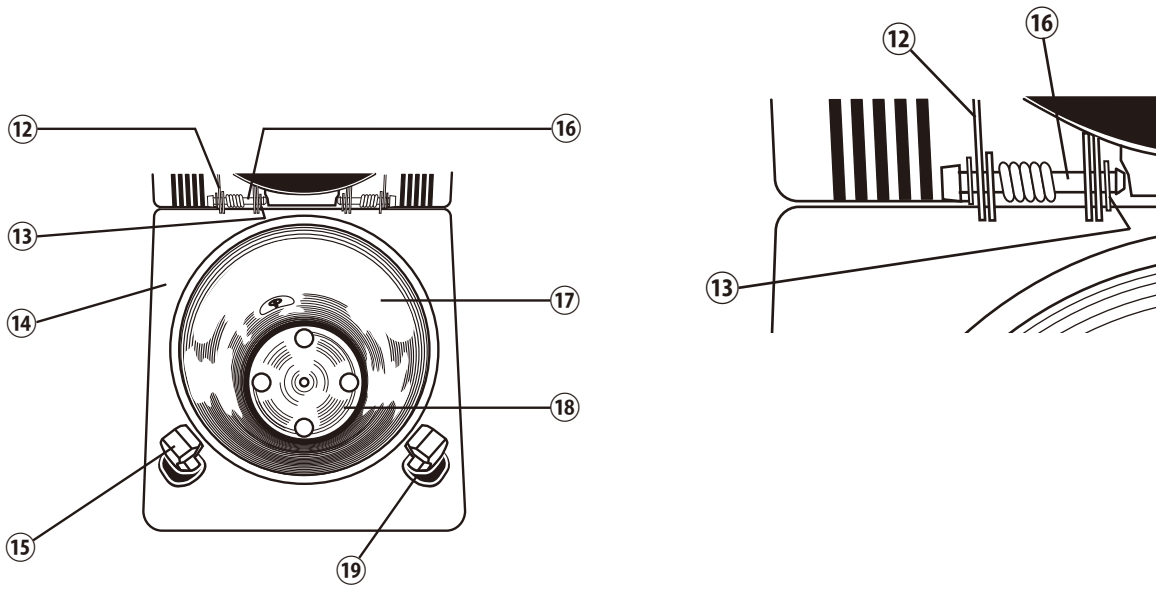
After commencement of operation, sterilizing water in the chamber is heated by the element heater at the bottom of the chamber to generate steam. Steam generated through heating drives air from the chamber and warms the inside of the chamber. When the temperature sensor in the chamber detects that the temperature has risen to the specified level, this temperature is maintained for a specified time. Residual air in the chamber is driven out through this operation. When the specified time has elapsed, the valve closes to carry out heating. When the temperature sensor detects that the temperature has risen to the specified level, the timer is activated to maintain a constant temperature. When the set sterilizing time has elapsed, the element heater stops. The sterilizing action is determined by the three elements: temperature, humidity, and time applied to articles to be sterilized during this time. When the temperature in the chamber falls, the valve opens to return the pressure in the chamber to the atmospheric level. When the temperature sensor detects 60 °C, all processes are completed and completion is indicated by a buzzer sounding and by the indication lamp. When an abnormality is generated in the autoclave, it changes to a safer status and the abnormality is indicated by an error code display and by a buzzer sounding.

2-2. Name and function of each

Main unit

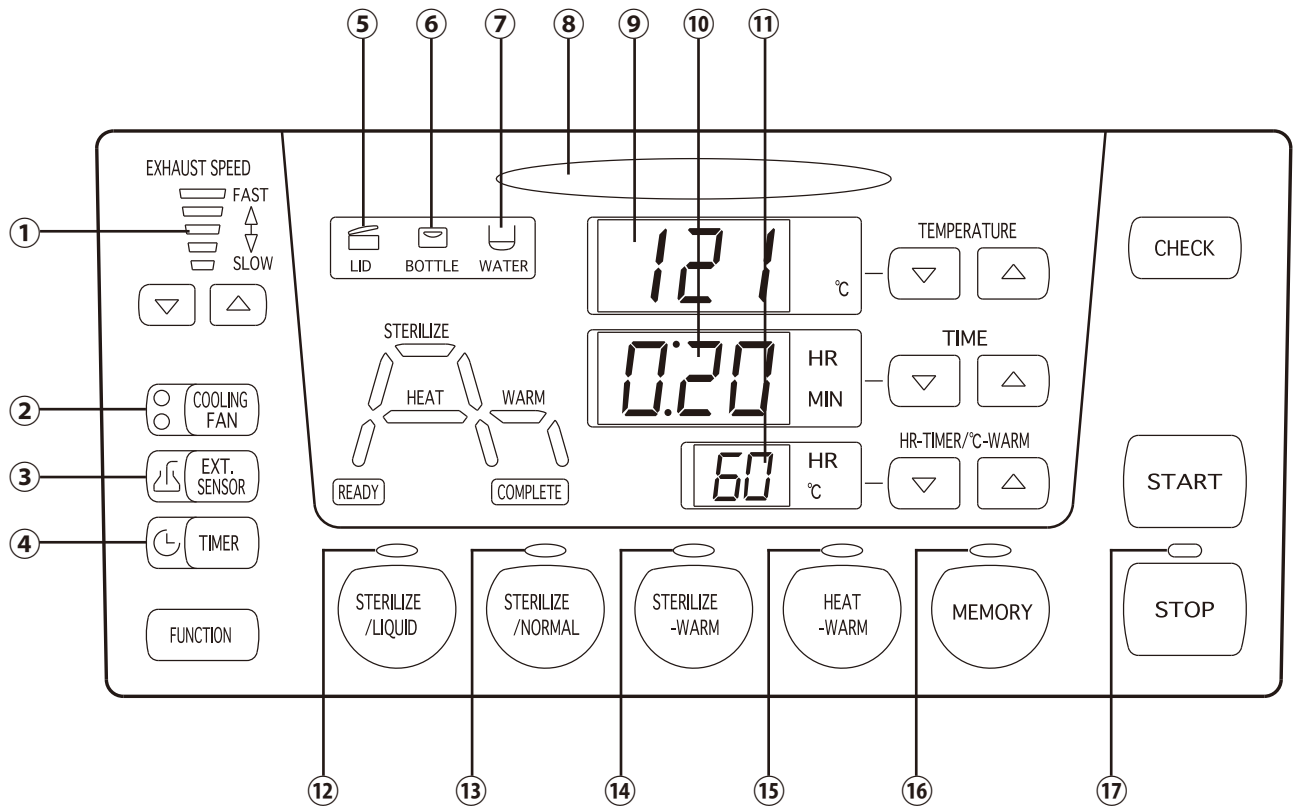


- ① **Control panel**
Used for operations such as the various settings.
- ② **Chamber lid handle**
Used for opening / closing the chamber lid.
- ③ **Pressure gauge**
Displays the pressure in the chamber.
<Pressure display range>
0 to 0.4 MPa
- ④ **Exhaust bottle**
Recovering air or steam in the chamber.
- ⑤ **Lid-lock releasing pedal**
Releases the lock of the chamber lid.
- ⑥ **Safety valve**
The safety valve is a safety device for reducing any abnormal pressure.
- ⑦ **Chamber lid**
Comprising the internal chamber lid, lid handle, and outer covering including the control panel.
Open or close this lid to place or remove articles to be sterilized.
- ⑧ **Power supply switch**
Power supply switch with the leakage breaker.
- ⑨ **Mount for accessory case**
For storing the operation manual.
- ⑩ **Steam exhaust opening**
Exhausts air or steam from the exhaust bottle.
- ⑪ **Caster**
Facilitating moving and fixing of the autoclave.

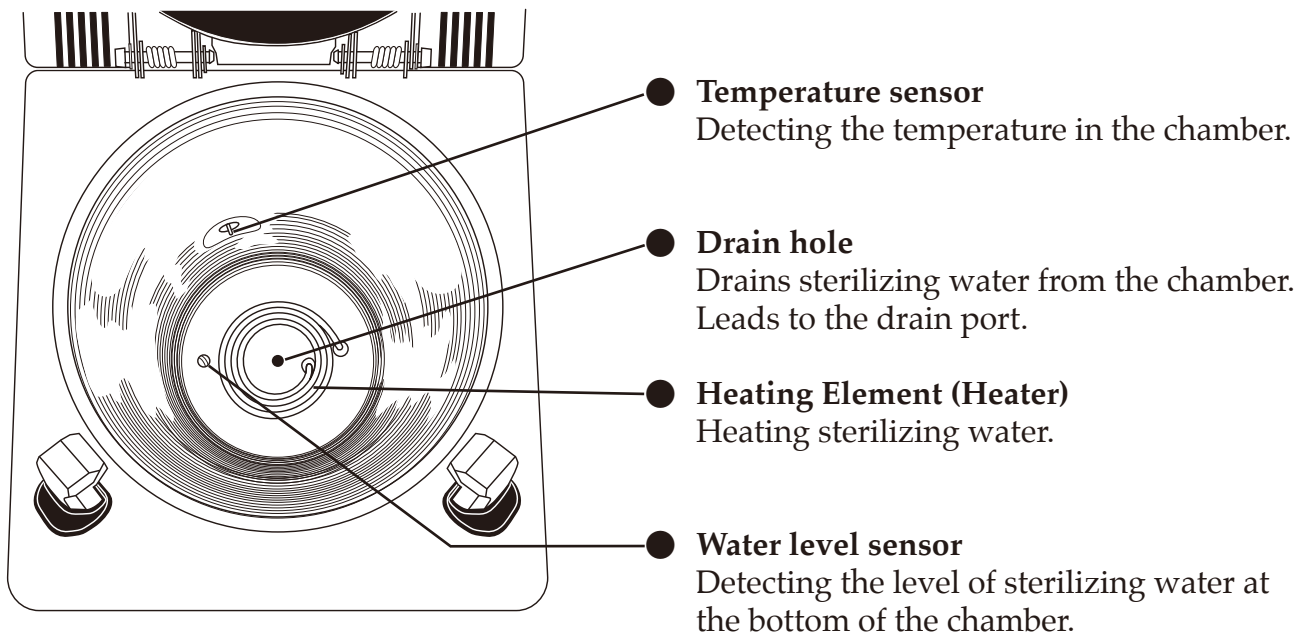


- ⑫ **Hinge**
Hinge of the chamber lid.
- ⑬ **Retaining ring**
Part of the hinge of the chamber lid.
- ⑭ **Top plate**
Stainless outer covering enclosing the vicinity of the chamber opening.
- ⑮ **Lid hook**
Used for locking the chamber lid.
- ⑯ **Hinge shaft**
Part of the hinge of the chamber lid.
- ⑰ **Chamber**
- ⑱ **Chamber Bottom Plate**
To prevent contents to be sterilized from touching heater at the bottom of chamber.
- ⑲ **Lid hook boot**
- ⑳ **Lid hook catch**
For the lid hook.
- ㉑ **Chamber lid gasket**
Maintaining air-tightness of the pressure chamber.
- ㉒ **Lid opening/closing sensor**
Sensor detecting opening/closing of the chamber lid.
- ㉓ **Chamber lid**
- ㉔ **Safety valve hole**
Leading to the safety valve. The safety valve is a safety device which reduces any abnormal pressure.
- ㉕ **Drain port (Drain valve)**
Drains sterilizing water from the chamber.

Control panel display

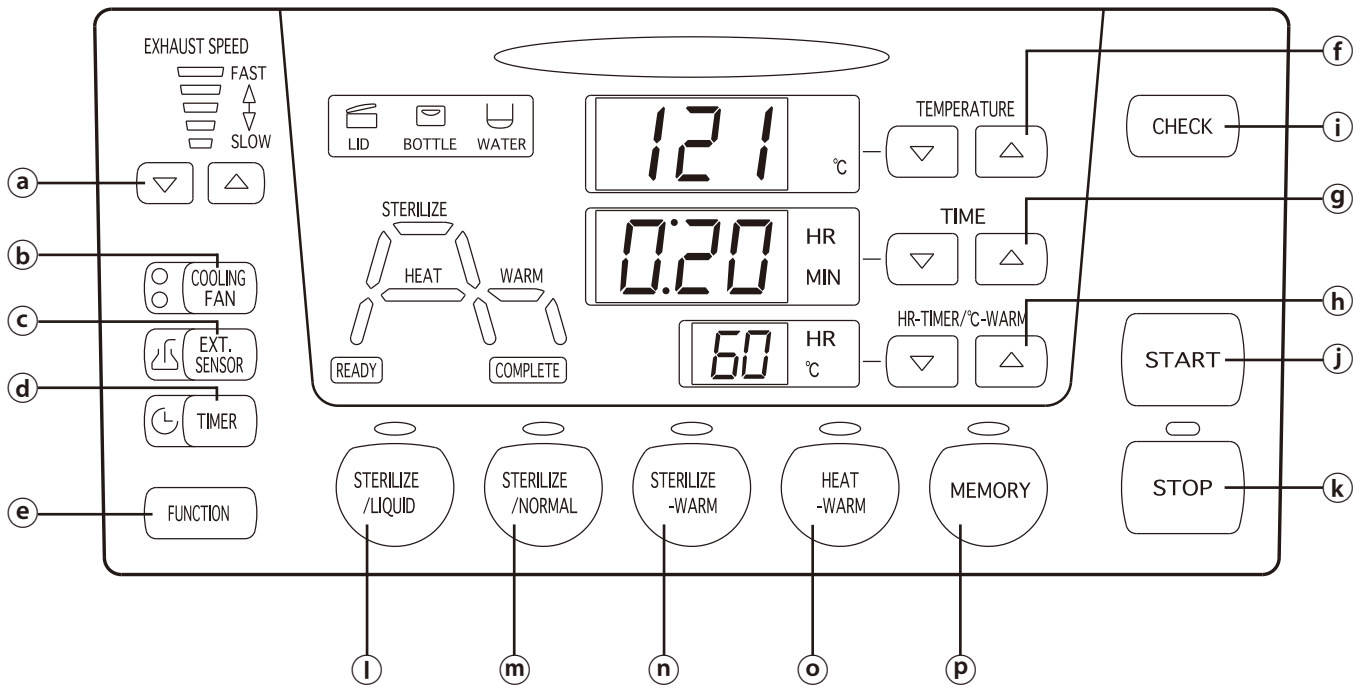


Inside of the chamber

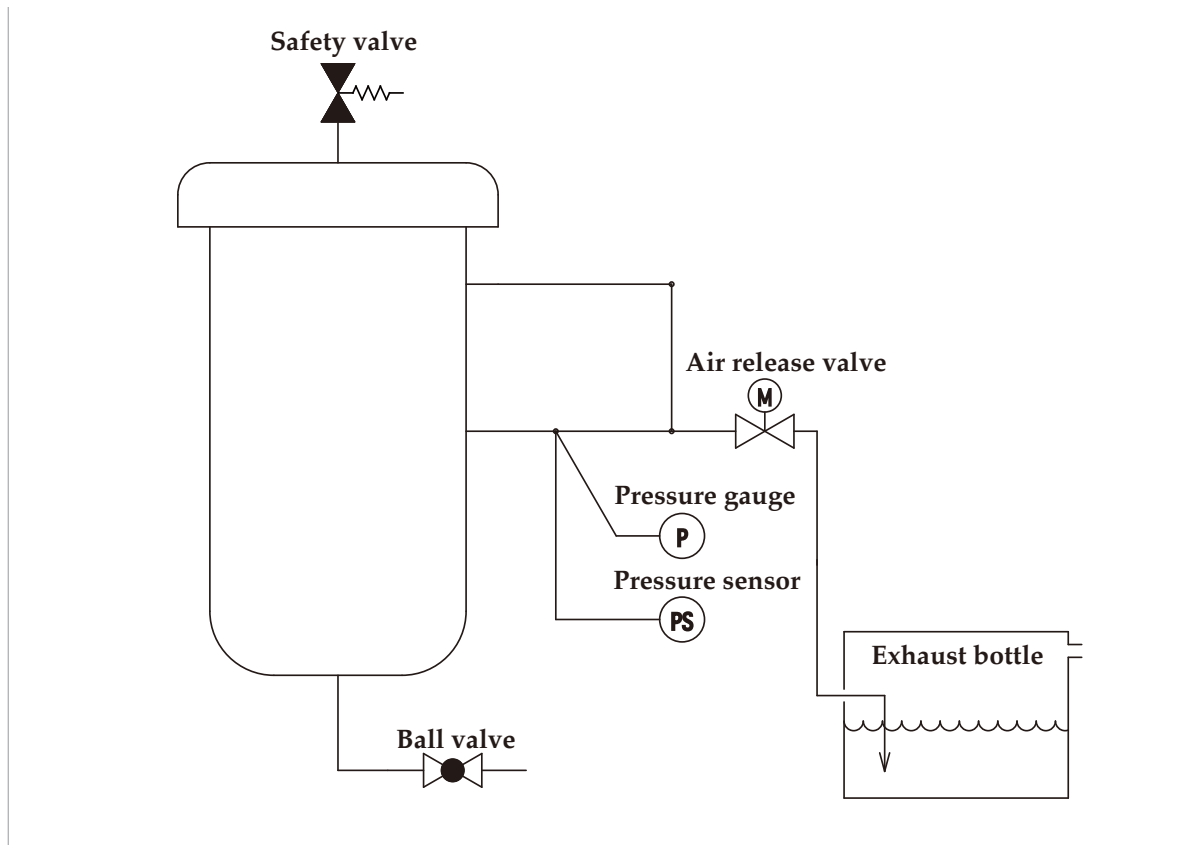


- ① **Exhaust speed display**
Displays the exhaust speed for the temperature and pressure reduction process. As more lamps are illuminated, the exhaust valve opening increases. When no lamp is illuminated, the exhaust valve is closed.
- ② **Cooling fan display**
Displays the fan setting for cooling the chamber for the temperature and pressure reduction process and the temperature reduction process. One or more fans are activated corresponding to the number of one or more illuminated lamps.
- ③ **Indication lamp for the external temperature sensor for articles to be sterilized**
Used when the optional external temperature sensor for articles to be sterilized is connected.
- ④ **Timer indication lamp**
Lights when timer is selected.
- ⑤ **Lid indication lamp**
The lid indication lamp lights up when the lid is opened or the door status is not confirmed by the lid open/close detection system. While the lid indication lamp is illuminated the operation cannot start.
- ⑥ **Exhaust bottle indication lamp**
Lights when the exhaust bottle is removed. When the exhaust bottle indication lamp is illuminated, operation cannot start.
- ⑦ **Low water level indication lamp**
Lights when the water level of sterilizing water in the chamber is low. When the low water level indication lamp is illuminated, operation cannot start.
- ⑧ **Operation indication lamp**
Lights up yellow during operation. Lights up red when the pressure in the chamber is higher than the atmospheric pressure.
- ⑨ **Temperature display**
Displays the set temperature for the sterilizing or heating process during preparation. Displays the temperature in the chamber during operation.
- ⑩ **Time display**
Displays the set time for the sterilizing or heating process during preparation. During operation, displays the remaining time until the sterilizing or heating process is completed. Displays the elapsed time during warming.
- ⑪ **Warming/timer display**
Displays the set temperature for the warming process. When the [Timer] key is pressed, the waiting time is displayed.
- ⑫ **Liquid sterilizing indication lamp**
Lights when the liquid sterilizing course is selected.
- ⑬ **Sterilizing indication lamp**
Lights when the sterilizing course is selected.
- ⑭ **Sterilizing-warming indication lamp**
Lights when the sterilizing-warming course is selected.
- ⑮ **Heating-warming indication lamp**
Lights when the heating-warming course is selected.
- ⑯ **Memory indication lamp**
Lights when the stored course is selected. At the same time, the indication lamp of the stored course lights.
- ⑰ **Stop indication lamp**
Lights when the [Stop] key is pressed.

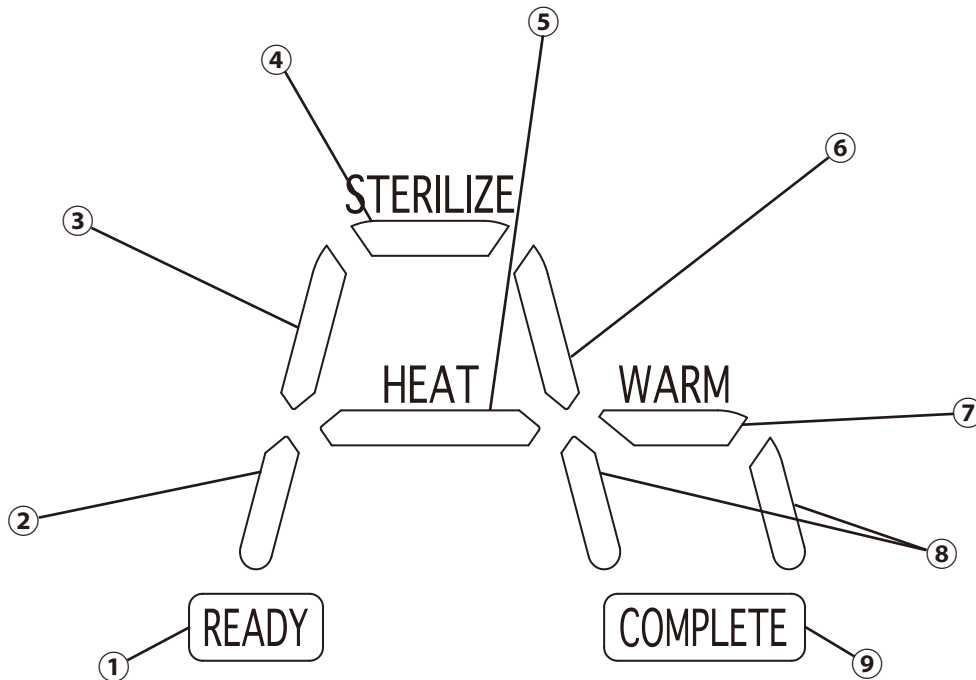
Control panel keys



Piping diagram



- Ⓐ **[Exhaust speed setting] keys**
 Allow the set exhaust speed value to be changed by pressing these keys. Changing operation is permissible during the temperature and pressure reduction process only when liquid sterilizing is selected.
- Ⓑ **[Cooling fan setting] key**
 Allows the cooling fan setting to be changed by pressing this key. Changing operation is allowed during the temperature and pressure reduction process when liquid sterilizing is selected.
- Ⓒ **Key for the external temperature sensor of articles to be sterilized**
 Used when the optional external temperature sensor of articles to be sterilized is connected.
- Ⓓ **[Timer] key**
 Allows timer to be selected and the waiting time to be set and checked by pressing this key.
- Ⓔ **[Function] key**
 Allows the temperature releasing the lid interlock, warming time, and display form to be set and checked by pressing this key.
- Ⓕ **[Temperature setting] keys**
 Allow the set temperature for the sterilizing or heating process to be changed by pressing these keys.
- Ⓖ **[Time setting] keys**
 Allow the set time for the sterilizing or heating process to be changed by pressing these keys.
- Ⓗ **[Warming/timer setting] keys**
 Allow the set temperature for the warming process to be changed by pressing these keys. Allow the waiting time to be changed by pressing these keys following the [timer] key.
- Ⓘ **[Check] key**
 Allows the current temperature to be checked by pressing this key during preparation. Allows the set conditions to be checked by pressing this key during operation.
- Ⓣ **[Start] key**
 Allows operation to start by pressing this key.
- Ⓚ **[Stop] key**
 Allows operation to be stopped by pressing this key.
- Ⓛ **[Sterilize /Liquid] key**
 Allows the liquid sterilizing course to be selected by pressing this key during preparation.
- Ⓜ **[Sterilize] key**
 Allows the sterilizing course to be selected by pressing this key during preparation.
- Ⓝ **[Sterilize-Warm] key**
 Allows the sterilizing-warming course to be selected by pressing this key during preparation.
- Ⓞ **[Heat-Warm] key**
 Allows the heating-warming course to be selected by pressing this key during preparation.
- Ⓟ **[Memory] key**
 Allows the displayed course setting to be memorized by holding down this key during preparation. Allows the memorized courses to be selected by pressing this key during preparation.



- ① **Ready indication lamp**
Lights during preparation.
The lid can be opened when this lamp is illuminated.
- ② **Temperature raising process indication lamp**
Displays that the temperature raising process is being carried out.
- ③ **Temperature and pressure raising process indication lamp**
Displays that the temperature and pressure raising process is being carried out.
- ④ **Sterilizing process indication lamp**
Displays that the sterilizing process is being carried out.
- ⑤ **Heating process indication lamp**
Displays that the heating process is being carried out.
- ⑥ **Temperature and pressure reduction process indication lamp**
Displays that the temperature and pressure reduction process is being carried out.
- ⑦ **Warming process indication lamp**
Displays that the warming process is being carried out.
- ⑧ **Temperature reduction process indication lamp**
Displays that temperature reduction process is being carried out.
- ⑨ **Completion indication lamp**
Displays that operation is completed.
Blinks when the lid can be opened. The status is changed from blinking to being lighted when the temperature in the chamber falls to 60 °C.

3. INSTALLATION

3-1. Method of movement and installation

⚠WARNING



Do not install the autoclave in places where chemicals such as flammable or corrosive gases are stored.

- Contravention is dangerous with likelihood of fire or electric leakage and shock due to corrosion of electrical parts.



Do not install the autoclave in a dusty or wet place.

- Contravention is dangerous with likelihood of short circuit or ignition of electrical parts.



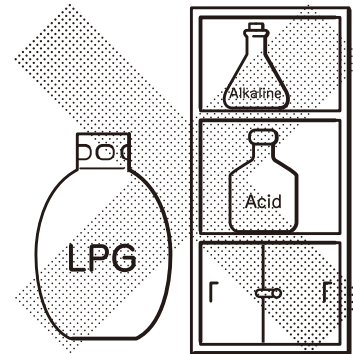
Do not install the autoclave near a sink or water pipe or any place where spillage of water is likely.

- Contravention is dangerous with likelihood of electric leakage or shock.



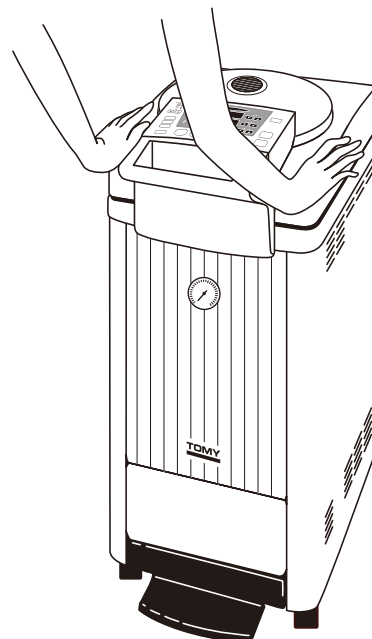
Install the autoclave on a firm and level surface such as a concrete floor.

- Contravention is dangerous with likelihood of injury or physical damage should the autoclave fall.

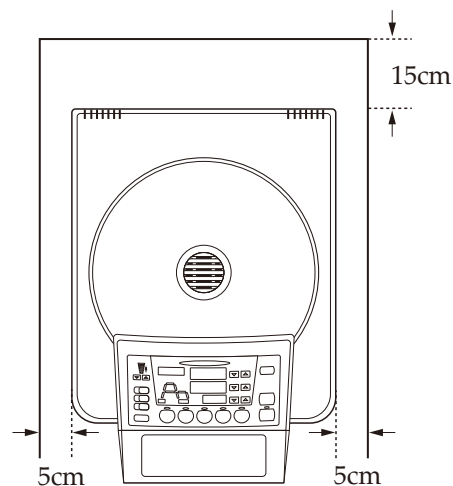


<Method of movement and installation>

- ① Support the autoclave with both hands and move it gently.



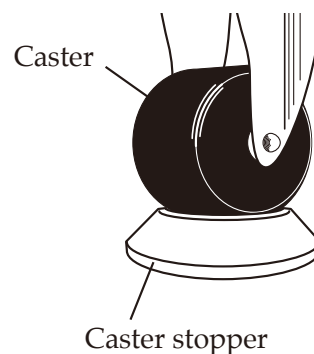
- ② Select a place which is not subject to direct sunlight and is well ventilated. Install the autoclave with a clearance of 150 mm or more behind the autoclave and 50 mm or more at both sides. Provide sufficient space at the front and above the autoclave.



- ③ Place the attached caster stoppers under the casters to fix the autoclave at the place of installation.

※ Be sure to place the attached caster stoppers under all casters. Otherwise, the chamber lid cannot be opened even though the lid-lock releasing pedal has been pressed.

※ Do not place any objects other than the attached caster stoppers under the casters.



- ④ Attach the clear folder for storing the operation manual using the attached decorative screw. An attachment hole is provided at each side.

※ After reading the operation manual, store it carefully in the clear folder.

<Environmental Conditions>

When operating the autoclave, observe the environmental conditions given below.

Ambient temperature : 10 to 35°C
Atmospheric pressure : 860 to 1060 hPa
Relative humidity : 30 to 85%
Maximum gradient : 2°

3-2. Power supply connection and protective grounding (earthing)

⚠ WARNING



Connect the power plug singly to the specified power supply.

- Contravention is dangerous with likelihood of fire, electric leakage, or breakdown due to ignition.



Do not use power cable extensions.

- Contravention is dangerous with likelihood of fire, electric leakage, or breakdown due to ignition.



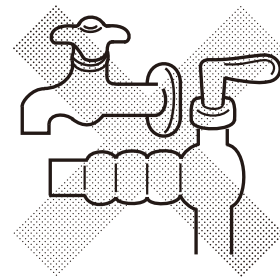
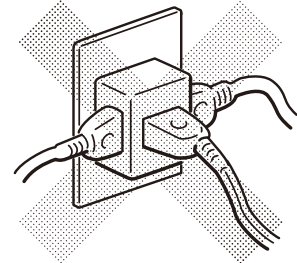
Be sure to provide protective grounding.

- Contravention is dangerous with likelihood of explosion, electric shock, or malfunction.



Do not use a gas pipe or water pipe etc. for protective grounding.

- Contravention is dangerous with likelihood of explosion, electric shock, or malfunction.



For protection against electrical shock, grounding is required. When this type of grounding cannot be provided, request works to be carried out by specialists.

Provide a power supply terminal board with the satisfying the condition given below and carry out connection.

Power supply condition:

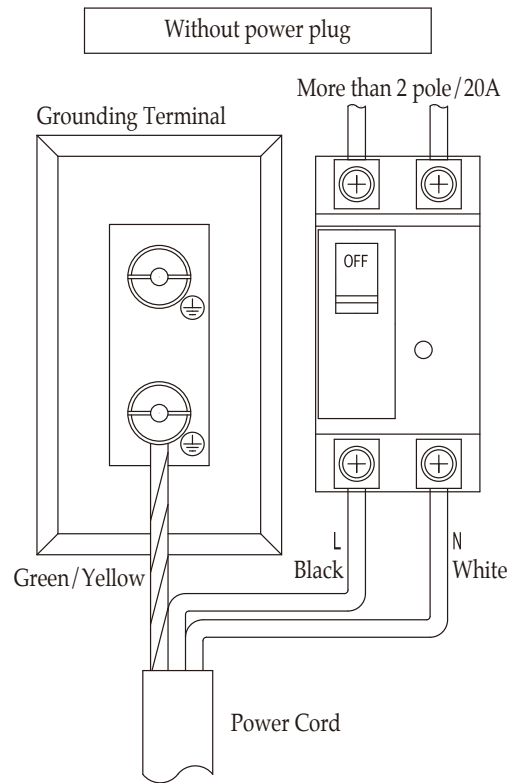
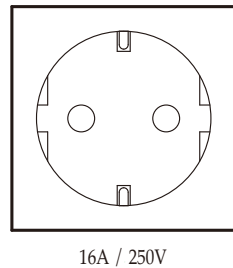
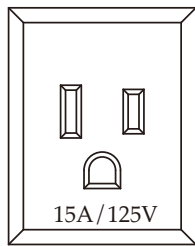
- SX-300 : single-phase 120V AC (50/60 Hz), 15A or more
single-phase 230V AC (50/60 Hz), 10A or more
- SX-500 : single-phase 120V AC (50/60 Hz), 20A or more
single-phase 230V AC (50/60 Hz), 15A or more
- SX-700 : single-phase 230V AC (50/60 Hz), 15A or more

Protection against electrical shock is provided by connecting the protective grounding wire to the grounding terminal.

※ Turn OFF the breaker to which the power cable is connected when hearing thunder in order to prevent lightning damage.

<sample>

- ① Connect the power plug to the proper outlet. Be sure to provide protective grounding.
- ② Be sure to provide protective grounding to the grounding terminal in case of the power supply connection without power plug.



4. FLOW OF OPERATION

1. Turning ON the power supply switch
2. Checking the pressure gauge
3. Checking the volume of water in the exhaust bottle
4. Checking sterilizing water
5. Placing articles to be sterilized
6. Setting operating conditions
7. Starting operation
8. Operation completion
9. Removing sterilized articles
10. Draining sterilizing water
11. Turning OFF the power supply switch

※ When operating the autoclave repeatedly, restart operation from “Checking the pressure gauge” after carrying out “Removing sterilized articles”.

5. OPERATING PROCEDURES

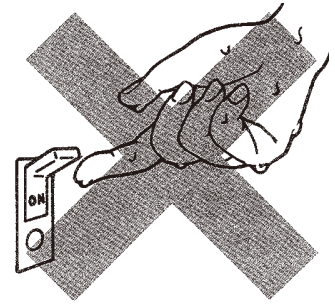
5-1. Turning ON/OFF the power supply switch

⚠WARNING



Do not touch the power supply switch with a wet hands.

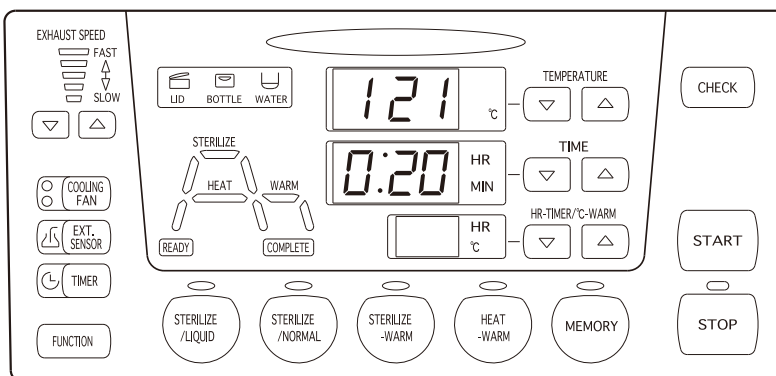
- Contravention is dangerous with likelihood of electric shock.



<Turning ON the power supply switch>

- ① Confirm that the power supply connection and protective grounding have been carried out correctly.
- ② Turn ON the power supply switch at the right side of the main unit. The control program number of the autoclave is displayed at the "time display" on the control panel.
- ③ The operating conditions used for previous operation are displayed after approximately five seconds.

- The operating conditions used for previous operation are displayed.



<Turning OFF the power supply switch>

- ① Turn OFF the power supply switch at the right side of the main unit.

5-2. Opening/closing the chamber lid

WARNING



Do not open the chamber lid until the pressure falls to 0 MPa.

- Contravention is dangerous with likelihood of death or serious accident due to blow out from sterilized articles or steam when the lid is opened while a raised pressure remains.



Be extremely careful of steam emanating from the inside of the chamber when opening the chamber lid.

- Contravention is dangerous with likelihood of scalds or injury because the temperature of steam emanating from the inside of the chamber is extremely high.

CAUTION

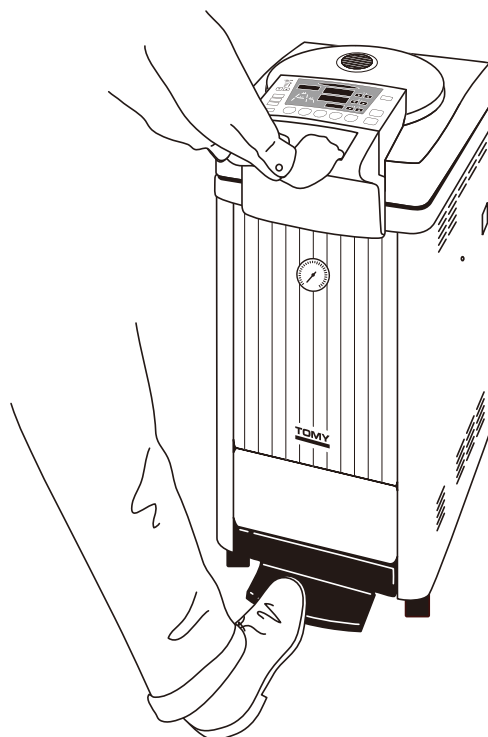


Do not place the hands on the top plate.

- Contravention is dangerous with likelihood of injury because the hands may be caught by the chamber lid.

<Opening the chamber lid>

- ① Confirm that the pressure is displayed as "0 MPa".
- ② Confirm that the power supply switch is set to ON.
- ③ Confirm that the operation or completion indication lamp on the control panel is not illuminated or blinking respectively.
- ④ Press the lid lock releasing pedal while slightly pushing down the lid handle of the main unit.
- ⑤ Pull up the lid gently while holding the lid handle of the main unit.



<Closing the chamber lid>

- ① Pull down the lid while holding the lid handle of the main unit.
 - ② Place the hands on the lid handle of the main unit and push it down until the open lid indication lamp goes out.
- ※ The chamber lid may not close easily when the temperature in the chamber is high, immediately after operation etc. In such a case, close the lid after the temperature falls.

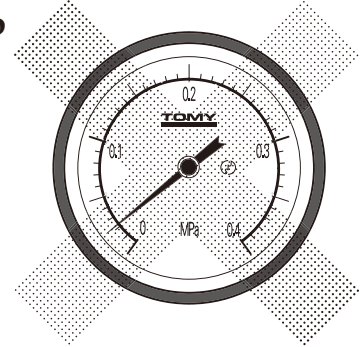
5-3. Checking the pressure gauge

⚠ WARNING



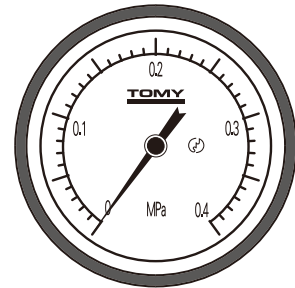
When the pressure gauge is abnormal, stop operation.

- Contravention is extremely dangerous because abnormality of the inside of the chamber cannot be checked. Contact the dealer or business institution of our company.



<Checking the pressure gauge>

- ① Open the chamber lid.
- ② Confirm that the pointer of the pressure gauge displays "0 MPa".



5-4. Checking the volume of water in the exhaust bottle

⚠ WARNING

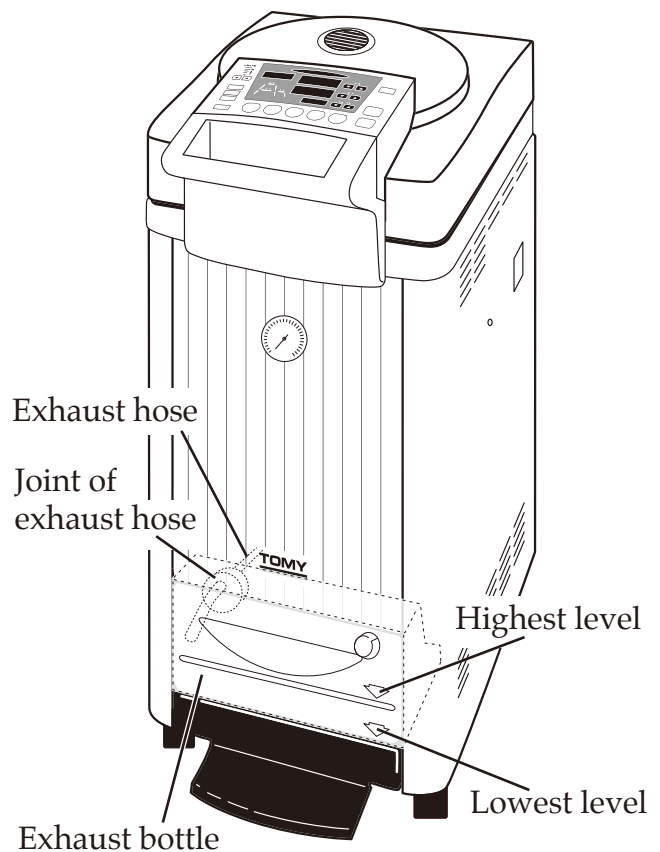


Do not bend the exhaust hose.

- Contravention is dangerous with likelihood of damage to parts and burns, injury, or serious accident due to explosive breakage because the pressure will rise abnormally when exhaust is not carried out smoothly.

High-temperature steam is exhausted from the autoclave during operation. In order to avoid accidents such as scalds, check that the volume of water for cooling steam is appropriate.

- ① Check that the water level in the exhaust bottle is between the lowest and highest levels.
When the water level is not appropriate, supply water following the procedures given below.
- ② Confirm that the operation indication lamp is not illuminated.
- ③ Remove the exhaust bottle gently from the main unit.
- ④ Pull out the exhaust hose from the exhaust bottle while holding the joint of the exhaust hose.
- ⑤ Supply water from the water supply / drain port to the lowest water level.
- ⑥ Insert the joint of the exhaust hose in the rear of the exhaust bottle.
Pay attention to the orientation so that the exhaust hose is located at the upper of the joint of the exhaust hose.
In addition, be careful to avoid the hose from bending in the exhaust bottle.
- ⑦ Place the exhaust bottle gently in the main unit.



5-5. Checking sterilizing water

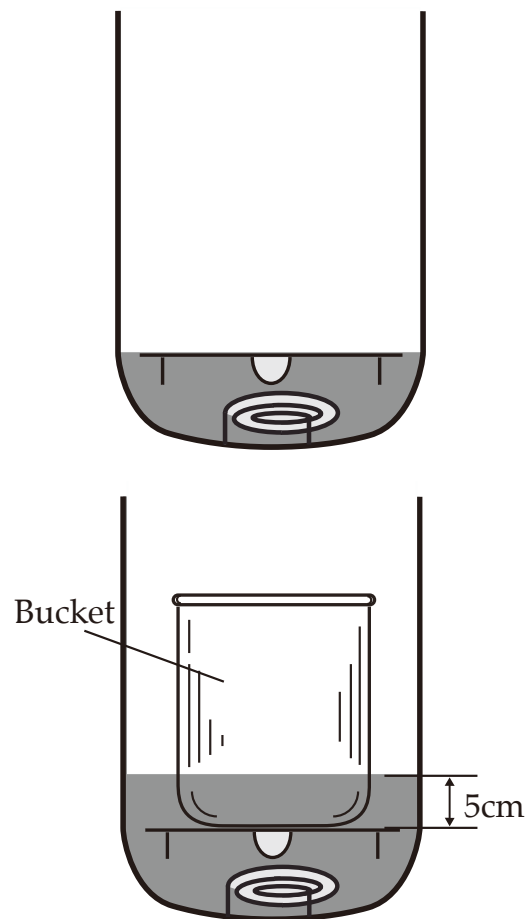
The autoclave generates steam by heating sterilizing water in the chamber with the element heater. Check the quality and volume of sterilizing water in order to carry out appropriate sterilization.

Use tap water as sterilizing water. If purified water or extremely cold water is used as sterilizing water, the water level sensor may not correctly detect the level of sterilizing water.

If the quality of the tap water causes any problems, purified water mixed with tap water can be used instead. In this case, pour purified water in the chamber first. Once the slatted bottom plate is soaked, add tap water until low water level indication lamp lights off. Due to the quality of tap water is quite different depending on each area, please adjust the amount of sterilizing water based on 300ML of tap water for 3L of purified water.

<Checking sterilizing water>

- ① Open the chamber lid and check that the sterilizing water in the chamber is not contaminated.
- ② When water is contaminated, drain water.
※ For the procedures of draining water, refer to "5-11. Draining sterilizing water".
- ③ Check that the water level in the chamber is such that the grating (bottom plate) is soaked.
※ For sterilizing with a large volume of liquid in the bucket, supply water until the bottom of the bucket is covered with water to approximately 5 cm.
- ④ When the water level is not appropriate, supply water until the grating (bottom plate) is soaked.



<Guide for the volume of sterilizing water>

- SX-300 / 500 approximately 3.0L
- SX-700 approximately 3.6L

5-6. Placing articles to be sterilized

⚠ WARNING

⊘ Do not operate the autoclave with flammable or explosive articles in place.

- Contravention is dangerous with likelihood of fire or explosion.

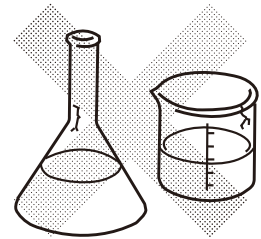
⊘ Do not sterile sealed articles.

- Contravention is dangerous with likelihood of burns or serious accident due to blowout during removal of articles. In addition, contravention is dangerous with likelihood of damage to parts, or burns or serious accident due to explosive breakage because the pressure in the chamber may rise abnormally.



⊘ Do not sterilize glass equipment having cracks or scratches.

- Contravention is dangerous with likelihood of burns or serious accident due to blowout during removal of equipment.



⊘ Do not block the hole in the inside of the chamber with articles to be sterilized.

- Contravention is dangerous with likelihood of serious accident such as blowout because the pressure in the chamber cannot be controlled when the hole at the inside of the chamber is blocked with an article such as a sterilizing bag. Make sure that articles are placed in the basket provided etc. so that the vicinity of the hole is not blocked.

<Placing articles to be sterilized>

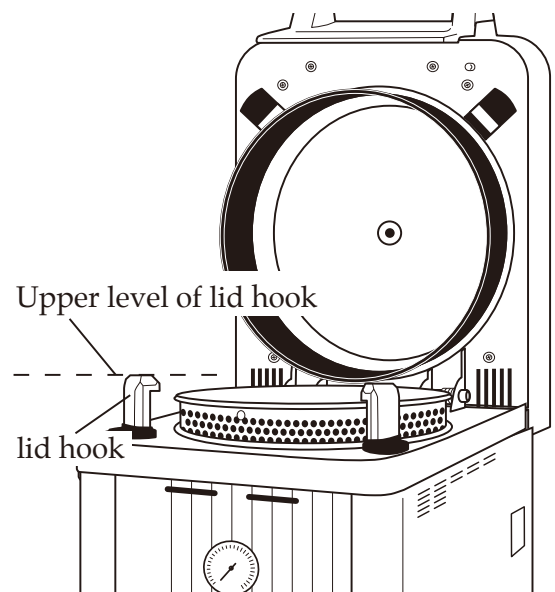
① Place articles to be sterilized in the stainless basket normally attached or an optional stainless bucket.

- ※ Be careful not to hit articles to be sterilized on the lid gasket or the temperature sensor when placing or removing the articles. They may be damaged.

② Place articles gently in the chamber.

- ※ Place articles so that they do not come above the upper level of the lid hooks. When the chamber lid is closed with articles placed above this level, they may be damaged.

③ Close the chamber lid.



<For effective sterilization>

○ When the form of articles to be sterilized is unlikely to permit the escape of air, the sterilizing effect may be lessened because of the air remaining in the chamber. It is recommended that the countermeasures given below be taken before sterilization.



- When using the sterilizing bag, put approximately 100 ml of water in the bag and open the mouth of the bag as much as possible.
- In case of a container, put a small volume of water (approximately 10 to 50 ml) into the container.
- Adjust the volume of articles to be sterilized to 50% or less of the chamber capacity.

○ When a container with poor permeability is sterilized, the container may deform or its internal parts may not be sterilized sufficiently. Therefore, it is recommended that the countermeasures given below be taken before sterilization.

- Remove or loosen the lid of the container before sterilizing.
- Exchange the lid of a container with a permeable one.

○ When plastic articles are sterilized, they may deform. Therefore, it is recommended that sterilization be carried out referring to the table given below.

Table. Sterilizing processing adaptation of each material

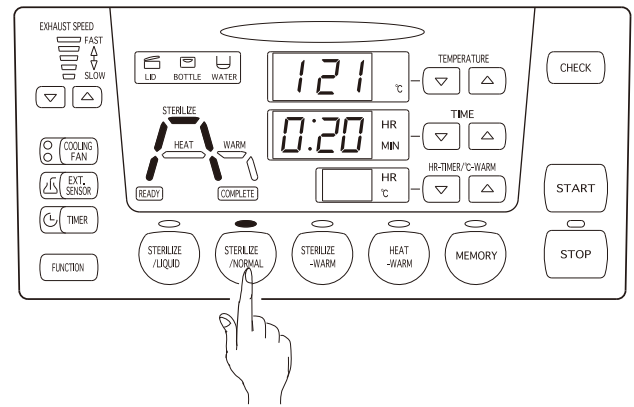
Adaptation	Polyethylene	Polypropylene co polymer	Polypropylene	Polycarbonate	Tefron FEP
Use of autoclave	Not allowed	Allowed (121°C)	Allowed (121°C)	Caution needed	Allowed (121°C)
Water absorption ratio (%)	0.02 or less	0.02 or less	0.03 or less	Approximately 0.3	0.01 or less
Transparency	Opaque	Harf transparent	Harf transparent	Transparent	Harf transparent

※ The table should be referred as a guide. Note that characteristics will vary depending on the pressure, temperature, time, etc.

5-7. Setting operating conditions

<Setting sterilizing operation>

- ① Press the [Sterilize] key once. The sterilizing indication lamp lights and sterilizing operation is selected. Concurrently, the temperature raising process indication lamp, temperature and pressure raising process indication lamp, sterilizing process indication lamp, temperature and pressure reduction process indication lamp, and temperature reduction process indication lamp on the work monitor light in yellow.
- ② Press the [Temperature setting] keys to set the temperature for the sterilizing process.
- ③ Press the [Time setting] keys to set the time for the sterilizing process.
- ④ Press the [Exhaust speed setting] keys to set the exhaust speed for the temperature and pressure reduction process.
- ⑤ Press the [Cooling fan setting] key to select the number of fans activated during the temperature and pressure reduction process and temperature reduction process.



	Sterilizing process	
	Settable temperature range	Settable time range
SX-300/500/700	105 ~ 135°C	0 : 01 ~ 9 : 59

※ To change the time display form, refer to “6-9. Setting the time display form”.

<For effective sterilization>

- When a large volume of liquid is sterilized, raising the temperature requires a longer time. Therefore, it is recommended that the operation time be extended by referring to the description given below as a guide.

Extended sterilizing time for liquid sterilization Reference example: in case of 121 °C and 20 minutes

- When 2 L of water is put in metal container (20 minutes) + 4 minutes
- When 5 L of water is put in metal container (20 minutes) + 8 minutes
- When 10 L of water is put in metal container (20 minutes) + 15 minutes

- The autoclave controls the temperature using the temperature detected by the temperature sensor in the chamber as an index. When reliable sterilization is required, set appropriate sterilizing conditions employing the temperature sensor of articles to be sterilized, sterilizing indicator, etc.

5-8. Starting operation

WARNING



Stop operation immediately when the pointer of the pressure gauge reads above the red line during operation.

- Contravention is dangerous with likelihood of damage to parts and burns or serious accident due to explosive breakage. Stop operation immediately and contact the dealer or business institution of our company.



Do not block the vicinity of the safety valve during operation.

- Contravention is dangerous with likelihood of damage to parts and burns or serious accident due to explosive breakage. Stop operation immediately and contact the dealer or business institution of our company.

CAUTION



Be careful of steam emanating from the vicinity of the steam exhaust opening during operation.

- Contravention is dangerous with likelihood of scalds due to high temperature.



Be careful of steam emanating from the vicinity of the safety valve during operation.

- Contravention is dangerous with likelihood of scalds due to high temperature.

① Press the [Start] key.

The operation indication lamp lights and operation starts. When the pressure in the chamber is higher than the atmospheric pressure, this indication lamp lights in red. The indication lamps corresponding to the selected course light on the work monitor. The indication lamp corresponding to the time being carried out blinks in red and that of the completed time lights in red.

- ※ When the lid status is not confirmed by the lid open/close detection system, the operation cannot start. The lid open/close detection system activates when the lid is opened or closed.
- ※ The temperature in the chamber and remaining time are displayed during operation.
- ※ When the [Check] key is pressed during operation, the set values are displayed.
- ※ When an error is generated during operation, the indication lamp corresponding to the time being carried out continues blinking in red.

5-9. Operation completion

The completion indication lamp blinks when the temperature in the chamber falls to that which releases the interlock of the chamber lid allowing the chamber lid to open. It is recommended that the chamber lid be opened after the temperature in the chamber falls to 60 °C and the operation indication lamp goes out because there is likelihood of scalds due to sudden boiling immediately after operation.

- ① The buzzer sounds three times when the set sterilization time has elapsed and the sterilizing process is completed.
- ② When the pressure in the chamber falls to atmospheric pressure, the color of the operation indication lamp changes from red to yellow.
- ③ When the temperature inside the chamber or temperature measured by the temperature sensor for materials to be sterilized (optional) falls below a preset value to release the lid interlock, the buzzer will sound six times and the lid will unlock and open.
- ④ When the temperature inside the chamber or temperature measured by the temperature sensor for materials to be sterilized (optional) falls to 60°C and the process of temperature decreasing ends, the buzzer will sound ten times to indicate an operation is completed.
- ⑤ After completing the operation, press the [Stop] key. The lid indication lamp lights up and the lid open/close detection system is released.
 - ※ Operation can be interrupted by pressing the [Stop] key while running.
 - ※ When operation is interrupted, the status shifts to the temperature and pressure reduction process or temperature reduction process.
 - ※ The lid open/close detection system is activated by opening or closing the door.

5-10. Removing sterilized articles

⚠ WARNING



Do not open the chamber lid until the pressure falls to 0 MPa.

- Contravention is dangerous with likelihood of death or serious accident due to blowout emanating from sterilized articles or steam when the lid is opened while a raised pressure remains.



Be extremely careful of steam emanating from the inside of the chamber when opening the chamber lid.

- Contravention is dangerous with likelihood of scalds or injury because steam emanating from the inside of the chamber is extremely high in temperature.



Be careful of high-temperature liquid because it may boil suddenly.

- The temperature of liquid falls more slowly than that of the chamber and liquid may boil because of a trigger such as physical shock. When liquid is not dealt with carefully, there is likelihood of scalds or unexpected accident.



Do not leave the inside of the chamber or sterilizing water contaminated.

- Contravention is dangerous with likelihood of corrosion or damage to the chamber. In addition, the water level sensor may malfunction and reduce the empty heating prevention function, which may result in fire in case of empty heating.

- ① Confirm that the pressure is displayed as "0 MPa".
- ② Confirm that the completion indication lamp on the work monitor is blinking or illuminated.
- ③ Open the chamber lid.
- ④ Remove sterilized articles.
 - ※ Do not hit articles to be sterilized on the lid gasket when placing or removing the articles to be sterilized.
The damage and deflection on the lid gasket may cause the steam leakage.
- ⑤ Clean the inside of the chamber or sterilizing water when they are contaminated.
 - ※ Refer to "8.Preventive maintenance".

5-11. Draining sterilizing water

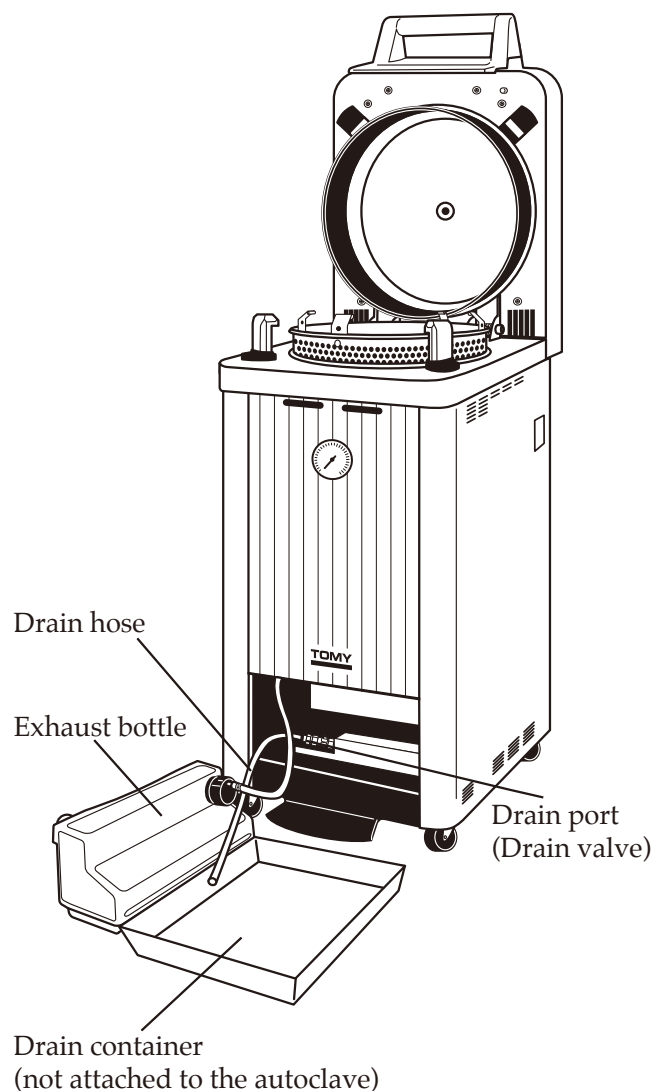
⚠ CAUTION



Drain water after the sterilizing water cools down sufficiently.

- Contravention is dangerous with likelihood of scalds because the sterilizing water is heated immediately after operation.

- ① Open the chamber lid.
- ② Remove the exhaust bottle.
- ③ Pull out the drain hose.
- ④ Place the drain container below the drain hose.
- ⑤ Open the drain cock while rotating it slowly and drain the sterilizing water from the drain port. When the sterilizing water is not drained, remove clogging matter by passing a wire etc. through the drain port.
- ⑥ After draining the sterilizing water completely, fully rotate the drain cock to close the drain port completely.
- ⑦ Return the drain hose.
- ⑧ Return the exhaust bottle.



6. CONVENIENT FUNCTIONS

6-1. Liquid sterilization function

The autoclave provides a liquid sterilization operation which is convenient for sterilizing liquid. In order to avoid sudden boiling, the liquid sterilization operation allows the exhaust speed and cooling fan settings to be changed during the temperature and pressure reduction process and temperature reduction process only.

	Liquid sterilizing process	
	Settable temperature range	Settable time range
SX-300/500/700	105 ~ 135°C	0 : 01 ~ 9 : 59

※ To change the time display form, refer to “6-9. Setting the time display form”.

<Setting liquid sterilization operation>

Set operating conditions following the procedures given below.

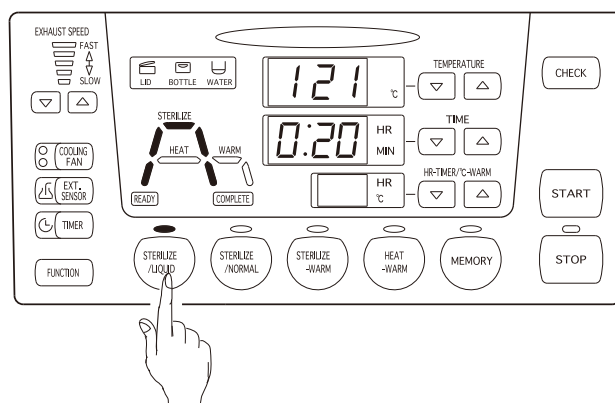
- ① Press the [Liquid sterilize] key.

The liquid sterilizing indication lamp lights and the liquid sterilizing course is selected. Concurrently, the temperature raising process indication lamp, temperature and pressure raising process indication lamp, sterilizing process indication lamp, temperature and pressure reduction process indication lamp, and temperature reduction process indication lamp on the work monitor light in yellow.

- ② Press the [Temperature setting] keys to set the temperature for the sterilizing process.
- ③ Press the [Time setting] keys to set the time for the sterilizing process.

※ The exhaust speed and cooling fans cannot be set in advance.

※ The exhaust speed and cooling fans can be operated during the temperature and pressure reduction process and temperature reduction process only.



6-2. Sterilizing-warming function

The autoclave allows a sterilizing-warming operation which is convenient for sterilizing agar medium and similar materials.

After sterilization, a warming operation is carried out in order to avoid coagulation.

	Sterilizing process		Warming process	
	Settable temperature range	Settable time range	Settable temperature range	Settable time range
SX-300/500/700	105 ~ 135°C	0 : 01 ~ 9 : 59	45 ~ 95°C	1 to 99 hours

※ To change the time display form, refer to “6-9. Setting the time display form”.

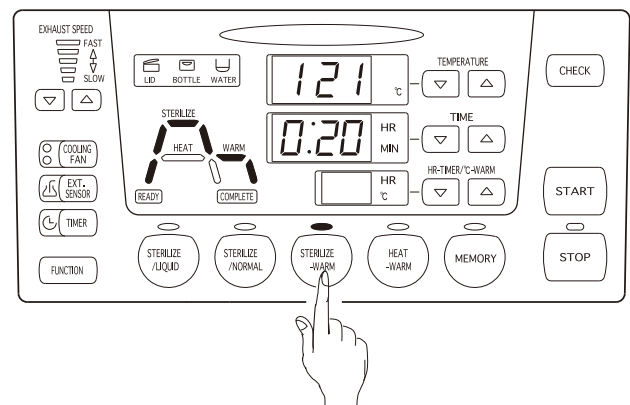
※ To change the warming time, refer to “6-8. Setting the warming time”.

<Setting sterilizing-warming operation>

Set operating conditions following the procedures given below.

- ① Press the [Sterilize-warming] key.

The sterilizing-warming indication lamp lights and the sterilizing-warming course is selected. Concurrently, the temperature raising process indication lamp, temperature and pressure raising process indication lamp, sterilizing process indication lamp, temperature and pressure reduction process indication lamp, warming process indication lamp, and temperature reduction process indication lamp on the work monitor light in yellow.



- ② Press the [Temperature setting] keys to set the temperature for the sterilizing process.
- ③ Press the [Time setting] keys to set the time for the sterilizing process.
- ④ Press the [Warming / timer setting] keys to set the temperature for the warming process.
 - ※ To change the warming time, refer to “6-8. Setting the warming time”.
- ⑤ Press the [Exhaust speed setting] keys to set the exhaust speed for the temperature and pressure reduction process and temperature reduction process.
- ⑥ Press the [Cooling fan setting] key to set the number of fans activated during the temperature and pressure reduction process and temperature reduction process.
 - ※ The time display of the warming process is changed in units of one hour.

6-3. Heating-warming function

The autoclave allows a heating-warming operation which is convenient for such usage as dissolving agar.

After heating, a warming operation is carried out in order to avoid coagulation.

	Heating process		Warming process	
	Settable temperature range	Settable time range	Settable temperature range	Settable time range
SX-300/500/700	45 ~ 104°C	0 : 01 ~ 9 : 59	45 ~ 95°C	1 to 99 hours

※ To change the time display form, refer to “6-9. Setting the time display form”.

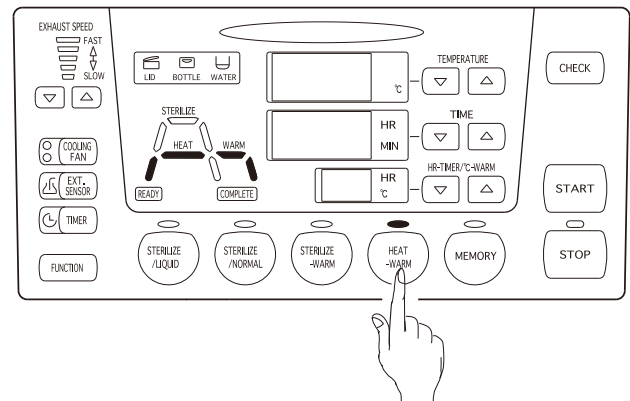
※ To change the warming time, refer to “6-8. Setting the warming time”.

<Setting heating-warming operation>

Set operating conditions following the procedures given below.

- ① Press the [Dissolve-warming] key.

The heating-warming indication lamp lights and the heating-warming course is selected. Concurrently, the temperature raising process indication lamp, heating process indication lamp, warming process indication lamp, and temperature reduction process indication lamp on the work monitor light in yellow.



- ② Press the [Temperature setting] keys to set the temperature for the heating process.
- ③ Press the [Time setting] keys to set the time for the heating process.
- ④ Press the [Warming / timer setting] keys to set the temperature for the warming process.
 - ※ To change the warming time, refer to “6-8. Setting the warming time”.
- ⑤ Press the [Exhaust speed setting] keys to set the exhaust speed for the temperature and pressure reduction process and temperature reduction process.
- ⑥ Press the [Cooling fan setting] key to set the number of fans activated during the temperature and pressure reduction process and temperature reduction process.
 - ※ When “—” is set by reducing the temperature for the heating process, the heating process only can be cancelled.
 - ※ When “—” is set by reducing the temperature for the warming process, the warming process only can be cancelled.
 - ※ The time display of the warming process is changed in units of one hour.

6-4. Memory function

Preferred operating conditions can be called up easily by memorizing them.

<Memorizing the preferred course>

- ① Set and display preferred operating conditions.
- ② Hold down the [Memory] key.

The buzzer sounds approximately after two seconds and preferred operating conditions are memorized.

※ All operating conditions displayed are memorized.

<Calling the memory>

- ① Press the [Memory] key.

The memory indication lamp lights and operating conditions are displayed.

6-5. Timer function

The waiting time till the start of operation can be specified. Timer setting can be performed by following the procedures given below after the lid status is confirmed by the lid open/close detection system and the desired operating conditions are set.

※ The lid status should be confirmed by the lid open/close detection system before pressing the [Start] key. When the lid indication lamp goes out, the confirmation by the lid open/close detection system is completed.

<Memorizing the preferred course>

- ① Press the [Timer] key.

The timer indication lamp lights and the waiting time is displayed at the warming/timer display.

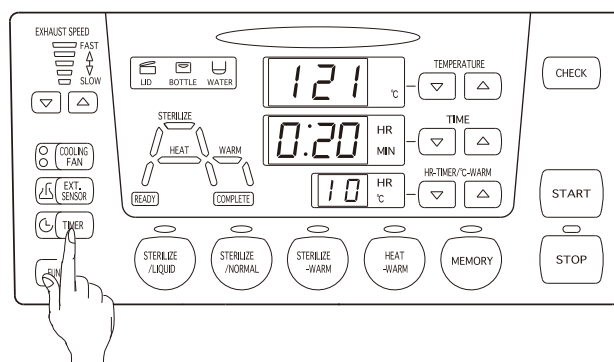
- ② Press the [Warming/timer setting] keys to set the waiting time when the timer indication lamp is illuminated.

※ The settable range of the timer waiting time is 1 to 99 hours.

- ③ Press the [Start] key when the timer indication lamp is illuminated.

The operation indication lamp lights and the remaining waiting time is displayed at the warming/timer display.

※ Operation can be interrupted by pressing the [Stop] key.



6-6. Checking function

The set temperature and time can be displayed during operation.

The actual temperature can be displayed during display of the set values.

<Checking the set temperature and time>

- ① Press the [Check] key when the operation indication lamp is illuminated.

The set temperature and time are displayed while the key is depressed.

<Checking the actual temperature>

- ① Press the [Check] key when the operation indication lamp is not illuminated.

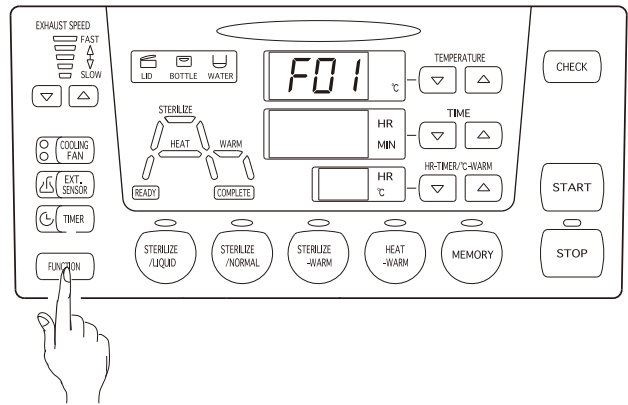
The actual temperature is displayed while the key is depressed.

6-7. Setting the temperature which releases the interlock of the chamber lid

The autoclave lid interlock system does not allow the lid to be opened while the temperature inside the chamber or temperature measured by the temperature sensor for materials to be sterilized (optional) is high. The temperature to release the lid interlock can be changed according to the operating conditions.

<Memorizing the preferred course>

- ① Hold down the [Function] key when the operation indication lamp is not illuminated.
After approximately two seconds, "F01" blinks at the temperature display.
- ② Display "F02" by pressing the [Temperature setting] keys.
The temperature releasing the interlock of the chamber lid is displayed at the time display.
- ③ Press the [Start] key.
The time display blinks.
- ④ Press the [Time setting] keys to display the desired temperature releasing the interlock of the chamber lid.
- ⑤ Press the [Start] key to determine the temperature which releases the interlock of the chamber lid.
 - ※ The temperature is set to 97 °C at the time of shipment from the factory.
 - ※ The settable range of the temperature which releases the interlock of the chamber lid is 60 to 100 °C.



6-8. Setting the warming time

The warming time can be changed.

- ① Hold down the [Function] key when the operation indication lamp is not illuminated.
After approximately two seconds, "F01" blinks at the temperature display.
The warming time is displayed at the time display.
- ② Press the [Start] key.
The time display blinks.
- ③ Press the [Time setting] keys to display the desired warming time.
- ④ Press the [Start] key to determine the warming time.
 - ※ The temperature is set to 4 hours at the time of shipment from the factory.
 - ※ The settable range of the warming time is 1 to 99 hours.

6-9. Setting the time display form

The display form of the time display can be changed.

<Memorizing the preferred course>

- ① Hold down the [Function] key when the ready indication lamp is illuminated.
After approximately two seconds, "F01" blinks at the temperature display.
- ② Display "F04" by pressing the [Temperature setting] keys.
The code of the display form is shown at the time display.
- ③ Press the [Start] key.
The time display blinks and the code of the display form is displayed.
- ④ Press the [Time setting] keys to display the code of the desired form.

Code	Display form	Display range
0	Hour : minute	0 : 01 ~ 9 : 59
1	Hour	1 to 99 hours
2	Minute	1 to 999 minutes
3	Hour : minute / hour	0 : 01 ~ 9 : 59 / 10 to 99 hours

- ⑤ Press the [Start] key to determine the code of the display form.
※ The code is set to "0 (hour: minute)" at the time of shipment from the factory.

6-10. Setting the exhaust mode for liquid sterilization operation

Regarding exhaust for liquid sterilization operation, the variable setting permitting fine adjustment of valve opening can be selected as well as the normal exhaust speed setting.

- ① Hold down the [Function] key when the ready indication lamp is illuminated.
After approximately two seconds, "F01" blinks at the temperature display.
- ② Display "F03" by pressing the [Temperature setting] keys.
The code of the exhaust setting mode for liquid sterilization operation is displayed at the time display.
- ③ Press the [Start] key.
The time display blinks.
- ④ Press the [Time setting] keys to display the code of the desired exhaust setting mode.

Code	Exhaust setting mode	Contents
0	Exhaust speed setting	Six-step setting
1	Variable setting	Variable

- ⑤ Press the [Start] key to determine the code of the exhaust mode for liquid sterilization operation.
※ The code is set to "0 (exhaust speed setting)" at the time of shipment from the factory.

7. OPTIONAL FUNCTIONS

The following optional accessories and functions are available for use with the autoclave:

■ Temperature sensor for materials to be sterilized

The temperature sensor for materials to be sterilized is placed directly into the material in the chamber for accurate monitoring of sterilization process. It ensures that the autoclave begins the sterilization time countdown only when the temperature of the material has reached a set sterilization temperature ※ . During the heating course, the countdown for the heating process starts when the temperature of the material to be dissolved reaches a set value.

※ A temperature is controlled for this function to within $\pm 2^{\circ}\text{C}$ of the set value. The optional temperature sensor is also used for releasing the lid interlock and completing an operation.

■ Temperature/pressure data output function

The autoclave can output maximum two analog signals from the data of the temperature and the pressure inside the chamber or the temperature of the materials to be sterilized. When connecting to the recorder optional, the data can be stored.

■ External temperature sensor/recorder

The external temperature sensor independent of the autoclave will measure the temperature inside the chamber and the result can be stored in the recorder.

■ Printer

Data of the chamber temperature, chamber pressure and temperature of the item being sterilized can be printed out on an optional thermal printer.

To operate the optional printer, please refer to the separate SX Series Autoclaves "Optional Functions" Operator's Manual.

7-1. Temperature sensor for materials to be sterilized

Measures the set temperature for the sterilizing or heating process during preparation and commences the countdown. The optional temperature sensor is also used for releasing the lid interlock and completing an operation.

<Setting temperature sensor>

- ① Press the [Temperature sensor] key to select the function. The temperature sensor indication lamp lights.
 - ※ While the indication lamp is on, the sensor detects the set temperature for sterilizing.
 - ※ Please note that the temperature display on the control panel shows the temperature inside the chamber. It does not show the temperature measured by the external sensor.
 - ※ When this function is not provided by the autoclave, the indication lamp will not be illuminated by pressing the [Temperature sensor] key.

<Releasing the setting for temperature sensor>

- ① Press the [Temperature sensor] key again to release the setting. The indication lamp turns off and the autoclave returns to its normal function.

<Measuring material temperature with the sensor>

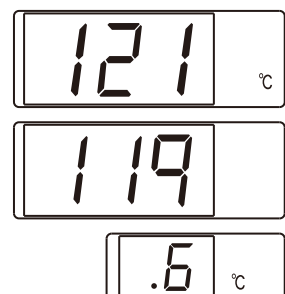
Place the head of the sensor, which measures temperature, directly inside the material to be sterilized or heated.

<Setting the temperature to release the lid interlock>

To set the lid interlock release temperature, please refer to “6-7. Setting the temperature which releases the interlock of the chamber lid”.

<Displaying temperature of materials to be sterilized>

- ① Press the [Temperature sensor] key, while holding down the [Check] key. The material temperature measured by the sensor is displayed on the time display and the warming/timer display.
 - ※ The whole number is displayed on the time display and the first decimal number on the warming/timer display.



7-2. Data output function (temperature/pressure)

The autoclave has an optional function to select maximum two data from the temperature and the pressure inside the chamber or the temperature of the materials to be sterilized and transmit analog output signals to the recorder optional.

■ Selecting output data

The table below shows the available selection for data output for each option order:

Number	Selected Parameters	
	Terminal CH1	Terminal CH2
1	chamber temperature	chamber pressure
2	chamber temperature	material temperature
3	chamber pressure	material temperature
4	chamber temperature	-
5	chamber pressure	-
6	material temperature	-

※ When outputting the data of the material temperature, an optional temperature sensor is required.

■ Connecting to the recorder

Connect the two pair of the lead wire from the autoclave to the terminal of the recorder as follows.

Even for a single output order SX-Series Autoclave has two pairs of lead wires, of which only one will be used. Do not connect unused terminal.

- CH1: the red lead to the (+) terminal of the recorder
the red/white lead to the (-) terminal of the recorder
- CH2: the blue lead to the (+) terminal of the recorder
the blue/white lead to the (-) terminal of the recorder

■ Data output specifications

Parameter	Chamber temperature	Chamber pressure	Material temperature
Signal, output	8-bit D/A Converter for sensor output, direct current voltage		
Output range	0 to 150°C	0 to 0.3 MPa	0 to 150°C
Voltage range	0 to 1.5 V		
Resolution	5.88 mV/Resolution		
	0.59°C	1.1kPa	0.59°C

7-3. External temperature sensor/recorder

Connect the external temperature sensor of the autoclave to the recorder and start operation.

※ Refer to the operator's manual of the recorder.

8. PREVENTIVE MAINTENANCE

⚠WARNING



Before carrying out preventive maintenance work, unplug the power plug of the autoclave from the outlet.

- Contravention is dangerous with likelihood of electric shock. For models with which a power plug is not provided, turn OFF the breaker to which the power cable is connected.

⚠CAUTION



Carry out preventive maintenance work only after the temperature in the chamber has fallen sufficiently.

- Contravention is dangerous with likelihood of burns due to high temperature.

8-1. Cleaning and disinfecting the main unit

When the outer covering or the inside of the chamber is contaminated, carry out cleaning or disinfection following the procedures given below.

<Cleaning the main unit>

- ① Remove contaminants using a soft cloth moistened with mild detergent.
- ② Wipe off detergent using a tightly wrung-out damp cloth.

<Disinfecting the main unit>

- ① Carry out disinfection using ethanol.

8-2. Preventive maintenance to be carried out every week

⚠WARNING



Stop operation when corrosion, damage, or deformation is found on the chamber, chamber lid, hinges, hinge shafts, cover rings, lid hooks, or lid hook catches.

- Contravention is dangerous with likelihood of death or serious accident due to blowout during rise of the pressure. When an abnormality is found, contact the dealer or business institution of our company.



Stop operation when damage such as cracks is found on the chamber lid gasket.

- Contravention is dangerous with likelihood of scalds due to steam leakage. When an abnormality is found, contact the dealer or business institution of our company.



Unplug and check the power plug regularly.

- Failure to do so may cause a fire or burnout.

For ensuring safe operation of the autoclave, carry out cleaning and inspection described below every week as a guide.

<Cleaning>

1. Cleaning the inside of the chamber and the water level sensor

- ① Remove the grating carefully.
- ② Thoroughly clean the inside of the chamber and the water level sensor using mild detergent and cloth or other suitable material, then wash out the detergent by means of tap and drain water.
 - ※ Be careful not to distort the sensors in the chamber during cleaning.

2. Cleaning the lid gasket

- ① Wipe off the surface of the chamber lid gasket using a damp soft clean cloth etc. without applying force.
 - ※ Be careful not to damage the lid gasket, while cleaning.
- ② Wipe off opening of the chamber using a soft clean cloth etc.

3. Cleaning the outer covering

- ① Remove contaminants using a soft cloth moistened with mild detergent.
- ② Wipe off detergent using a tightly wrung-out damp cloth.

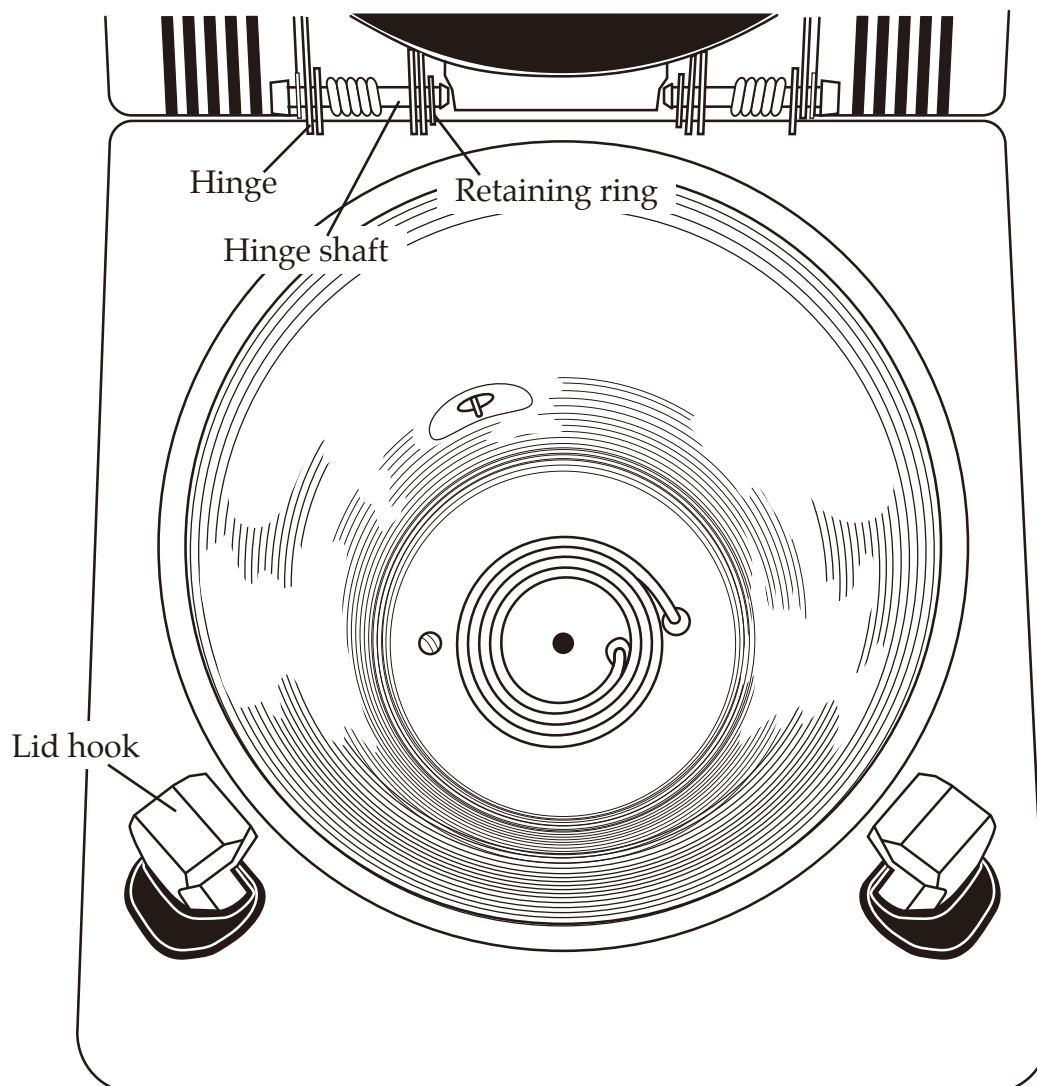
<Inspection>

1. Checking the leakage breaker

- ① Turn ON the power supply switch on the main unit.
- ② Press the gray test button within the power supply switch using a slim rod.
When the switch is turned OFF automatically, the leakage breaker is normal. When it is not turned OFF, contact the dealer or business institution of our company.

2. Checking the pressure chamber

- ① Check for any damage such as cracks on the chamber lid gasket.
- ② Check for any corrosion or damage such as cracks in the inside of the chamber.
- ③ Check for any corrosion or damage such as cracks on the chamber lid.
- ④ Check for any corrosion or cracks on the hinges, hinge shafts, retaining rings, lid hooks, or lid hook catches.



3. Maintenance of the Power Plug (for the unit with the power plug only)

- ① Unplug the power plug.
- ② Using dry cloth, wipe off any dust particles or other objects from the surface of the power plug.
 - ※ If the power plug generates abnormal heat or has any burn marks on it, stop using the equipment and call for service.
 - ※ If the power plug is too loose in the outlet, stop using the equipment and call for service.

8-3. Replacing the chamber lid gasket

If the chamber lid gasket shows any signs of deterioration or damage, replace it as follows: Use extreme caution while performing the replacing procedure and ensure there is no damage to the chamber lid gasket or the spring band of the gasket gland.

⚠WARNING



After replacing the chamber lid gasket, be sure to make a test run.

- Make sure the chamber lid gasket is properly installed, otherwise a steam leak through the lid may cause burns.

⚠CAUTION

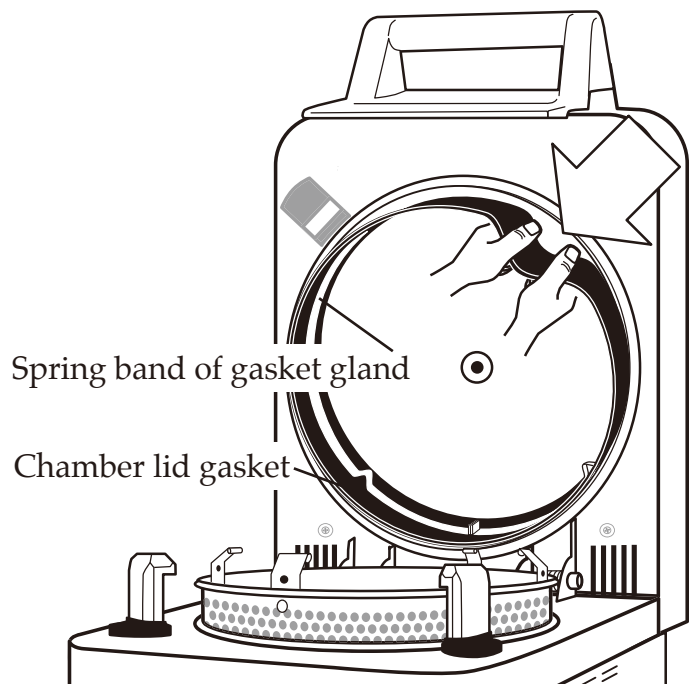


Extra care should be taken when handling the spring band of the gasket gland.

- The elastic force may cause unexpected injuries. Be sure no other people are in the immediate vicinity when handling the spring band.

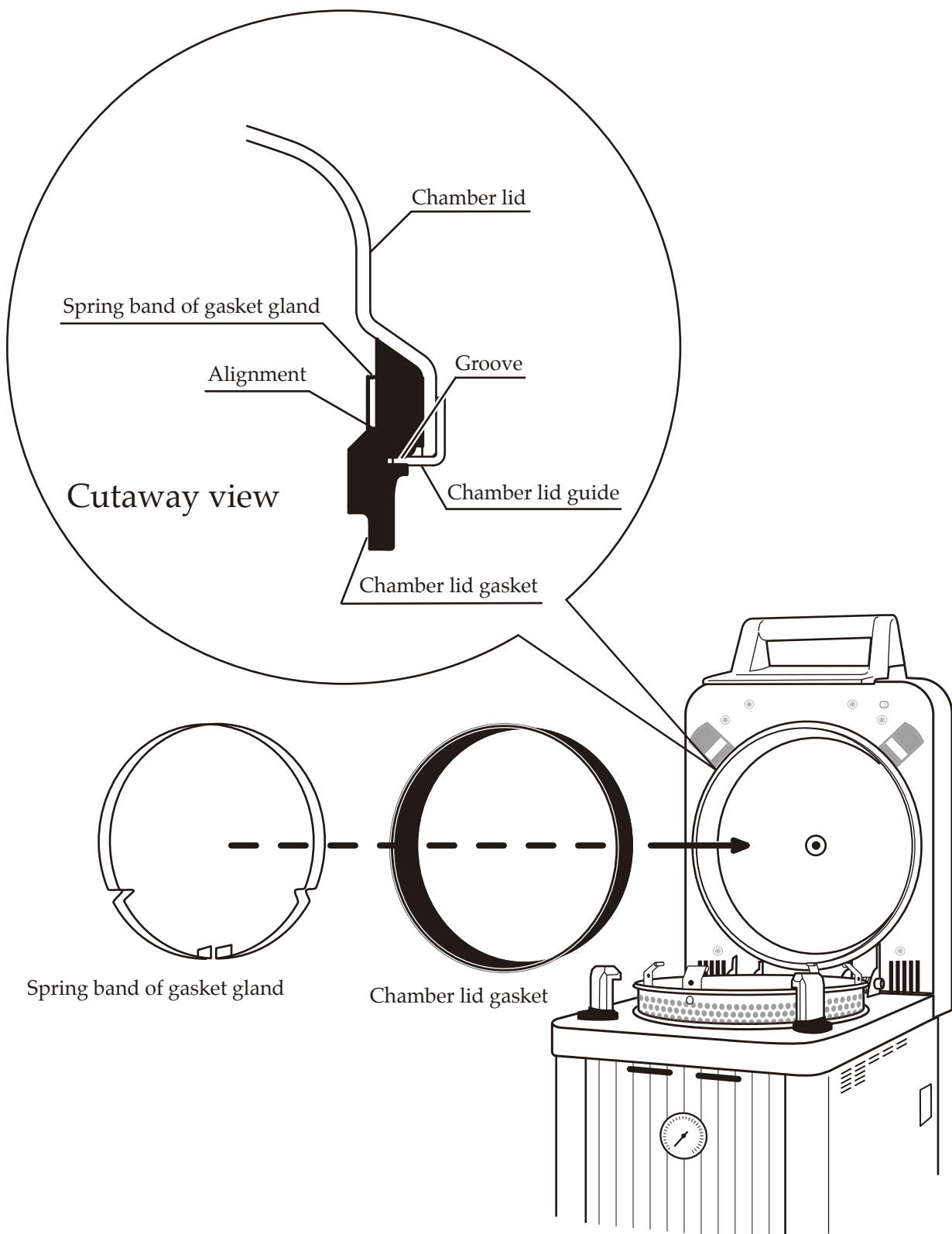
<Replacing the chamber lid gasket>

1. Remove the chamber lid gasket.
 - ① Grip the upper right of the lid gasket with the hands as shown in the photo and pull it down to the lower left to make a deflection on both the lid gasket and the spring band of the gasket gland.
 - ② Pull both the lid gasket and the spring band of the gasket gland off the rim to remove them.



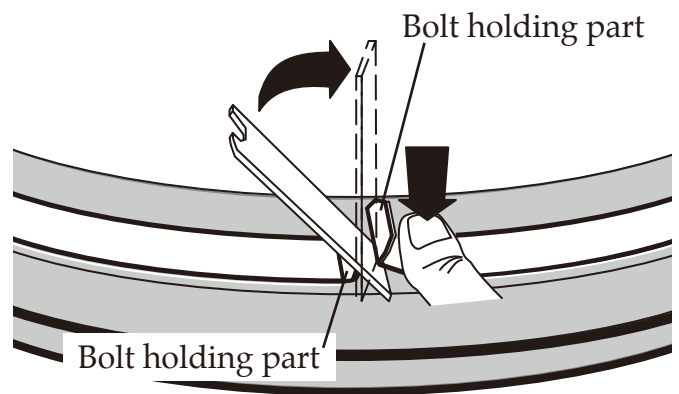
2. Install the chamber lid gasket.

- ① Install the new lid gasket so that the gasket groove rests firmly in the chamber lid guide.



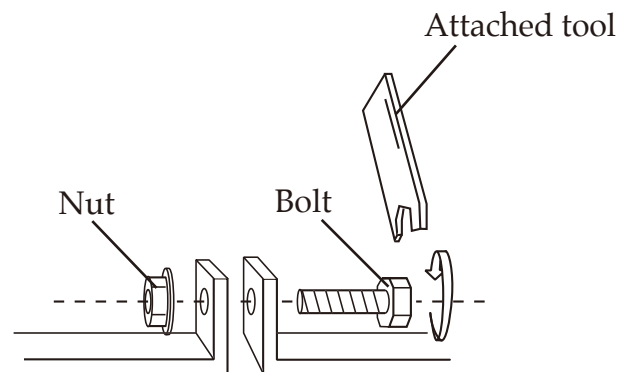
- ② Put the spring band of the gasket gland inside the chamber lid gasket so that the bolt holding part of the spring band lies beneath the lid gasket.

※ Do not install the chamber lid gasket with the spring band of the gasket gland secured with a bolt. Any deflection on the spring band prevents it from holding down the lid gasket tightly. Install the chamber lid gasket properly by following the procedures provided in the operator's manual.



- ③ Insert the attached tool handle into the joint gap in the bolt holding parts of the folded spring band. Move the tool as shown in the photo and bring the bolt holding parts together while pressing down the top part of the spring band.

- ④ Fasten the nut with the attached tool as shown in the photo to secure the spring band of the gasket gland.



3. Make a test run.

Make a test run to ensure that there is no steam leak around the chamber lid gasket. Perform the following procedures to run the test.

- ① Set the temperature for the sterilization cycle at 135°C without placing items to be sterilized following the 5. Operating Procedures stated in this operator's manual. Set any given value for the time, cooling fan, and exhaust level.
- ② Start the sterilizing operation.
- ③ Make sure that there is no steam leak around the chamber lid gasket until the chamber temperature reaches 135°C.
 - ※ Immediately stop running the instrument when the steam leak has found and contact your dealer or the nearest TOMY office for an inspection.
- ④ Press the stop key to end the operation after confirming that no steam leaks out of the lid.

9. WHEN A MALFUNCTION IS SUSPECTED

When the autoclave does not operate normally even though operation is carried out according to the operation manual, carry out checking by referring to “Problems and countermeasures”. When a problem is not in accordance with the items or its countermeasures seem to be difficult, unplug the power plug of the autoclave from the outlet and contact the dealer or business institution of our company.

9-1. Problems and countermeasures

Problem	Cause	Countermeasures
Nothing is displayed on the control panel although the power supply switch is turned ON.	The power cable is not connected.	Check the power cable for connection.
	The fuse or breaker at the power supply side is blown or tripped.	Connect the power cable to the power supply with the power capacity required for the autoclave.
The temperature rises slowly.	The volume of water in the chamber is extremely large.	Check the volume of sterilizing water and optimize the volume.
	The volume of articles to be sterilized is large.	Optimize the volume of articles to be sterilized.
Sterilization is not carried out sufficiently.	The sterilizing time is insufficient.	Extend the sterilizing time.
Steam leaks from the chamber lid.	Dusts etc. are adhering to the chamber lid gasket or opening of the chamber.	Clean the chamber lid gasket or opening of the chamber.
	The chamber lid gasket is damaged or broken.	Unplug the power plug of this instrument from the outlet and contact us or our dealer/ distributor from which you purchased this instrument for repair service.
Steam leaks from the safety valve.	The pressure in the chamber is high.	Unplug the power plug of the autoclave from the outlet and contact the dealer or business institution of our company.
An error code is displayed and operation does not start or is interrupted.	Take countermeasures corresponding to the relevant error code referring to the error code table.	

9-2. Error code table

Error code	Cause	Countermeasures
E01	Sterilizing water is insufficient.	Replenish sterilizing water.
	The water level sensor is contaminated.	Clean the water level sensor.
	Deionized water was used in the chamber.	Drain deionized water and add tap water. (Refer to 5-5. Checking sterilizing water.)
	Extremely cold water was used in the chamber.	Add hot water and raise the temperature.
E04	The volume of sterilizing water in the chamber becomes insufficient during operation.	Turn OFF the power supply switch temporarily. Open the chamber lid after the pressure in the chamber falls to 0 MPa and replenish sterilizing water.
E05	The temperature in the chamber is abnormally higher than the set value during sterilization operation, heating operation, or warming.	Unplug the power plug of the autoclave from the outlet and contact the dealer or business institution of our company.
E06	The pressure rises because the form of articles to be sterilized is likely to retain air.	Turn OFF the power supply switch temporarily. Open the chamber lid after the pressure in the chamber falls to 0 MPa. Take countermeasures so that air can escape easily from articles or reduce the volume of articles. (Refer to 5-6. Placing articles to be sterilized.)
E07	The temperature sensor has fractures.	Unplug the power plug of the autoclave from the outlet and contact the dealer or business institution of our company.
E08	The temperature in the chamber is abnormally below the set value during sterilization operation, heating operation, or warming.	Unplug the power plug of the autoclave from the outlet and contact the dealer or business institution of our company.
E09	The chamber lid is open.	Close the lid securely. When this error occurs during operation, unplug the cable from the outlet and contact your dealer or our local service representative.
	The lid open/close detection system is not working. ※ 1	Open or close the lid.
E10	The interlock of the chamber lid is not activated.	Unplug the power plug of the autoclave from the outlet and contact the dealer or business institution of our company.
E11	The temperature does not rise during the temperature raising process or the temperature and pressure raising process.	Unplug the power plug of the autoclave from the outlet and contact the dealer or business institution of our company.
E12	The pressure sensor of articles to be sterilized has fractures or is defective.	Unplug the power plug of the autoclave from the outlet and contact the dealer or business institution of our company.
E13	The temperature sensor of articles to be sterilized has fractures or is defective.	Unplug the power plug of the autoclave from the outlet and contact the dealer or business institution of our company.
E15	The valve through which air escapes is defective.	Unplug the power plug of the autoclave from the outlet and contact the dealer or business institution of our company.
E18	Lid parts are at the end of their service life and need to be replaced.	Contact the dealer or business institution of our company. (Press the STOP key to temporarily cancel the error and return to the operational mode.)

※ 1 To ensure safety operation, the Autoclave employs the lid open/close detection system. To activate the system please open or close the lid every time before the operation is started or the timer is set.
To resume operation after a blackout without opening the lid, please contact your dealer or our local service representative.

Error code	Cause	Countermeasures
E20	The pressure in the chamber is high when the power is turned ON.	Start operation after the pressure in the chamber falls to 0 MPa.
E21	The exhaust bottle is removed.	Attach the exhaust bottle.
E22	The exhaust hose is bent.	Turn OFF the power supply switch temporarily. Reinsert the exhaust hose so that it is not bent.
	The pressure rises because the form of articles to be sterilized is likely to retain air.	Turn OFF the power supply switch temporarily. Open the chamber lid after the pressure in the chamber falls to 0 MPa. Take countermeasures so that air can escape easily from articles or reduce the volume of articles. (Refer to 5-6. Placing articles to be sterilized.)
E23	The hole in the chamber (exhaust route) is blocked with articles to be sterilized such as a sterilizing bag.	Turn OFF the power supply switch temporarily. Open the chamber lid after the pressure in the chamber falls to 0 MPa. Reattempt to place articles to be sterilized so that the hole in the chamber is not blocked. If the mouth of the sterilizing bag is closed, open it.
E24	The temperature in the chamber is 0°C or less.	Operate the autoclave after the main unit is warmed up to the temperature satisfying the environmental condition.
E25	Control system abnormality.	Turn OFF the power supply switch temporarily. Open the chamber lid after the pressure in the chamber falls to 0 MPa. Take countermeasures so that air can escape easily from articles or reduce the volume of articles. (Refer to 5-6. Placing articles to be sterilized.)

9-3. Contact addresses of business institutions

⚠WARNING



When returning the autoclave or its parts, or requesting repairs, disinfect the autoclave or parts when condition 1 or 2, given below, applies.

- 1 : When the autoclave or any part of the autoclave has been subjected to contamination by infectious and dangerous material or radioactive material.
- 2 : When blood or other chemicals have pooled in the autoclave or any part of the autoclave, of types which may be judged to be dangerous to personnel.

If any system malfunction or abnormality in the autoclave is suspected, contact your dealer or the following TOMY offices.

For Assistance or Service Contact ;

TOMY SEIKO CO.,LTD.

TOMY DIGITAL BIOLOGY CO., LTD.

3-14-17 Tagara, Nerima-ku, Tokyo 179-0073, Japan

e-mail : info@digital-biology.co.jp

URL : <http://www.digital-biology.co.jp>

phone : +81-3-5971-8160 fax : +81-3-3970-6036

10. SPECIFICATIONS

Model name		SX-300	SX-500	SX-700
Environmental temperature range	Sterilizing	105 ~ 135°C (0.019 ~ 0.212MPa)		
	Heating	45 ~ 104°C (0 ~ 0.015MPa)		
	Warming	45 ~ 95°C		
Maximum operating pressure		0.263MPa		0.25MPa
Temperature	Display form	Digital		
	Display range	-9 ~ 155°C		
Pressure gauge	Display form	Analog		
	Display range	0 ~ 0.4MPa		
Heat source		1.5kW electric fire	2.0kW electric fire	3.0kW electric fire
Safety mechanism		* Blank heating prevention * Leakage breaker * Lid interlock * Over-heating prevention * Over-pressure prevention * Temperature sensor break detection * Safety valve		
Leakage breaker	Rated breaking current	15A/120V	20A/120V	-
		15A/230V	15A/230V	15A/230V
	Rated sensed current	10mA		
Protection against electric shock		Class I		
Time	Display form		Digital	
	Display range	Sterilizing	0:00 ~ 9:59 (changeable)	
		Heating	0:00 ~ 9:59 (changeable)	
		Warming	0 ~ 99 hours	
Chamber dimensions		φ 325 × 553mm	φ 325 × 733mm	φ 370 × 774mm
Effective diameter × Effective depth		φ 315 × 458mm	φ 315 × 638mm	φ 360 × 675mm
Chamber capacity		Effective internal volume:36L, Internal volume:44L	Effective internal volume:50L, Internal volume:58L	Effective internal volume:69L, Internal volume:79L
Chamber material		SUS304		
External dimensions		410W,477D,790Hmm (Protruding : 574Dmm)	410W,477D,970Hmm (Protruding : 574Dmm)	470W,528D,1003Hmm (Protruding : 625Dmm)
Weight		50kg	60kg	72kg
Rated voltage		120V AC		-
		230V AC		230V AC
Power input		13A/120V 7A/230V	17A/120V 9A/230V	- 13A/230V
Required power supply		Single-phase 120V AC (50/60Hz) 15A or more	Single-phase 120V AC (50/60Hz) 20A or more	-
		Single-phase 230V AC (50/60Hz) 10A or more	Single-phase 230V AC (50/60Hz) 15A or more	Single-phase 230V AC (50/60Hz) 15A or more
Power consumption (calorific power)		1.5kW	2.0kW	3.0kW
Accessories		Stainless baskets (φ 300 × 182mm)—1	Stainless baskets (φ 300 × 182mm)—2	Stainless baskets (φ 345 × 181mm)—2
		Caster stopper—4, Slatted Bottom Plate—1, Operator's Manual—1, Clear Plastic Accessory Case—1, Attachment Screw for Clear Plastic Accessory Case—1, Inspection Sheet—1, Warranty card—1, Customer card—1		

MEMO

TOMY SEIKO CO.,LTD.

TOMY DIGITAL BIOLOGY CO.,LTD.

3-14-17 Tagara, Nerima-ku, Tokyo 179-0073, Japan

e-mail : info@digital-biology.co.jp

URL : <http://www.digital-biology.co.jp>

Phone : +81-3-5971-8160 fax : +81-3-3970-6036