No. S01G-006-B

HIRAYAMA

HIRAYAMA AUTOCLAVE **HICLAVE** HVP-50 **OPERATION MANUAL**



· Accidents can occur if this autoclave is operated in the same way as an ordinary gas instrument or electrical appliance. Be sure to read this instruction manual carefully and understand its contents before attempting to operate this instrument.

VERY IMPORTANT:

In Modes 1 and 2, you should hear the vacuum turning on after pressing the START button. If it does not because the pump has not be used for some time, use an appropriate tool to turn the shaft of the vacuum pump clockwise about 90° to 180°. In some models, you have to remove the cover at the rear of the HVP-50 to access the motor shaft. In others, there is a round access opening on one top side of the cover so that you don't have to remove it.

- This manual covers the operation and basic maintenance procedure for the Autoclave HVP-50. Proper handling will allow the autoclave to demonstrate its full performance and ensure a long lifetime for the instrument.
- Please confirm that this product conforms to your order, and confirm that it was not damaged during transport. In the event of damaged or broken equipment, please contact our authorized distributor in your region.
 - (1) No part of this document may be reproduced without permission.
 - (2) The contents of this document are subject to change without notice.
 - (3) This document has been carefully compiled. If you have any questions or require information not covered in the manual, please contact our authorized distributor in your region.

Revisions

No.	Date	Description of revision	

Read Carefully Before Using

Set the operation responsibility person of this product.

In this manual the following headings are applied to items to which great attention should be given:

A WARNING:

Failure to observe this warning can cause serious

physical injury to the operator or destruction of the

equipment.

CAUTION:

Failure to observe this caution can cause physical

damage to the equipment.

(!) IMPORTANT:

Items the operator is strongly advised to obey.

△ NOTE:

Items that will aid in proper operation of the equipment.

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WARNING:

Never use the autoclave to sterilize any of the following hazardous materials or substances with alkali content. Sterilization of such objects can cause explosion, corrosion of the working chamber or chamber piping, and deterioration of gaskets.

List of Hazardous Materials (see: Workers Safety and Sanitation Law, Appendix Table 1, Hazardous Materials)

(1) Explosive substances

- 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.

(2) Ignitable substances

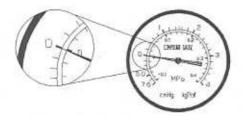
- Metallic lithium, potassium, sodium, yellow phosphorous, phosphorus sulfide, and red phosphorus
- Celluloids, calcium carbide (carbide), lime phosphide, and magnesium powder
- Aluminum powder, magnesium powder, and metallic powders other than aluminum powder
- Sodium dithionite (or sodium hydrosulfite)

(3) Oxidizing agents

- Potassium chlorate, sodium chlorate, ammonium chlorate, and other chlorates
- Potassium perchlorate, sodium perchlorate, ammonium perchlorate, and other perchlorates.
- Potassium peroxide, sodium peroxide, barium peroxide, and other inorganic peroxides
- Potassium nitrate, sodium nitrate, ammonium nitrate, and other nitrates
- · Sodium chlorite and other chlorites
- Calcium hypochlorite and other hypochlorites

(4) Flammable substances

- Ethyl ether, gasoline, acetaldehyde, propylene oxide, carbon disulfide, and other substances whose flash points range from -30 to 0°C.
- Methanol, ethanol, xylene, benzyl acetate (or amyl acetate), and other substances whose flash points range from 0 to 30°C.
- Kerosene, gas oil, turpenine oil, isopentyl alcohol (or isoamyl alcohol), acetic acid, and other substances whose flash points range from 30 to 65°C.
- (5) Flammable gas (hydrogen, acetylene, ethylene, methane, ethane, propane, butane, and other substances that are gases at a temperature of 15°C under 1atm of pressure.)
- When liquid with salt water and much salinity of salt agar etc. spills in the chamber, blowing, discharge water in the chamber and wipe up drop of water around the lid gasket beautifully. It causes the corrosion of the chamber and the piping when leaving just as it is.
- Check that the pressure is below 0Mpa (0Kg/ cm²) before opening the lid.



Absolutely do not attempt to remodel or alter this product.

A CAUTION:

- Foreign matter (metals, liquid) may enter through the vent hole.
 Operating the equipment with such foreign matter inside may cause trouble with the equipment, fire, or electric shock.
- Do not forcibly bend, twist, tie or extend the power cord. Do not place heavy objects on the cord. A damaged cord or exposed wire can cause fire or electric shock.
- Never connect the power cord to a power supply other than one of the rated voltage.
 Connection to such a power supply can cause fire or electric shock.
- If grounded socket is unavailable, ground the equipment using a separate ground wire before connecting the power cord to the power source.
- Securely connect the ground to a line that meets D Grounding work Specifications. Never ground to a gas pipe or vinyl chloride water service pipe.
- Close the lid after confirming that no foreign matter is adhering to the section contacting the lid gasket. Foreign matter in this section can cause vapor leaks.
- Be careful not to pinch your hands when closing the lid.
- Do not put your face or hands close to the working chamber when lifting the lid after operations are complete; steam can gush out of the chamber.
- The working chamber and panel are extremely hot immediately after operation. Burns can result if the equipment is touched.
- Put on heat insulating gloves before removing a substance from the working chamber. Do
 not put hands into the chamber until the steam has been vented.
- Some time is required for liquids to cool. Be sure to check that the temperature has dropped sufficiently before unloading a liquid from the working chamber or burns can result.
- Do not unload the exhaust bottle or drain the working chamber when the chamber is under pressure. Boiling water or steam can gush out causing burns.
- If any abnormality occurs (e.g. abnormal sounds, smells, smoke), immediately shut the power off. After checking to see that the abnormal condition does not continue, call our authorized distributor in your region.
- If the display reading changes between steps, turn the power switch off then on again.
 If the problem continues, turn the power switch off and call our authorized distributor in your region.
- Check at least once a month if both ends of the flexible drain pipe are firmly secured, and retighten if found loose.

How to Read this Manual

This operation manual consists of the following sections covering the information required for proper operation of the Autoclave HVP-50:

Chapter 1. What is the Autoclave HVP-50?

This section describes the uses and features of the product, and the names and functions of its parts.

Chapter 2. Installation

This section explains where the equipment should be installed and how to install it. The product incorporates precision parts, so be sure to follow the instructions covered in this chapter.

Chapter 3. Operation Method

This section illustrates how to change various set values, and describes operations before starting the equipment and after automatic operation. This section also covers the display and performance of the equipment during automatic operation.

Chapter 4. Maintenance and Servicing

This section explains the methods for draining water from the exhaust bottle or working chamber, and cleaning the body of the equipment.

Chapter 5. Specifications

This section includes dimensions, power consumption, and working range of the product. Refer to this section as required.

Chapter 6. Troubleshooting

This section covers troubleshooting procedures for the product. If you encounter a problem, read this section first.

Appendix

This section contains information on the glossary of terms that appear in the manual. Refer to this section when necessary.

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Chapter 1. What is the Autoclave HVP-50?

1. Product Uses

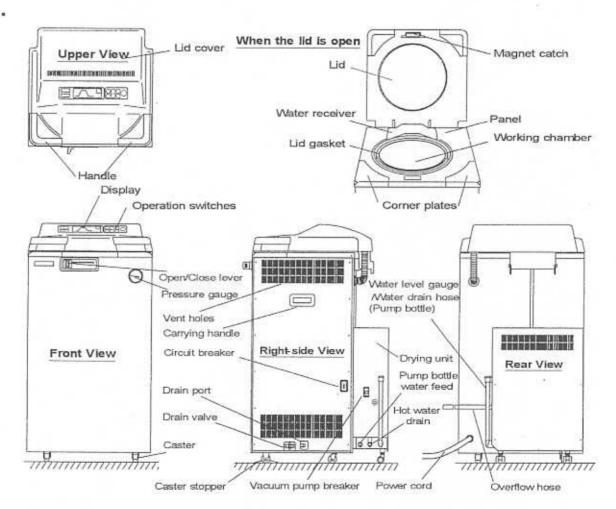
- The product is used to sterilize substances that need drying after sterilization, such as gauze, clothing, etc.
- And that can withstand high temperature and/or high pressure steam, such as tools of glass, ceramic, metal or rubber, water, reagents, liquid medicines, etc.

2. Product Features

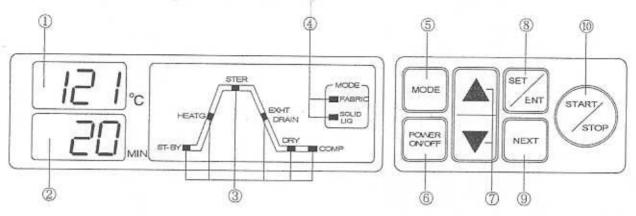
- The product is equipped with a lid cover to protect personnel from the high temperatures reached by the lid during use.
- The product is provided with Sterilization-Drying Mode for substances that need drying after sterilization, and also with independent Drying Mode
- The product is equipped with a vacuum pump and a bacteria separating air filter so as to enable drying under clean condition while keeping the lid closed, and accordingly there is no anxiety of bacterial contamination.

3. Names and Functions of Parts

Outer View of Body



Display and Operation Switches



① Digital Display (Temperature, Error)

The digital display indicates the set temperature when the equipment is in standby and the temperature in the working chamber during operation. When a problem occurs and an error is detected, the display indicates the error.

2 Digital Display (Time, Exhaust Pattern)

The digital display indicates the set time and the set exhaust pattern when the equipment is in standby and the time remaining before completion of sterilization during operation.

- ③ Cycle Display (ST-BY, HEATG, STER., EXHT./ DRAIN, DRY, COMP.)
 All the cycles included in the selected mode illuminate and the current cycle blinks.
- Mode Display (LiQ, SOLID)
 The operation/action of the selected mode lights.

MODE Switch

Selects a mode or checks a set temperature, time, or exhaust pattern.

6 POWER ON/OFF Switch

Turns the power on or off.

Set Value Increase/Decrease Switch (▲, ▼)

Increase or decrease the set values.

8 SET/ENT Switch

Used to change a set value.

NEXT Switch

Selects the item for which the setting will be changed.

START/STOP Switch

Used to start or stop operation.

Chapter 2. Installation

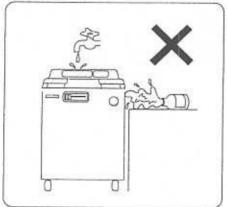


CAUTION:

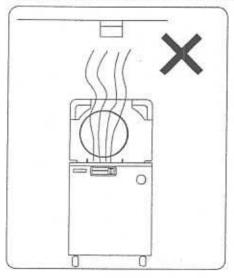
- If the equipment is installed in a place that is 800m or more above sea level (i.e. under low pressure in mountainous areas), the settings must be changed (reset). In this case, be sure to contact our authorized distributor in your region. Do not use the equipment before making the changes.
- When transporting the equipment, close the lid and slide the open/close lever to LOCK side(left end) to prevent the lid from opening.
- When moving the lid, do not hold it by the handle, otherwise the lid may become difficult to close.

1. Installation instructions

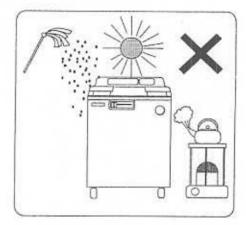
①Avoid installing the equipment in a place where its body may be exposed to water or chemicals, or where corrosive and explosive gases may be produced nearby.



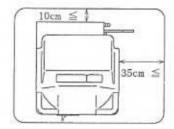
③Avoid placing the equipment directly under a fire detector. If you open the lid immediately after completion of operation, steam comes out of the working chamber, and may activate the detector.



②Avoid installing the equipment in a place within is exposed to high humidity, direct sunlight or much much dust.



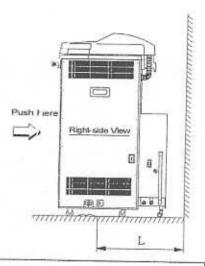
(a) Arrange the eqipment with a clearance of 35cm or wider on the right side and 10cm or wider on the rear side to prevent the vent hiole from being blocked.



- Avoid an installation place which is subject to impact or vibration.
- @Place the unit in a level, firm place.
- ①Avoid installing in a place which is subjected to a room temperature of 5°C or below or 35°C or above.

2. Installation Procedure

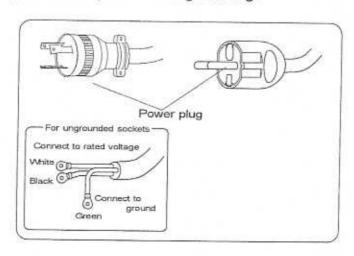
- (1) Put the body on the caster stoppers to prevent it from accidentally moving.
- Anchor the body as described in the following.
 - ①Set the stopper the specified distance from walls. Specified distance L = 65 cm or over
 - ② Push the body until the front casters roll onto the stopper
- (2) Connect the power cord to a properly rated power supply.
- Reliably ground the grounding cable.





WARNING:

- Do not forcibly bend, twist, tie, or extend the power cord. Do not place heavy objects on the cord. A damaged cord or exposed wire may cause fire or electric shock.
- Never connect the power cord to a power supply with a voltage other than the rated voltage. Connection to such a power supply may cause fire or electric shock.
- If plugging the sterilizer into a non-grounded outlet, ground the equipment separately before connecting it to the power source.
- Securely connect the ground to a line made with D Grounding Work. Never ground to a
 gas pipe or vinyl chloride water service pipe.
 - Connect the HVP-50 power cord to an outlet or power supply with special grounding point. When connecting it to a non-grounded outlet, remove the power plug and ground the green cable provided for grounding.



- (3) Connect the attached hose between the pump bottle water inlet and the water tap.
 - Fasten the both ends tightly with the bands.
- (4) Connect the flexible pipe to the hot water drain.
- (5) Open the water tap and supply water to the pump bottle.
 - Close it when water reaches the upper limit of the level gauge/water drain hose.
- (6) Place the tip of the over flow hose at drainage properly.
- (7) Place the tip of the flexible pipe at drainage properly.



NOTE:

Receive by a vessel a small volume of water that spills out from the water inlet, when
detaching the drain hose.

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CAUTION:

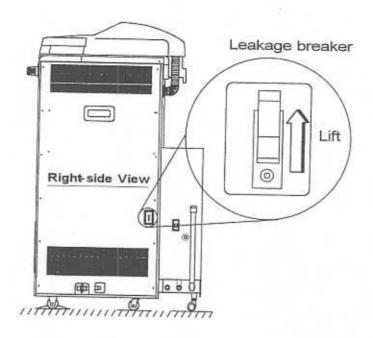
 Ensure to secure firmly the tip of the flexible pipe to prevent it from vibrating wildly when draining. Check at least once a month if both ends of the flexible drain pipe are firmly secured, and retighten if found loose.

! IMPO

IMPORTANT: -

- Do not bend the over flow hose to prevent it from clogging.
- Keep the tip of the over flow hose away from the surface of drainage water in order to prevent drainage water of over flow from flowing back.
- Keep the tip of the flexible drain pipe away from the surface of drainage water in order to prevent drainage water from flowing back.
- Ensure that the size of water drainage is larger than the diameter of the flexible drain pipe in order to prevent drainage water from flowing back.
- Do not bend the flexible drain pipe to an extent to disturb free-fall of drain water.

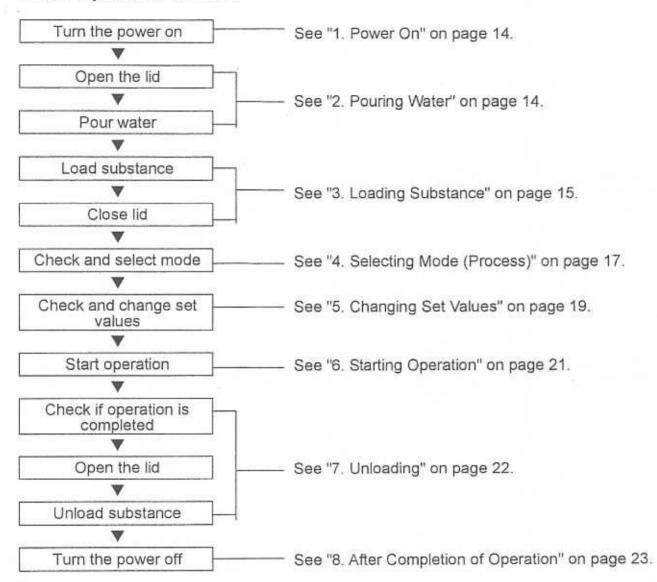
- (8) Turn the breaker ON.
- Turn on the circuit breaker located on the right side of the main body.



- (9) Referring to "Chapter 3. Operation Method", open the lid, and take out the accessories.
- (10) Place the bottom plate in the working chamber.

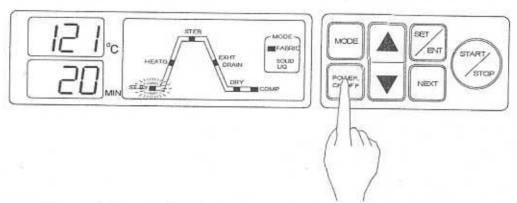
Chapter 3. Operation Method

Basic Operation Method



1. Power On

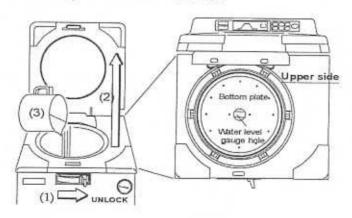
- (1) Press the POWER ON/OFF switch at the front of the body.
- When the open/close lever is set to "LOCK" (left side), setting values are shown on the display, and the autoclave is ready for operation. When the open/close lever moves toward "UNLOCK" (anywhere other than on the left side), "L i d" and "Temperature in the working chamber" are shown alternately on the display.



 If the operation switches and the lock / unlock lever are left un-operated for 30 minutes, the power saving function starts to work so that the display board blackens except for dots blinking at the temperature zone. For reviving the display, please press any of the operation switches.

2. Pouring Water

- (!) IMPORTANT:
- In operation of UNLOCK/LOCK lever, never fail to put POWER switch ON.
 - (1) Slide the open/close lever to UNLOCK position (right end).
 - (2) Grab the handle and lift the lid as shown in the figure below.
 - (3) Pour water through the opening of the working chamber until you can see water through the hole at the center of the bottom plate.
 - The HVP-50 requires 2 liters of water.



3. Loading Substance



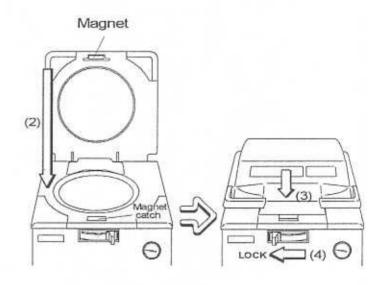
CAUTION:

- Be careful not to pinch hands when closing the lid.
- Close the lid after confirming that no foreign matter is adhering to the section contacting the lid gasket. Foreign matter in this section may cause vapor leaks.

1)

IMPORTANT:

- When using a waste disposal bag for sterilization of substance, place the bag in the wire basket and put it into the working chamber. Not using the basket can cause such problems as excessive temperature, excessive pressure, lack-of-water, etc.
- When the autoclave is operated continuously, keep the lid open until the temperature in the working chamber on the display shows 50°C or below before loading the substance for the next operation (operating the open/close lever).
- Be sure to use the bottom plate.
- Place the substance in the working chamber.
- (2) Hold the handle and lower the lid.
- (3) Press the front center of the lid so as to stick the magnet to the magnet catch.
- (4) With the lid pressed down, slide the Open/Close lever to LOCK.



-△ NOTE:

Gauze, clothing and apparatus already wet cannot be dried.

- Excessive volume of gauze or clothing packed in the drum may cause insufficient sterilization.
- When sterilizing an empty deep container, lay the container on its side in the working chamber so as to attain permeation of steam. Putting it upright may cause insufficient sterilization.
- When sterilizing the substance in a waste disposal bag, do not close the mouth of bag, but open it properly enough to keep the brim of bag away from the chamber wall, in order to attain sufficient sterilization. If the bag is opened too much to make the brim in contact with the chamber wall, it will prevent steam from circulating in the working chamber.

When using the buckets, do not stack them so as to ensure steam to circulate.

For sterilizing liquid substances, the quantity of the liquid contained must be approx. 3/4 of the capacity in case of the Erlenmeyer flasks, or approx. half in case of the test tubes. Excessive quantity of the liquid may result in overflow from the container during the heating or cooling process.

In order to eliminate a possibility of explosion of the containers, ensure free passage of air

by loosening the container caps, or by using the well-ventilated caps.

 When DURHAM sample tube is used, air bubbles may remain. This fact will have to be informed us for modification of the specifications.

Do not load substances (e.g. media) that need a rapid cooling.

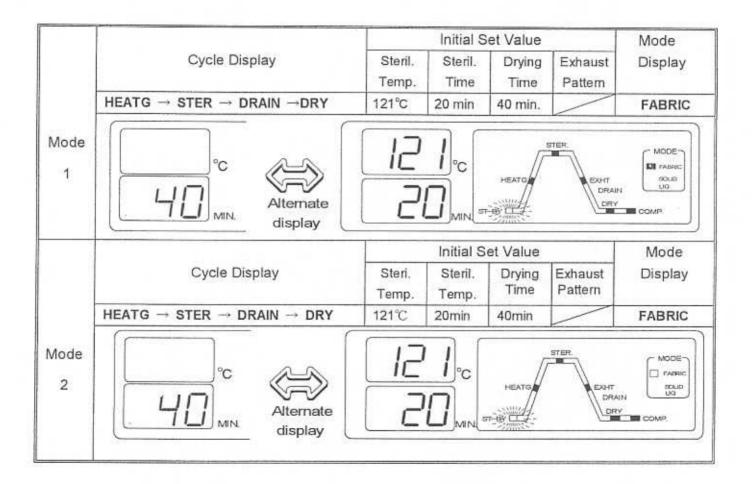
4. Selecting Mode (Process)

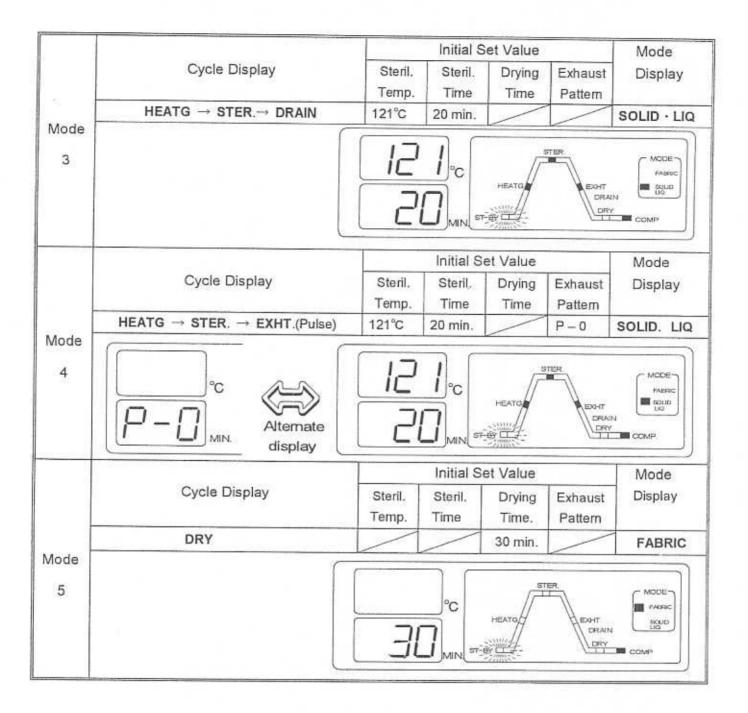
The following modes are programmed in the microcomputer. Select a proper mode.



(1) Press the MODE switch. Each time the switch is pressed the current mode repeatedly changes from Mode 1 to Mode 2, 3, 4, 5, 1... in sequence.

Mode	Application	
1	Sterilization of gauze and clothing (Drying after air purge two times and sterilization).	
2	Sterilization of gauze and clothing (Drying after air purge three times and sterilization)	
3	Sterilization of solids of glass, ceramic, metal or rubber, and wastes packed in disposal bag that withstand high temperature, high pressure steam and abrupt depressurization during the exhaust process.	
4	Sterilization of liquids, such as water, reagents, and liquid medicines, that withstand high temperature, high pressure steam.	
5	Additional independent drying cycle.	





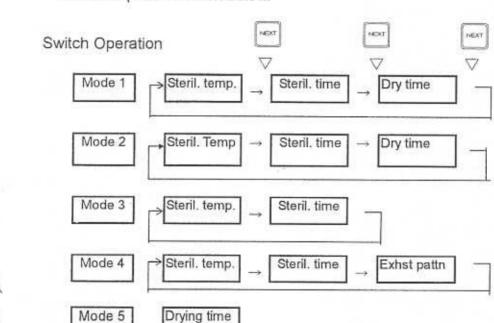
5. Changing Set Values (Registering of Values by Customer)

To change the setting values (sterilization temperature, sterilization time, drying time, exhaust pattern), follow the steps below: The settings cannot be changed once started the operation.

(1) Press the SET/ENT switch.

The sterilization temperature on the display starts blinking, and is ready for changing the value.

(2) Press the NEXT switch to select an item to change. Each time the switch is pressed the item to set will change in the sequence shown below.



(3) Change the displayed value using the adjusting switches

(▲,▼). Each time the switches are pressed, the displayed value increases or decreases as follows.

Sterilization temp.: @ 1°C within a range of 105 - 135°C

Sterilization time: @ 1 min. within a range of 1 – 250 minutes

Drying temperature: @ 1 min. within a range of 1 – 90 minutes

Exhaust pattern: @ 1 within a range of 0 - 2

When keeping a switch pressed, the displayed value increases or decreases 10 times the above rates except for Exhaust Pattern. When the displayed value exceeds the upper/lower limits, its returns to the lower/upper limits.

(4) Press the SET/ENT switch.

The changed value is stored and the display stops blinking and lights up. This completes the setting procedures.

Canceling Setting Value Changes

To cancel changing the set value halfway, press the MODE switch. The changed values will not be stored and the equipment will return to the standby state.



 For sterilization of liquids, set a sterilization time longer than desired, taking a delay time into account according to the table below.
 Example)

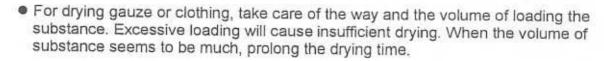
When there is 3 liters of water in a flask, it takes nearly 30 minutes (delay time) for the temperature of the water to reach a set sterilization temperature after the temperature in the working chamber reaches the set value. The sterilization time should therefore be set 30 minutes longer than desired in order to deal with this time delay. The sterilization time is therefore set at 50 minutes.

Set sterilization time (50 minutes) = Delay time (30 minutes) + desired sterilization time (20 minutes)

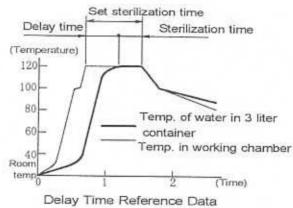
Delay time for reference(per Flask)

Liquid Volume	Delay Time
3 liters	30 minutes
2 liters	25 minutes
1 liter	20 minutes
500 cc	15 minutes

When sterilizing gauze or clothing, it is necessary to prolong the sterilization time by adding an expected delay time to be caused by loading the substances in the dressing drum excessively. (e.g. stacking 8 pieces or more of gauze of 30cm x 10m is too much enough to delay the temperature at the center of the substance to reach the set sterilization temperature.)



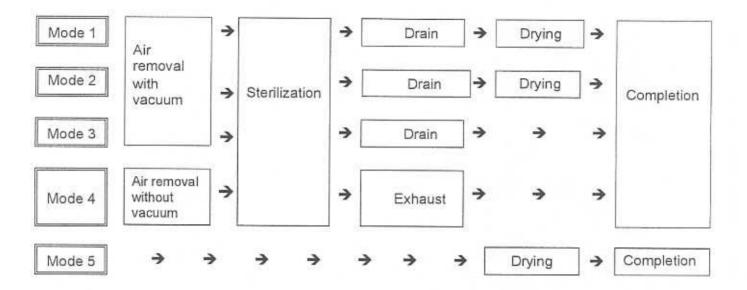
- Abrupt exhaust after sterilization of a liquid may likely cause the liquid to gush out.
 To prevent this, change the exhaust pattern setting depending on the substance.
 - P-0: Exhaust pattern does not work, and equipment is left to sit.
 - P-1: Pulse exhaust works. (very small amount of exhaust)
 - P-2: Pulse exhaust works. (small amount of exhaust)
- The mode, temperature, time, and exhaust pattern are stored even if the power is cut off by the [POWER ON/OFF] switch. However, when the power is cut by putting the circuit breaker to [OFF], or by a power failure, the set values will return to the initial set values of mode 1. In the latter case, reset the set values as desired.



6. Starting Operation



(1) Press the START/STOP switch The open/close lever is locked and the lid can no longer be opened. Thereafter, one of the following processes is executed depending on the chosen mode of operation. For details on each specific mode, see "11. Operation of Cycles" on page 24.



Checking the Set Values during Operation

 To check the set values of temperature, time, or exhaust pattern during operation, press the MODE switch. The set value remains on the display while the switch is held down. Set values are not changeable.

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NOTE:

 In Mode 4, exhaust cycle is either by Pulse Exhaust or Natural Cooling depending on selection of Exhaust Pattern.

$\sqrt{1}$

CAUTION:

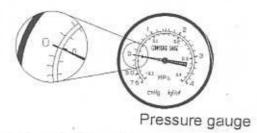
• If large clog enter into water for vacuum pump or vacuum pump is not operated for a long time, vacuum pump locks and doesn't operate. If it locks, the motor is flown with over currency, the vacuum pump breaker in drying unit turn off. The earth leakage circuit breaker turn off and release the locking with reference to "Chapter 4. Maintenance and Servicing 5. Release the locking of Vacuum Pump".

7. Unloading



WARNING:

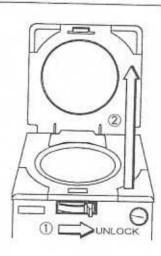
 Before opening the lid, confirm that the pressure gauge for the working chamber reads 0MPa.





CAUTION:

- Keep the face and hands away from the working chamber when lifting the lid after operation is complete; steam will gush out of the opening of the chamber.
- When operation is complete, the lid, chamber and panel are hot. Do not touch these areas with bare hands in order to prevent from burns.
- A long time is required for a liquid substance to cool. Be sure to check that the temperature
 has dropped sufficiently before unloading the substance from the working chamber. The
 temperature of the liquid substance is higher than displayed.
- Unload the substance using the heatproof gloves after confirming the steam is completely vented from the working chamber.
 - Slide the OPEN/CLOSE lever to UNLOCK side (right end).
 - (2) Lift the lid by holding the handles.
 - (3) Unload the sterilized substance out of the working chamber.



8. After Completion of Operation

(1) Turn OFF the circuit breaker after the completion of daily operations.



 To prevent clogging of the piping, discharge the water from the working chamber, once everyday, with reference to "1. Draining the Working Chamber" on page 28.

9. Interrupting Operation

(1) Press the START/STOP switch.



- The current process will be interrupted and the equipment will return to the standby state (the state before operation).
- When removing the sterilized substance from the working chamber, follow the instructions described in "7. Unloading." (The OPEN/CLOSE lever is unlocked only when the chamber temperature drops below 97 °C, and the pressure drops to 0MPa.

10. When Power Supply is Cut Off during Operation

If the power supply is cut off due to power failure or the like, operation is interrupted.
 When power supply is restored, the equipment will revert to the standby state (the state before operation). In this case, repeat operations from the beginning.



NOTE:

If the power supply is cut off due to power failure or the like, the OPEN/CLOSE lever is locked for safety. To open or close the lid, follow the instructions described in "7. Unloading" on page 22 after the power supply has been restored.

11. Operation of Cycles

- Air Removal Cycle --- Modes 1, 2 & 3 = Vacuum pump system

 Mode 4 = Steam pressure system
 - The ST-BY display changes from blinking to lighting, and the HEATG display from lighting to blinking. The temperature in the working chamber is displayed in the digital temperature display.
 - Any amount of air remaining in the working chamber makes the temperature distribution in the chamber uneven, and hinders temperature to rise for sterilization. Air purge with vacuum pump = Mode 1 & 3 (two itmes), Mode 2 (three times). Air purge with steam pressure system = Mode 4.
 - Temperature increases until the set sterilization temperature (pressure) is attained.
 - After the set sterilization temperature is attained, the HEATG display changes from blinking to lighting. Operation then proceeds to the next cycle.
- Sterilization Cycle --- Modes 1, 2, 3 & 4
 - The STER display changes from lighting to blinking, and the set sterilization time appears in the digital display upon activation of the sterilization timer.
 - A constant temperature (pressure) is maintained during the period of the set sterilization time.
 - If the temperature in the working chamber drops 1°C or more from the set value due to any problem, the temperature over-drop mark appears on the digital display, and the digital timer operation is interrupted. When the set temperature is regained, the timer restarts operation.



- The digital timer displays the remaining time during the sterilization cycle. Refer to "Checking the Set Values during Operation" on page 21 for the method of checking the set time during operation.
- When the preset sterilization time has elapsed, the STER display changes from blinking to lighting. Operation then proceeds to the next cycle.

∧ NOTE:

- In sterilization of petri dishes, empty containers or clothing densely packed in the drum, the air remaining in the container expands and may increase the chamber pressure remarkably. If the pressure in the working chamber exceeds the saturated steam pressure, the automatic exhaust valve opens and discharges the air remaining in the chamber.
- Temperature inside the working chamber is so arranged not to go down below the set sterilization temperature.
- Drain Cycle --- Modes 1, 2 & 3
 - The EXHT DRAIN display changes from blinking to lighting, and the exhaust valve (motor valve) opens.
 - Mode 1 & 2: After draining, the EXHT-DRAIN display changes from blinking to lighting.
 Operation then proceeds to the next cycle.
 - Mode 3: When the chamber pressure is below 0.01MPa and the working chamber temperature falls to 97°C, the EXHT·DRAIN display changes from blinking to lighting.
 Operation then proceeds to the next cycle.

A CAUTION :

When draining, very hot water will spout out from the flexible pipe.
 Be sure to keep the face and hands away from the outlet of hot water and the flexible pipe itself.

∧ NOTE:

 After the drain cycle is over, there will be no water left for sterilization in the working chamber. Do not fail to pour the specified volume of water when operating newly.

■ Exhaust Cycle --- Mode 4

- The EXHT-DRAIN display changes from lighting to blinking.
- When the exhaust pattern is set to P-1 or P-2, the solenoid valve opens rhythmically for pulse exhaust. When the exhaust pattern is set to P-0, the solenoid valve does not open, and the working chamber is left for natural cooling.

NOTE:

Abrupt exhaust after sterilization of a liquid may cause the liquid to gush out. To prevent this, select pulse exhaust or natural cooling. Change the exhaust pattern setting depending on the substance.

P-0: Exhaust pattern does not work, and equipment is left to sit.

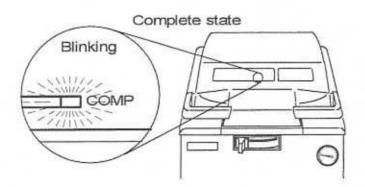
P-1: Pulse exhaust works. (very small amount of exhaust)

P-2: Pulse exhaust works. (small amount of exhaust)

- When the working chamber temperature falls to 97°C, the EXHT-DRAIN display changes from blinking to lighting. Operation then proceeds to the next cycle.
- Drying Cycle --- Modes 1, 2 & 5
 - The DRY display changes from lighting to blinking, and the set drying time appears on the digital display at start of the drying timer. Temperature is displayed [- - -].
 - During the period of the set time, the vacuum pump operates to keep the chamber pressure negative.
 - The digital timer displays the remaining time during the drying cycle. Refer to "Checking the Set Values during Operation" on page 21 for checking the set time during operation.
 - When the preset drying time is over, the filtered air flows into the working chamber through the bacteria separating air filter, so as to retrieve atmospheric pressure. The DRY display changes from blinking to lighting, and operation proceeds to the next cycle.

∧ NOTE:

- After the drying cycle is over, there will be no water left for sterilization in the working chamber. Do not fail to pour the specified volume of water when operating newly.
- If operation is repeated 3 times or more, change the water in the pump water bottle, as its temperature rises and affects the degree of vacuum and eventually the degree of dry.
- Completion Cycle --- Common to all modes
 - When all cycles of a mode are complete, the electronic alarm indicates the completion by beeping 3 times. The COMP display changes from lighting to blinking.



If the operation switches and the LOCK/UNLOCK lever are left unoperated for 30 minutes, the power saving function starts to work so that the display board blackens except for dots blinking at the temperature zone. Press any of the operation switches for returning to the completion state.

Chapter 4. Maintenance and Servicing

It is advised to check the major parts once in less than a year.

 \triangle

WARNING:

Be sure to start maintenance or service work after the main body has cooled sufficiently.

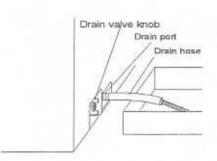
1. Draining the Working Chamber

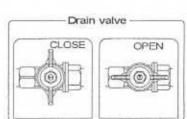
When planning to put the equipment out of service for a long time, be sure to drain the working chamber to prevent pipe from clogging. After checking that the working chamber has sufficiently cooled, drain the chamber in accordance with the following procedures.



WARNING:

- Do not drain the working chamber when the chamber is under pressure. Boiling water and steam may gush out causing burns.
 - (1) Open the lid.
 - (2) Connect one end of the attached drain hose to the drain tap located at the lower part of the right side of the body.
 - (3) Put the other end of the hose in a container located at the same level of the drain tap.
 - (4) Turn the drain valve knob, located at the left of the drain tap, counterclockwise to open.
 - (5) Be sure there is no water remaining in the working chamber.
 - (6) Turn the knob clockwise to close the drain valve.
 - Be sure the exhaust valve is closed.



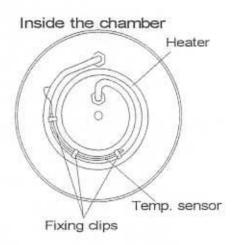


2. Cleaning the Working Chamber



WARNING: -

- The heater is provided with a temperature sensor, be careful not to damage this sensor when cleaning.
 - (1) Take out the bottom plate to see if the bottom of the working chamber or the surface of the heater is dirty. After draining the chamber, clean these areas with a soft brush or the like while applying water and keeping the drain valve open.
 - (2) If the temperature sensor comes loose from the fixing clip, reattach it.



3. Cleaning the Body



IMPORTANT:

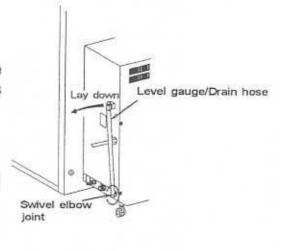
- Do not use benzene or thinner to clean the body. Also, make sure that volatile substances such as insecticides do not come into contact with the body as these may cause deterioration and stripping of the paint.
 - (1) Lightly wipe stains on the body with a soft cloth. To remove adherent stains, wipe with a cloth soaked in diluted detergent and wrung out, and wipe off further with a dry cloth.

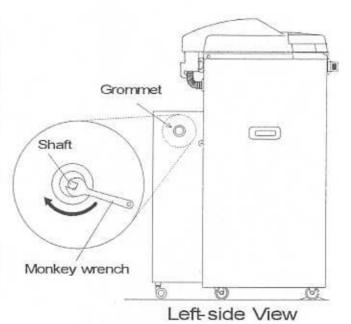
4. Changing the Vacuum Pump Water

- Change the vacuum pump water once a week.
- (1) Lay down the drain hose level gauge by turning the swivel elbow joint, and prepare for draining by placing its end at a drainage or a vessel.
 - Water to be drained is approx. 10 \(\ell \).
- (2) Put the drain hose level gauge back to the original place.
- (3) Feed water to the pump bottle.
 - Refer to "Chapter 2. Installation 2. Installation Procedure".



- If large clog enter into water for vacuum pump or vacuum pump is not operated for a long time, vacuum pump locks and doesn't operate. If it locks, the motor is flown with over currency, the vacuum pump in drying unit turn off. The earth leakage circuit breaker turn off and release the locking in accordance with the following procedure.
- Remove the grommet located on the side of drying unit on the rear body.
- (2) Turn clockwise the shaft of vacuum pump, which is possible to see from hole attached grommet until turning easily in spanner, etc..
- (3) The vacuum pump breaker turn on.
- (4) The earth leakage circuit breaker turn on and start operation.
 - Confirm that the indicator of pressure gauge is moved for under pressure in rotating the shaft of vacuum pump.
- (5) Attach the grommet.





Chapter 5. Specifications

Model	HVP-50	
External dimensions	540W × 1040H × 630D mm	
Chamber dimensions	300Ø × 710D mm (Effective: 50 ½)	
Power source	ACV±10%, Single-phase, 50/60Hz (A or more)	
Temperature and humidity conditions	5 ~ 35°C, 10 ~ 85%RH (No condensation)	
Power consumption	2.0 KW (A)	
Net Weight (approx.)	80kg	
Pressure vessel type	Small sized pressure vessel	
Working chamber material	Stainless steel (SUS304)	
Sterilization temperature range	105 ~ 135 °C variable	
Sterilization timer	1 ~ 250 minutes, remaining time displayed	
Drying timer	1 ~ 90 minutes, remaining time displayed	
Exhaust pattern setting	3 patterns (including natural cooling)	
Maximum operating pressure	0.255MPa	
Thermometer	Digital display, 5 ~ 137 °C	
Pressure gauge	Analog display, -0.1 ~ 0.4MPa	
Drying system	Water-sealed vacuum pump and outer heater	
Safety warning devices	Safety valve, Circuit breaker, Lack-of-water prevention device, Vacuum pump breaker, Error displays (Insufficient water held in pump bottle, Lack-of-water, Breakage of temperature sensor wire, Overheating, Overcooling, Overpressure, Open-Close lever failure)	
Accessories	Bottom plate (1pc)	
	Flexible drain pipe (1 pc)	
	Feed water hose (1 pc)	
	Drain hose (1 pc)	
	Caster stopper (2 pcs)	
	Operation manual (1 pc)	

Chapter 6. Troubleshooting

1. Error Detection (Alarms)

Should any malfunction occur in the autoclave, the error detection circuit will be triggered to assure safety. Once the circuit is activated, an error number appears on the digital display and the electronic alarm sounds, indicating the problem. To stop the alarm sound, press the START/STOP switch. If an alarm occurs, check the error number and turn off the power switch.

Error Number	Problem	Remedy
E r 0 (Pump bottle alarm)	Insufficient water held in the pump water bottle	Replenish water up to a sufficient Level, and restart operations.
E r 1 (Lack-of-water alarm)	Lack-of-water in the chamber	Be sure first that the pressure is at OMPa and then open the lid. After the heater has been cooled, pour in a sufficient quantity of water, and repeat operations from the beginning.
	Piping is clogged by a bag such as the waste disposal bag.	When a bag, such as a waste disposal bag, is used for sterilization, put it in the wire mesh basket for loading in the working chamber.
Er2	Temperature in the working chamber falls below the freezing point.	 Adjust room temperature at the installation site to 5 ~ 35°C.
(Temperature sensor wire breakage alarm)	Disconnection of temperature sensor for control.	Contact our authorized distributor in your region.
E r 3 (Overheating alarm)	 Temperature in the working chamber exceeds the upper limit of the working temperature range by +3°C or more. A temperature +5°C or more above the set temperature continues for 10 seconds during sterilization. 	
E r 4 (Overcooling alarm)	A temperature of 102°C or less continues for 10 seconds during sterilization.	

Error Number	Problem	Remedy
Er5	Pressure of 0.24MPa or more continues for 15 seconds.	Contact our authorized distributor in your region
(Overpressure alarm)	120	
	Piping is clogged by a bag such as the waste disposal bag.	 When a bag, such as a waste disposal bag, is used for sterilization, put it in the wire mesh basket for loading in the working chamber.
E r 6 (Lid open alarm)	The open/close lever is moved to the UNLOCK side during operation.	Contact our authorized distributor in your region.
E r 9 (Sterilization heater alarm)	 Temperature in the working chamber has not reached the set sterilization temperature even after 4 hours from operation startup. 	 Reduce the quantity of substance to be sterilized, and repeat operations from the beginning.
E r L (Open/Close lever locking failure alarm)	The open/close lever is unlocked during operation.	 Contact our authorized distributor in your region.

2. Early Troubleshooting

Symptom	Cause	Remedy
Display remains	Check the plug and socket first.	(1) Plug properly , or retighten any
OFF after power is turned ON.	(1) The plug is improperly socketed or is insufficiently tightened.(2) Disconnection in the power cord.	
	(3) Defective display.	***
No air exhausted from the working chamber.	(1) Defective solenoid valve. (2) Locking of Vacuum pump.	Contact our authorize distributor in your region. Release the locking in reference with Chapter 4. Maintenance and Servicing 5. Release the locking of Vacuum Pump. If no contact our authorized distributor.
Pressure gauge reading remains low.	 (1) Defective safety valve. (2) Defective pressure gauge. (3) Disconnection in the heater. (4) Defective automatic exhaust valve. (5) Steam leakage. 	(1)~(5) Contact our authorize distributor in your region.
Steam leakage from lid gasket	(1) The lid gasket deteriorated (2) The lid gasket installed improperly (3) Foreign matter enclosed under the lid gasket.	(1)(2) Contact our authorized distributor in your region. (3) Remove the foreign matter.
Water leakage from the bottom of the body.	 (1) Deterioration of the heater seal packing caused by lack-of-water heating or the like. (2) The drain valve not closed. (3) The drain piping loosened. (4) The water level gauge (hose) loosened or deterioration. 	 (1) Contact our authorized distributo in your region. (2) Close the drain valve. (3)(4) Contact our authorized distributor in your region.
Open/close lever cannot slide	(1) Temperature in the working chamber has exceeded 98°C or the pressure has exceeded 0.01MPa (2) The power switch is OFF.	 (1) Wait until the temperature in the working pressure falls below 97°C or the pressure is reduced to 0 MPa. (2) Turn on the power switch.
Lid cannot be opened or closed	(1) The open/close lever has not been slid completely to the UNLOCK side.	 Slide the lever completely to the UNLOCK side.
During sterilization cycle, displayed temp. exceeds the set temp., and exhaust is repeated frequently.	(1) Failure in the heater circuit	(1) Contact our authorized distributo in your region.

Symptom	Cause	Remedy
No draining from the drain	(1) Clogging of piping (2) Misinstallation of the flexible drain pipe.	(1) (2) Contact our authorized distributor in your region.
During drying noise from drying unit is loud than usual	(1) Detective installation way of over flow hose.(2) Detective adjustment of regulation valve for cuvitation.	(2) Contact our authorized distributor
Incomplete drying	 (1) The set drying time too short. (2) Substance packed too much. (3) Insufficient water supply to the pump. (4) Water temperature in the pump bottle too high. (5) The vacuum pump failure. (6) Heater wire disconnection. (7) Themo-regulator failure for the drying heater. 	(4) Change water in the pump bottle.(5)~(7) Contact our authorized distributor in your region.
After drying cycle, return to atmos- pheric pressure fails or retarded	(1) Solenoid valve failure (2) Bacteria separating air filter clogged.	(1) (2) Contact our authorized distributor in your region.

- This table of early troubleshooting describes the causes and remedies of simple problems.
 If you are unable to fix or repair the problem, contact our authorized distributor in your region and provide the following information.
- (1) Model and serial number of the autoclave.
- (2) Defective point(s) and symptom(s) (error number if applicable).
- (3) Number of days of operation (date, month and year of purchase).
- (4) Operating conditions (including details of substances being sterilized).

Appendix

1. Fast Wearing Parts List

Name	Specification	Code
Lid gasket	For HVP-50	300280

2. Glossary

Autoclave (High Pressure Steam Sterilizer)

Equipment to sterilize, with saturated steam and under a pressure higher than atmospheric pressure, the tools and gauze or clothing.

■ D Grounding Work

Grounding performed using a 1.6mm or larger diameter soft copper wire or equivalent suitable for grounding, that ensures a maximum grounding resistance of 100Ω .