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**INSTRUCTION MANUAL**

**CAT. 87032-01, 87032-02**

**EMS BioClave™ 16 Autoclave**



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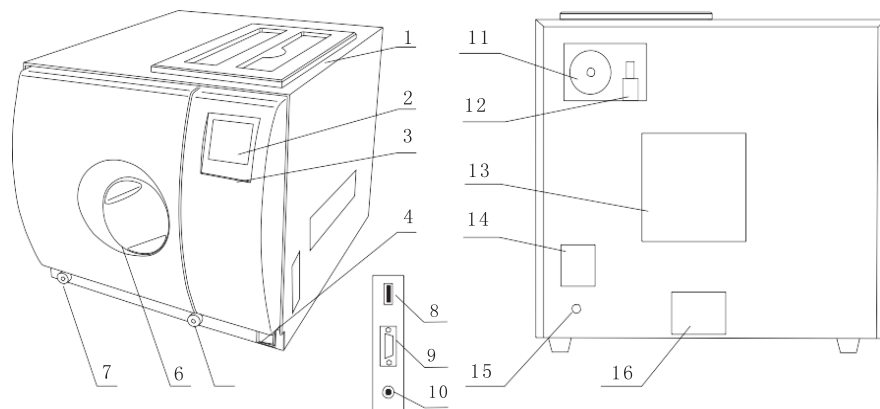
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## General

The sterilizer described in this manual is intended for the sterilization of research tools. It operated automatically with 134° and 121° sterilization temperatures. This sterilizer is in compliance with the European Directive 93/42/CEE and it has been produced in accordance with the EN 13060. In addition, the chamber has been ASME certified.



1. Distilled water tank
2. LED screen
3. Control panel
4. Main power switch
5. Drain connector of distilled water tank
6. Door handle
7. Drain connector of used water tank
8. USB port (optional)
9. Printer port
10. Printer power
11. Bacteriological filter
12. Safety valve
13. Condenser ventilation
14. Circuit breaker
15. Power supply cord
16. Rating plate

## Security notice

For safe operation, please pay close attention to the alert symbols below, which can be found throughout this manual. Please read carefully and understand the contents of this manual prior to operating this instrument.



This symbol represents an electrical caution—ground protection.



**HOT SURFACE.** This symbol represents a warning of a potential hot surface.



**Important safety information.** This symbol represents a warning for extra caution.

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## Technical Specifications

Item	16
Chamber	Φ230mmX360mm
Rated voltage	110V-130V or 220V-240V, AC, 50-60Hz
Main fuses	F25A/250V for 110V
Nominal power	1900VA
Sterilization temperature	121°C/134°C (250°F/274°F)
Capacity of the distilled water tank	Approx. 2.5L (water at level MAX) Approx. 0.5L (water level at MIN)
Operation temperature	5°C – 40°C
Exterior dimensions	445 mm (width) x 410 mm (height) x 605 mm (depth)
Weight	45 kg 99 lbs
Noise level	< 70 dB
Relative humidity	Max. 80% non-condensing
Atmospheric pressure	76kPa – 106 kPa

## Packing Content

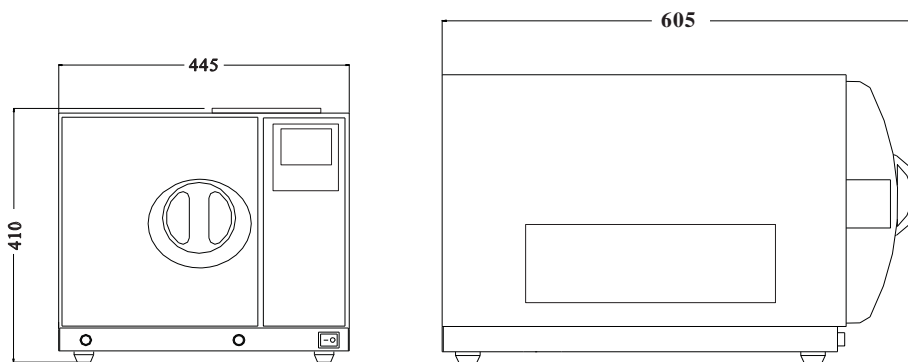
Number	Item	Quantity
1	Steam sterilizer	1
2	Instrument tray	2
3	Instrument tray rack	1
4	Instrument tray handle	1
5	Door adjustment tool	1
6	Draining hose	2
7	Instructions manual	1
8	Door deal	1

## Installation

1. Ensure that the sterilizer is installed with 2.5 in. (10 cm) ventilation space on all sides of the sterilizer, and 5 in. (20cm) on top side. The clearance required to open the door is 15.5 in. (40 cm).
2. The sterilizer should be placed on a level worktable.
3. Do not cover or block the door, ventilation or radiation openings on the sterilizer.
4. Do not install the sterilizer near a sink or in a location where it is likely to be splashed.
5. Do not install the sterilizer nearby a heat source.

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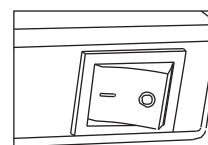
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## Operation

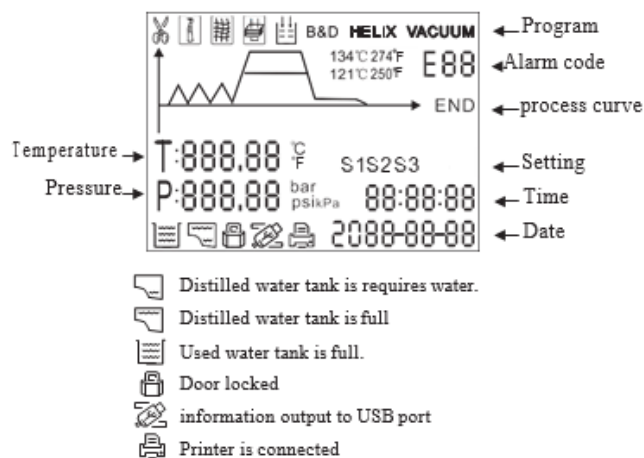
### Set-Up

1. Open the door and remove all of the inner contents for unpacking.
2. Connect the power cord to an outlet of the appropriate voltage.
3. Power ON.



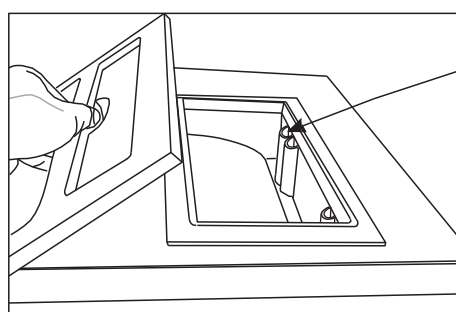
The switch is located underneath the control panel on the front side of the machine. After switching on, the machine turns on the LCD and shows the door position, water level, working program, date, time, etc.

NOTE: Before using the sterilizer or at any time the low water icon blinks, it is necessary to fill the distilled water tank with distilled water.



### Filling the distilled water

Remove the cover, and fill the tank with distilled water. When you hear a beep signal, it means the water level exceeds the maximum level. The maximum water level icon will be displayed. Please stop filling immediately.



The water level should not exceed this port.

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## Preparation of sterilization materials


For the most effective sterilization and to preserve the sample, please proceed as follows: Arrange the samples of different material on different trays or with at least 2 inches of space between them. Always insert a sterilization paper or cloth between the tray and sample to avoid direct contact between the different materials.

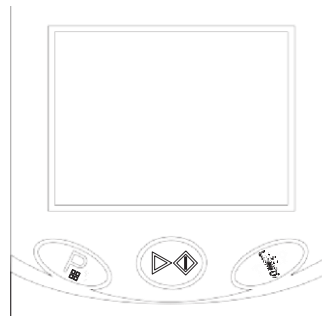
## Selecting the sterilization program

*LCD:* The panel displays the cycle temperature, pressure, error code, sterilization state and program.






 *Temperature button:* Press this button to toggle between 121°C and 134°C.

 *Program button:* Press this button to toggle between available sterilization cycles.

 *Start/Stop button:* Press this button to start the sterilization cycle. To stop a cycle, press and hold for 3 seconds.



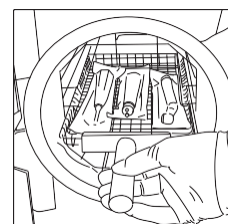
NOTE: Button will be “locked” for the initial 10 seconds after power up for system initialization.



	UNWRAPPED
	WRAPPED
	DRYING
	EXTENSIVE
	LIQUID

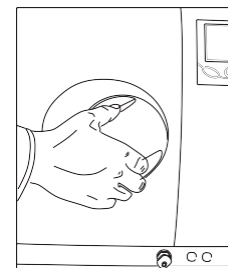


## Running the sterilization program

After selecting the program, the materials to be sterilized can now be placed on the tray and the tray placed inside the chamber using the tray handle.



After the instruments are loaded, you may close and lock the door by turning the door handle clock  until it stops. The  icon will be lightened.



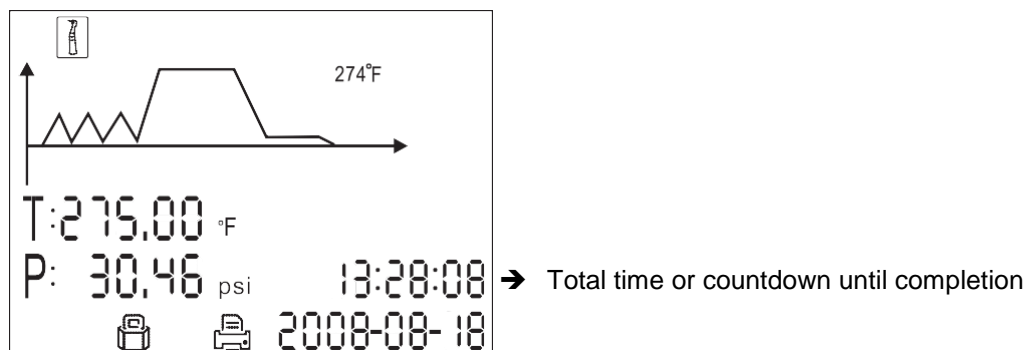
**CAUTION:** You must turn the door handle to the maximum position, otherwise the machine will alarm and prevent completing the cycle.


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### Start the sterilization program

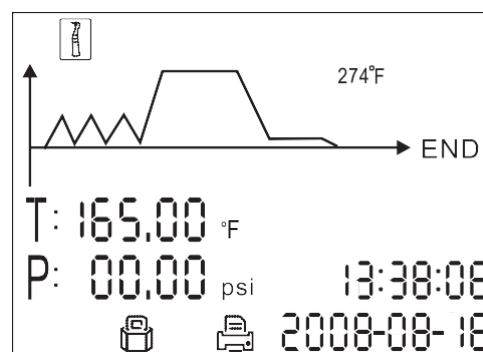
Press START button – the machine will begin the cycle automatically. It will take 30-75 minutes (see Appendix 2).



**CAUTION:** Take caution if you press the START button and the door has not been fully closed. In this case, you will see the  icon blinking on the screen. A cycle cannot be started until you close the door to the maximum position and press the START button again.

### Sterilization cycle completion

After a cycle is completed, the printer will be activated and print out a report of the cycle settings (if the optional printer has been connected). After the pressure returns to 0, the door is unlocked and the materials can be removed.



**CAUTION:** Always use the tray handle to load or unload the tray into the autoclave. Failure to do so can result in burning.

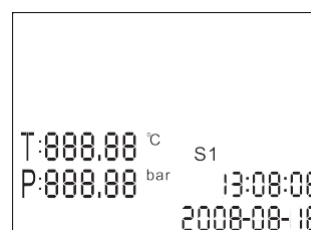
**NOTE:** If you need to interrupt a cycle and remove materials urgently, you may hold the START button for 3 seconds after completing sterilization time and skip to the dry cycle. This will result in the program skipping directly to the last step and eliminate the drying stage. After one minute, the cycle will end.

## Advanced Settings

### Enter the setting

1. Power on the machine while holding the START button and hold for 5 seconds. This will cause the machine to enter into the advanced settings mode.
2. Select the state (state 1 through 3) by pressing the program button.

Press the START button to enter the setting.



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## 3. S1 state

- a. If you select S1, you may change the unit of temperature and pressure as well as adjust time and date.
- b. The first option is to select the unit of temperature. Press the temperature button to select degrees Celsius or degrees Fahrenheit. The unit you selected will be lighted. Press the program button to the next item.
- c. You may select the unit of pressure in the same manner.
- d. Press the program button to the next item to adjust the time and date. After the last word of the date or time is set, then the data is permitted to be saved. If you want to finish the setting, you shall press START. It will return to the screen of selecting states.

## 4. S2 state:

- a. You may check the count of sterilization cycle. It cannot be changed by operator.
- b. Set the parameter for high altitude. If you have trouble completing a cycle in a location of high altitude (above 2 km or atmospheric pressure below 80kPa), you may need to adjust this parameter.
- c. Language set – English: 00, German: 01, Spanish: 02, Polish: 03, French: 04, Magyar: 05, Romanian: 06, Dutch: 07, Lithuanian: 08, Latvian: 09

## 5. S3 state

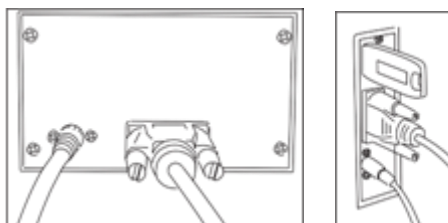
- a. Adjust the length of sterilization and drying time. Press program button to select the program. Press temperature button to select the temperature of the program. Then press START to adjust the drying time and holding time.
- b. First adjust the holding time. Press temperature button to adjust the data. Press the program button to select the items.
 

Holding time →	274 F
Drying time →	88
	88
- c. Press START to save.
- d. Drying time is 0-19. Holding time of 250°F is 1-59. Holding time of 274°F is 1-19.

NOTE: The default sterilization parameters have been chosen to provide optimal sterilization results. We do not suggest adjusting these parameters unless it is necessary.

## 6. Printer (optional)

- a. Connect the printer cable.
- b. Connect the printer power.



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## 7. USB Flash memory (optional)

- A USB drive can be used as a method of storing a report of the cycle. To do so, insert the USB drive into the slot on the right side of the instrument.
- The information will automatically output directly to the USB after the cycle has completed.

The name of the file is determined by the serial number of the machine and the cycle number. Example:

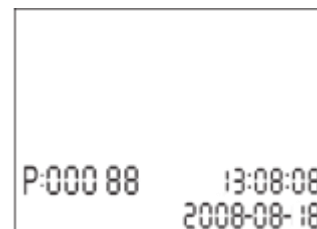
Serial number: E00001.

Cycle number: 00012.

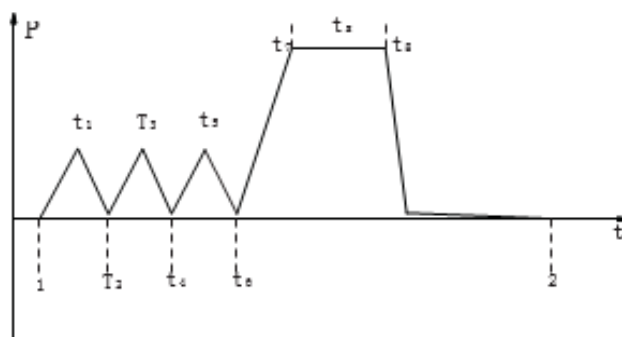
File name on USB: 01001200.txt → The first two numbers represent the machine number, the middle four numbers represent the cycle number, and the last two numbers represent error code.

## 8. Retrieve information from a prior cycle

- Press program repeatedly until you enter the prior program storage screen. This will show the cycle number.
- Press the TEMP button to toggle between different cycles.
- To print or send details to the USB drive, press the START button. The most recent 20 records are stored.



NOTE: When viewing printed data records, refer to the following diagram:



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Program: WRAPPED			
Temperature: 274F			
Pressure: 30.5 psi			
Dry time: 3 min			
Ster time: 4 min			
	Time	Temperature	Pressure
Start	15:24:20	107.6F	
T1:	15:32:11	158.0F	7.71psi
T2:	15:36:08	167.5F	1.42psi
T3:	15:39:21	194.5F	7.30psi
T4:	15:44:32	94.3F	1.39psi
T5:	15:47:12	201.7F	14.91psi
T6:	16:00:11	230.3F	1.35psi
TS:		274.6/f	32.14psi
Max. Temperature: 275.2F			
Min. Temperature: 274.1F			
Max. Pressure: 33.42psi			
Min. Pressure: 30.88psi			
T7:	16:04:02	275.0F	32.42psi
T8:	16:06:32	274.6F	31.05psi
End:	16:14:12	172.8F	
Cycle number: 0005			
Ster value: Success			
Date: 2011-01-18			
SN: E00001			
Operator:			

Program: WRAPPED			
Temperature: 274F			
Pressure: 30.5 psi			
Dry time: 3 min			
Ster time: 4 min			
	Time	Temperature	Pressure
Start	17:34:20	179.6F	
T1:	17:42:11	194.0F	7.57psi
T2:	17:46:08	185.5F	1.41psi
T3:	17:49:21	226.9F	7.75psi
T4:	17:54:32	212.5F	1.39psi
T5:	00:00:00	000.0F	000.0psi
T6:	00:00:00	000.0F	000.0psi
TS:		000.0F	000.0psi
Max. Temperature: 000.0F			
Min. Temperature: 000.0F			
Max Pressure: 000.0 psi			
Min. Pressure: 000.0psi			
T7:	00:00:00	000.0F	000.0psi
T8:	00:00:00	000.0F	000.0psi
End:	17:54:42	212.4F	1.46F
Cycle number: 0007			
Ster value: Failure E01			
Date: 2011-01-18			
SN: E00001			
Operator:			

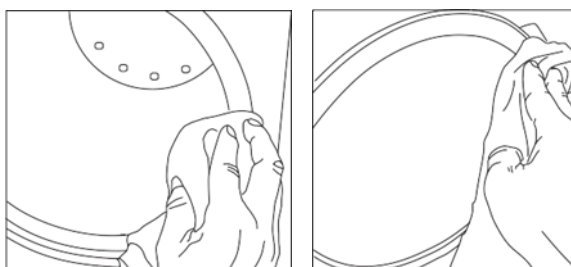
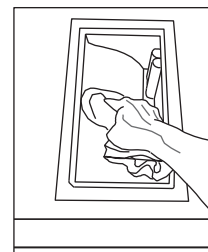
## Maintenance

Frequency	Maintenance operation
Daily	Clean the door seal Clean the external surface
Weekly	Clean the distilled water tank Clean the sterilization chamber
Yearly	Replace the door seal

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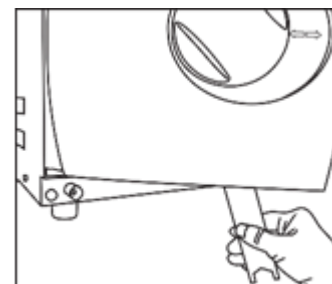
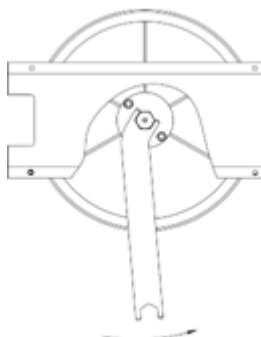
- Clean the distilled water tank every week with isopropyl alcohol or a medical disinfectant.
- Clean the chamber weekly.
  - Remove all trays and the tray rack from the chamber.
  - Clean the chamber with a smooth cloth saturated with distilled water.
  - Apply the same procedure for the trays and rack.
- Clean the door seal
  - Clean the door seal weekly, with a smooth cloth saturated with distilled water.



- Door adjustment
  - On normal circumstance, the chamber door does not require adjustments.
  - If the seal fails, you may use the included tool to tighten the door seal.
  - Open the door and insert the spanner tool in the gap beneath the plastic cover
  - Use the spanner to grip the adjustment nut.
  - Turn the nut counter clockwise as shown in the figure below. This will tighten the sealing plate.
  - Turn the nut until the sealing plate is tight. If the knob is too tight, you may also turn the nut clockwise to loosen it.



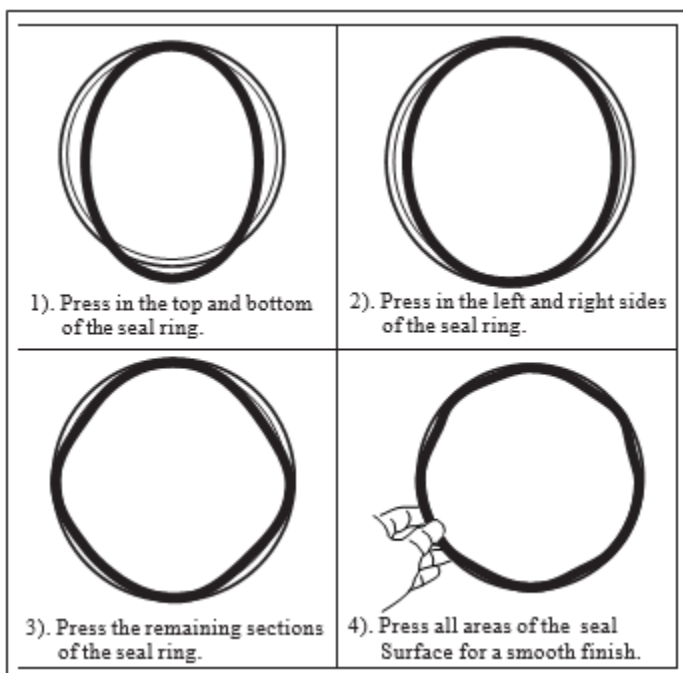
CAUTION: NEVER adjust the chamber door while the door is closed.



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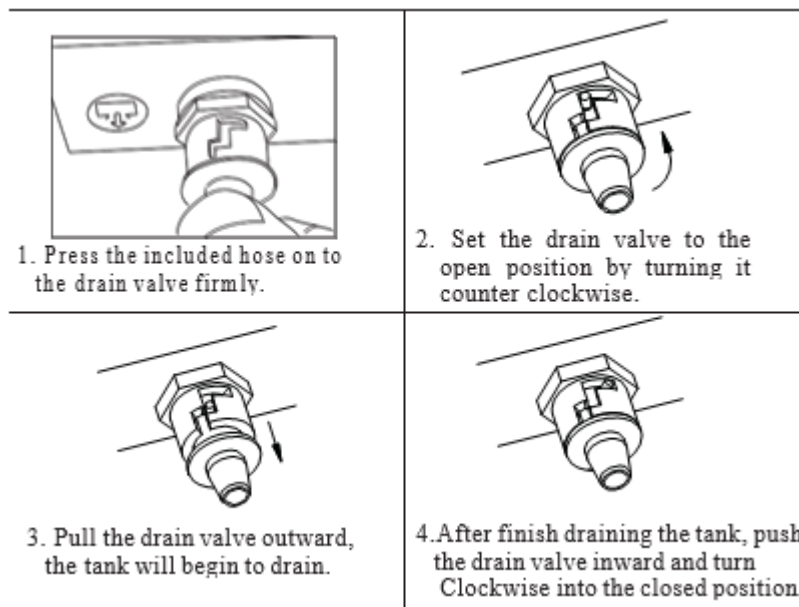
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- Replacement of the door seal
  - Open the chamber door.
  - Remove the door seal ring carefully by hand.
  - Clean the door seal ring carefully with a smooth cloth saturated with distilled water.
  - Moisten the new seal with medical disinfectant or with isopropyl alcohol.
  - Insert the new seal and press in sequence as follows:



CAUTION: Please ensure that the chamber and the door have cooled prior to replacing the seal ring.

- The drain valve

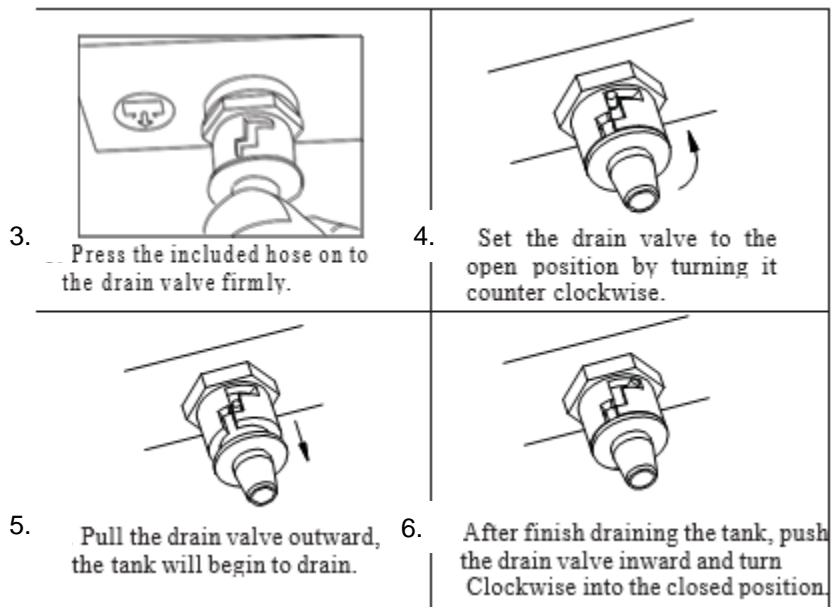


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## Transport and Storage

1. Switch off the sterilizer before transportation or storage.
2. Pull out the plug to let the machine cool down.



7. Drain the distilled water tank and the used water tank.
8. Conditions for transportation and storage: Temperature → -20 ~ +55, Relative humidity → ≥85%, Atmospheric pressure → 50kPa ~ 106kPa



CAUTION: Please ensure that the chamber and the door have cooled prior to replacing the seal ring.

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## Error Codes

Code	Description	Proposed solution
E1	Steam generator temperature sensor error	Power off & run a new cycle Contact your Supplier if error persists
E2	Inner temperature sensor error	Power off & run a new cycle Contact your Supplier if error persists
E3	Temperature sensor of chamber wall error	Carefully ensure that the chamber wall is heated. If not contact your supplier
E4	Fail to rise temperature	Check to ensure that the used water valve is fully closed.
E5	Fail to release the pressure	Power off & run a new cycle Contact your Supplier if error persists
E6	Door has opened during the cycle	Make sure you have turned the door handle to the max. Position or check the door switch
E9	Failure to hold temperature	Ensure the distilled water tank isn't empty Check the inner temperature sensor Check the door for leaking
E11	Failure to preheat the steam generator	Check the steam generator heater Check the steam generator protector
E12	Failure to preheat the chamber	Check the chamber heater Check chamber protector
E20	Program manually interrupted	Shut off the power and restart the power

## Safety Devices

Safety device	Purpose and action
Main fuses	Protect the instrument against possible failures of the heating resistor. <b>Action:</b> Interruption of the electric power supply.
Thermal cutouts on the main transformer windings	Protection against possible short circuit and main transformer primary winding overheating. <b>Action:</b> Temporary interruption of the winding.
Safety valve	Protection against possible sterilization chamber over-pressure. <b>Action:</b> Release of the steam and restoration of the safety pressure.
Safety micro-switch for the door status	Comparison for the correct closing positioning of the door. <b>Action:</b> Signal of wrong positioning of the door.
Door safety lock	Protection against accidental opening of the door. <b>Action:</b> Impediment of the accidental opening of the door during the program.
Self-leveling hydraulic system	Hydraulic system for the natural pressure levelling in case of manual cycle interruption, alarm, or black-out. <b>Action:</b> Automatic restoration of the atmospheric pressure inside the chamber.

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*Appendix***Water properties/Characteristics**

DESCRIPTION	FEED WATER	CONDENSATE
Evaporate residue	≥10 mg/l	≥1.0 mg/kg
Silicium oxide $\text{SiO}_2$	≥1 mg/l	≥0.1 mg/kg
Iron	≥0.2 mg/l	≥0.1 mg/kg
Cadmium	≥0.005 mg/l	≥0.05 mg/kg
Lead	≥0.05 mg/l	≥0.1 mg/kg
Rest of heavy metals, excluding iron, cadmium, lead	≥0.1 mg/l	≥0.1 mg/kg
Chloride	≥2 mg/l	≥0.1 mg/l
Phosphates	≥0.5 mg/l	≥0.1 mg/l
Conductivity (at 20°C)	≥15 $\mu\text{s}/\text{cm}$	≥3 $\mu\text{s}/\text{cm}$
pH value	5-7.5	5-7
Appearance	Colorless, clean, without sediments	Colorless, clean, without sediments
Hardness	≥0.02 mmol/l	≥0.02 mmol/l

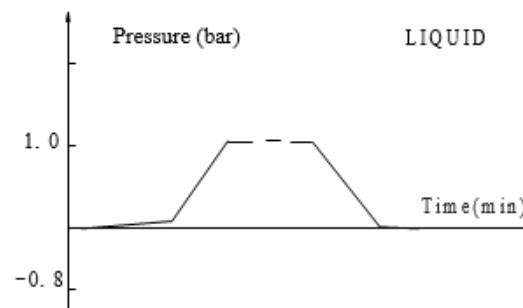
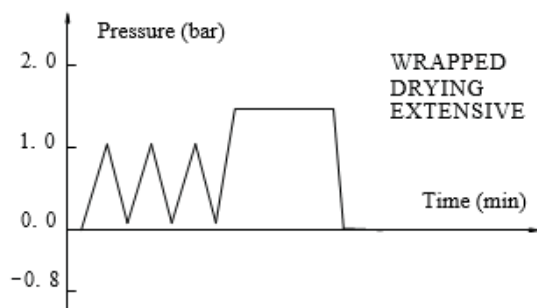
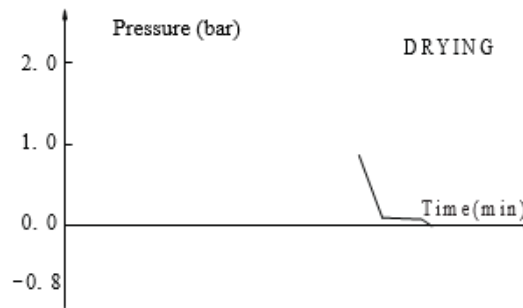
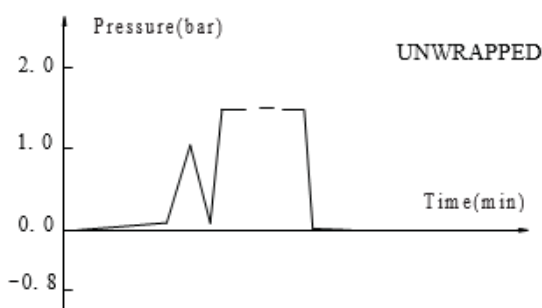
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**Diagrams of the sterilization programs**

PROGRAM	Temperature (F)	Pressure (psi)	Holding time (min)	Total time (min)	TYPE	Max. Load (kg)	Max. Load per tray (kg)
UNWRAPPED	274	30.5	4	14-30	Unwrapped solid material	4.00	1.20
	250	16.0	20	30-45			
LIQUID	274	30.5	10	30-55	Liquid	1.20	0.40
	250	16.0	30	35-60			
WRAPPED	274	30.5	4	30-50	Unwrapped porous material	4.00	1.20
	250	16.0	20	35-55	Single-wrapped solid or hollow material	3.00	1.00
EXTENSIVE	274	30.5	18	35-55	Unwrapped porous material	1.00	0.30
					Single-wrapped porous material	0.75	0.20
					Dual-wrapped porous material	0.50	0.15
					Single-wrapped hollow material	3.00	1.00
					Dual-wrapped solid and hollow material	2.00	0.75
DRYING				1-20			

The max. temperature of the 274F sterilization cycle is 279F.  
 The max. temperature of the 0F sterilization cycle is 256F.

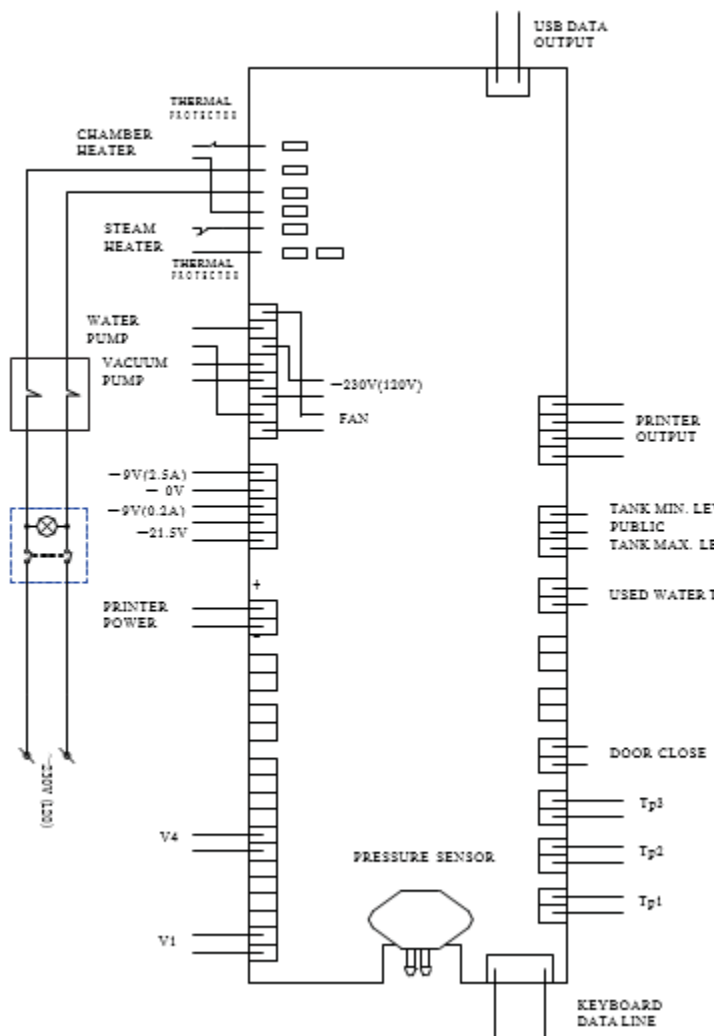


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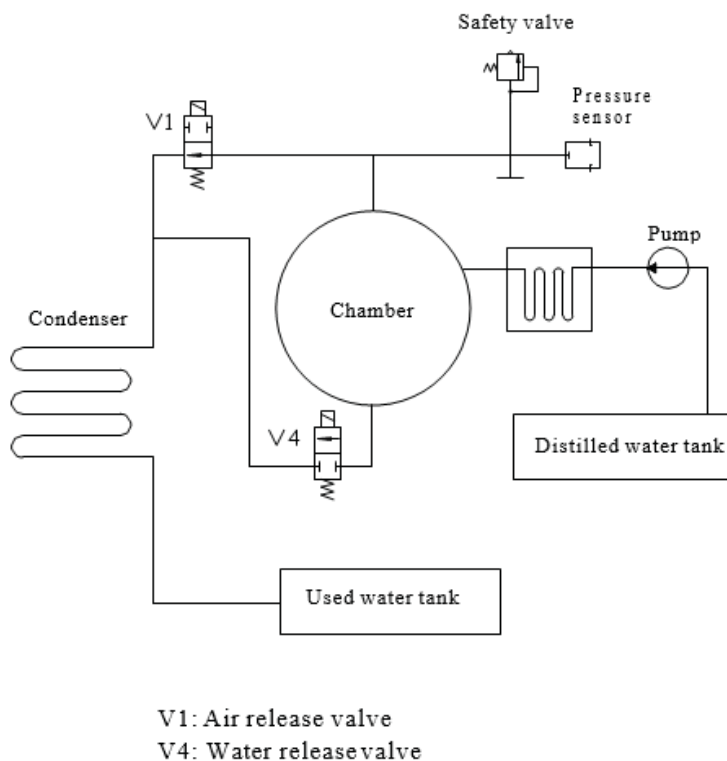
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Wiring diagram



Hydraulic drawing



TP1: Steam generator temperature sensor

TP2: Inner temperature sensor

TP3: Temperature sensor of chamber wall

V1: Air release valve

V4: Water release valve

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