

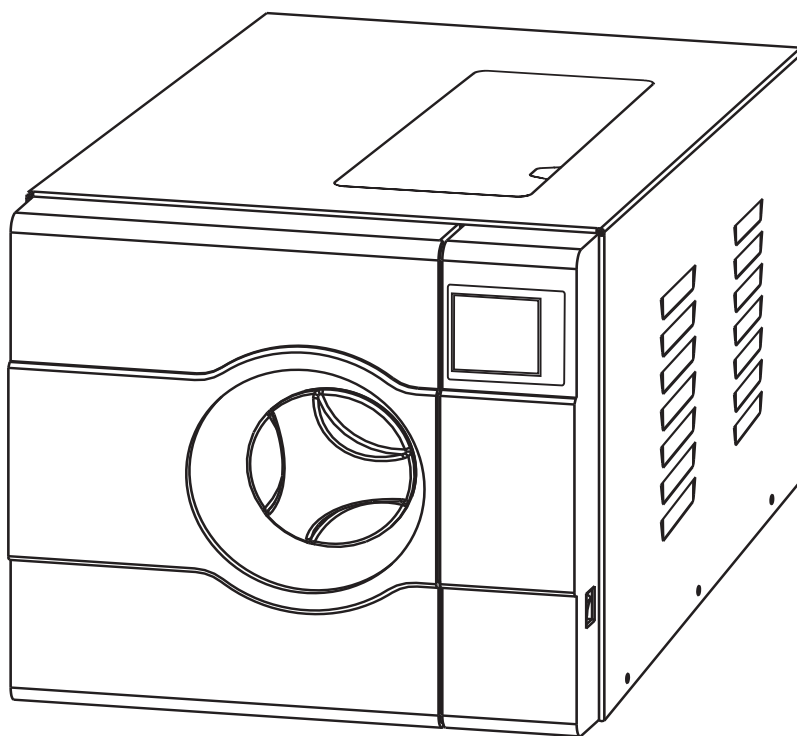


Laboratory Equipment Manufacturer
www.mrclab.com



STEAM STERILIZER

Instruction Manual



3, Hagavish st. Israel 58817 Tel: 972 3 5595252, Fax: 972 3 5594529 mrc@mrclab.com

MRC.12.16

Thank you for choosing our steam sterilizers.

Prior to operating this instrument, please read the operations manual carefully and follow all installation instructions.

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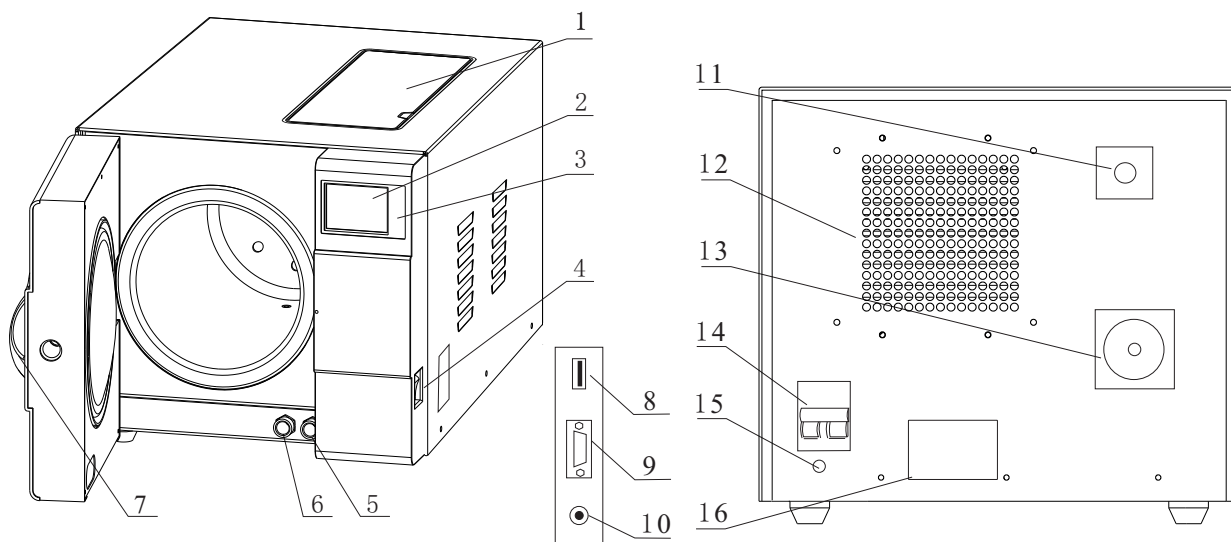
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1. General

The sterilizer described in this manual is intended for the sterilization for medical, dental, beauty, veterinary and tattoo fields. It operates automatically with 134°C and 121°C 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.



1 Distilled water tank

2 LCD screen

3 Control panel

4 Main Power switch

5 Drain connector of distilled water tank

6 Drain connector of used water tank

7 Door handle

8 USB port (optional)

9 Printer port

10 Printer power

11 Safety valve

12 Condenser ventilation

13 Bacteriological filter

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 carefully read 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.

2. Technical specifications

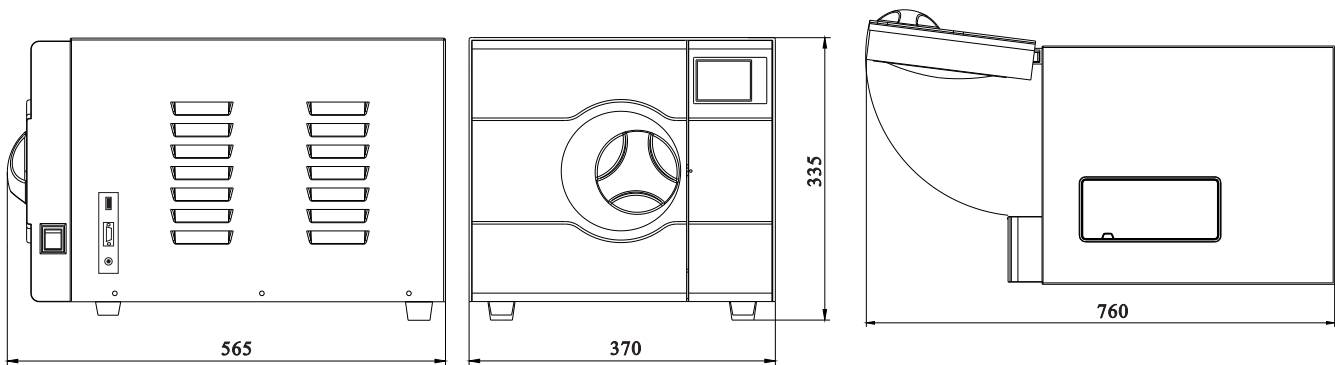
Item	Parameter
Chamber	Φ 170mm x 320mm
Rated voltage	AC 220-240V 50Hz (110-130V 60Hz)
Circuit breaker	F16A/400V (F20A/400V for 120V)
Nominal power	1500VA
Sterilization	121°C /134°C
Capacity of the distilled water tank	Approx 2.5 L (Water at level Max)
	Approx 0.5 L (Water at level Min)
Operation temperature	5°C-40°C
Exterior dimensions	370mm(W)*345mm(H)*565mm(D)
Net weight	34.5 kg
Noise level	<70 dB
Relative humidity	Max 80%, non condensing
Atmospheric pressure	76 kPa - 106 kPa

3. Packing content

No.	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	Instruction manual	1
8	Door seal	1

4. Installation

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



5. Operation

5.1 Setup

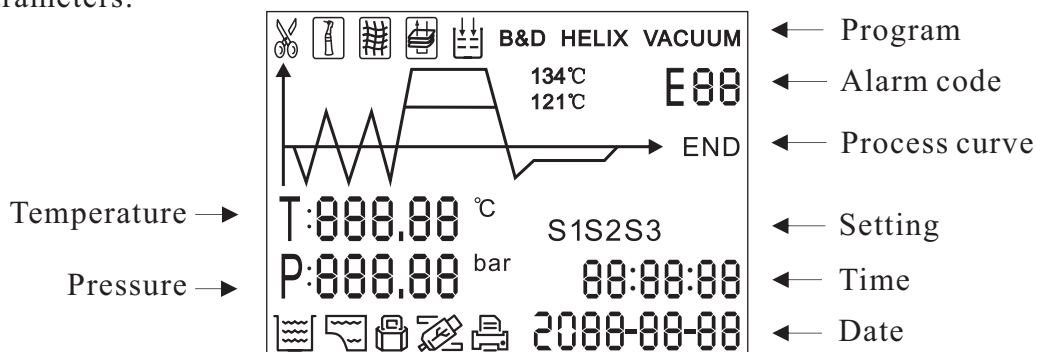
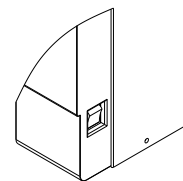
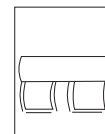
5.1.1 Open the door and remove all of the inner contents for unpacking.

5.1.2 Connect the power cord to an outlet of the appropriate voltage.


5.1.3 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 and test parameters.




 Distilled water tank requires water.


 Distilled water tank is full

 Used water tank is full.


 Door locked

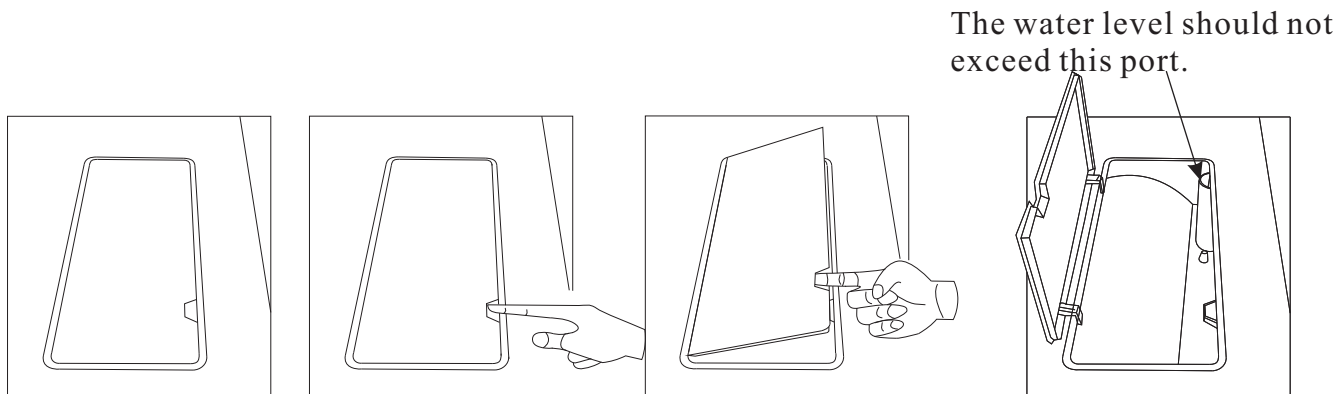
 information output to USB port

 Printer is connected

Notice: Before using the sterilizer or at any time the low water level icon  blinks, fill the distilled water tank with distilled water.

5.1.4 Filling the distilled water

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



5.2 Preparation of sterilization materials

For effective sterilization and to preserve the sample, please follow the steps below:

- * Arrange the samples of different materials on different trays or with at least 3cm of space between them.
- * Always insert a sterilization paper or cloth between the tray and the sample to avoid direct contact between the different materials.
- * Arrange the containers (glasses, cups, test-tubes, etc) on one side or in an inverted position to avoid possible water stagnation.
- * Do not stack the trays one above the other or put them in direct contact with the walls of the sterilization chamber.
- * Always use the instrument tray handle.
- * Wrap the samples one by one or, if more tools have to be set in the same bag, verify that these are made of the same material.
- * Do not use metallic clips, pins or other, as this jeopardizes the maintenance of the sterilizer.
- * Do not overload the trays over the stated limit (see Appendix 2).

5.3 Selecting the sterilization program

5.3.1 LCD

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

5.3.2 Temperature button

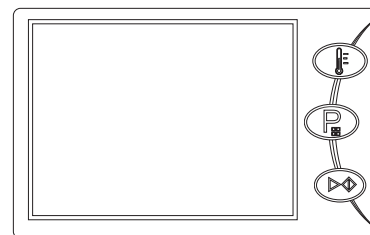
Press this button to toggle between 121 °C and 134°C.






5.3.3 Program button

Press this button to toggle between available sterilization programs (see below)

5.3.4 Start/Stop button

Press this button to start the sterilization cycle. To stop a cycle, press and hold this button for 5 seconds.

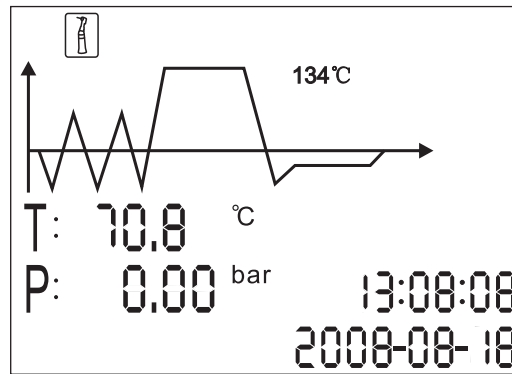


-  Solid
-  Wrapped
-  Textile or Drying
-  Prion
-  Liquid

B&D B&D Test

HELIX HELIX Test

VACUUM VACUUM Test




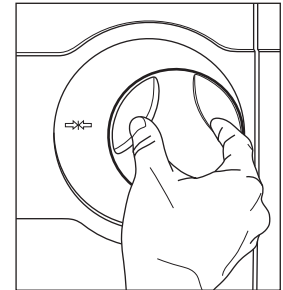
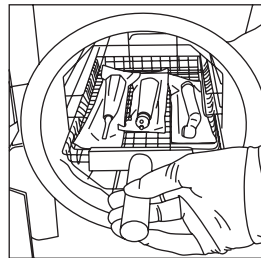
Notice:

The Start/Stop button will be locked for an initial 10 seconds after powering up the system

5.4 Running the sterilization program.

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

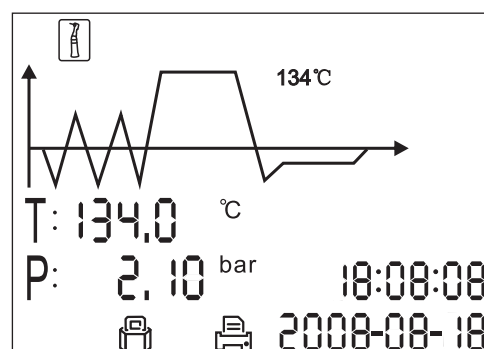
5.4.1 After the steam sterilizer is loaded, you may close and lock the door handle clockwise until it stops. The icon  will be illuminated.






Caution: You must turn the door handle to the maximum position, otherwise the machine will alarm and prevent starting the cycle.

5.4.2 Start the sterilization program.

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

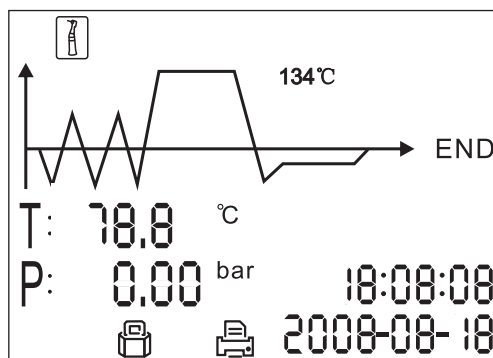


← Total time or count down until completion


Caution: When you press the  button but the door has not been fully closed, you will see the  blinking on the screen. A cycle can not be started until you close the door to the max position and press the  button again.

5.4.3 Sterilization cycle completion

After the cycle is completed, the printer will be activated and will print out a report of the cycle settings (if the optional printer has been connected) or save the report in the USB drive (optional).




Caution: Always use the tray handle to load or unload the tray into the sterilizer in order to avoid scalding.

Notice: If you need to interrupt a cycle and remove materials urgently, you may hold the  button for 3 seconds to skip 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.

5.5 Test programs


5.5.1 Press the program button, select the “B&D” Test.

5.5.1.1 Put the Bowie-Dick pack into the chamber. Then close the door and press the  button.

5.5.1.2 After the cycle is finished you may check the indicator and evaluate the result.

5.5.2 Select the “Helix” test.

5.5.2.1 Put the indicator paper in the capsule.

5.5.2.2 Put the Helix test tube into the chamber, then close the door and press the  button.

5.5.2.3 After finishing the cycle you may check the indicator and evaluate the result.

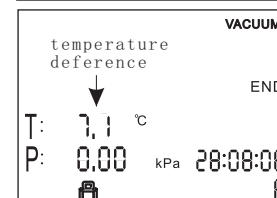
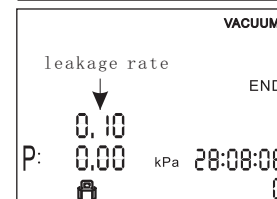
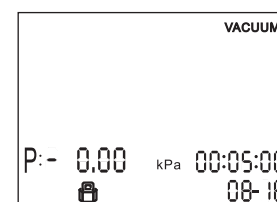
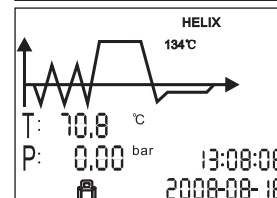
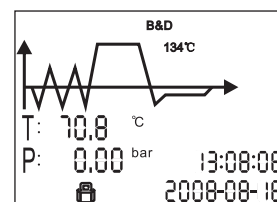
5.5.3 Select the “Vacuum” test.

5.5.3.1 Close the door and press the  button.

5.5.3.2 After finishing, it will show the result.

5.5.3.3 In compliance with EN 13060, the test requires the steam leakage rate to be less than or equal to 0.13 kPa/min. During 10 minutes, if the leakage rate is not greater than 0.13, it will show 0, that means success.



5.5.3.4 If the temperature difference between the max temperature and the min is above 3°C, it will show ‘F’. That means the result of the test is void. You need to run the vacuum test again after the chamber has cooled down.

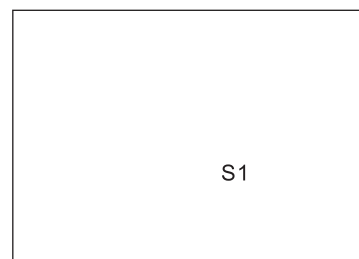


Caution: The “Vacuum” test must be carried out with the sterilizer cold. If the Tp is greater than 3° C, it will show ‘F’.

6. Advance setting



6.1 Enter the setting

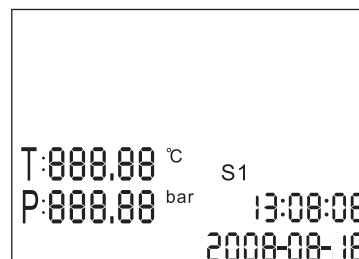
- 6.1.1 Power on the machine while holding the  button for 5 seconds. This will enter the machine into the advance setting mode.
- 6.1.2 Select the state (state 1 to state 3) by pressing the program button. Press the  button to enter the setting.





6.2 S1 State

If you select the S1. You may change the unit of the temperature and pressure and adjust time and date.

- 6.2.1 The first option is to select the unit of temperature. Press the  button to select the unit. The unit you selected will be illuminated. Press the  button to proceed.



- 6.2.2 You may select the unit of pressure in the same manner.

- 6.2.3 Then press  button to adjust the time and date. After the last letter of the date or time is set, then the data will be saved. If you want to finish the setting you shall press  It will return to the stage selection screen.

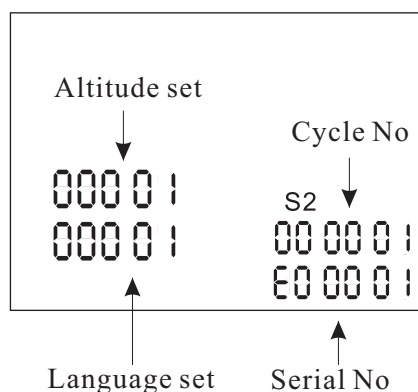
6.3 S2 State.

- 6.3.1 You may check the count of sterilization cycle. It can not be changed by the operator.
- 6.3.2 Set the parameter for high altitude (above 2.0 km or if atmospheric pressure is below 80 kPa) you may need to adjust this parameter.







6.3.3 Language set.


00 English	01 German	02 Spanish	03 Polish	04 French	05 Magyar
06 Romanian	07 Dutch	08 Lithuanian	09 Latvian	10 Czech	11 Italian

The Serial No. and Cycle No. can not be set by the operator.




6.4 S3 State

- 6.4.1 Adjust the length of the sterilization and drying time. Press the  button to select the program.     

Press the temperature button to select the temperature of program. Then press  to adjust the drying time and holding time.

- 6.4.2 Firstly, adjust the holding time.

Press  to adjust the data.

Press the  button to select the items.

- 6.4.3 Press  to save.

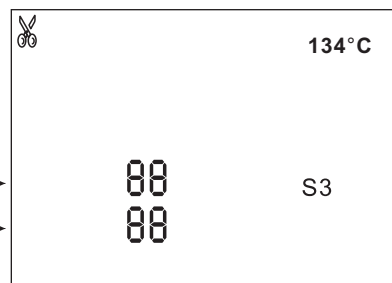
- 6.4.4 Drying time is 0-19.

Holding time of 121 °C is 1-59.

Holding time of 134 °C is 1-19.

holding time →

drying time →

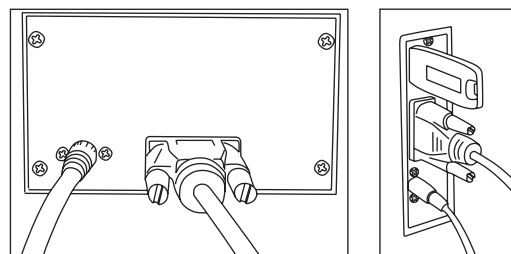


Notice: The default sterilization parameters have been chosen to provide the optimal sterilization result. We do not suggest adjusting these parameters unless it is necessary.

6.5 Printer (Optional)

- 6.5.1 Connect the printer cable.

- 6.5.2 Connect the printer power cable.



6.6 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 to 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.

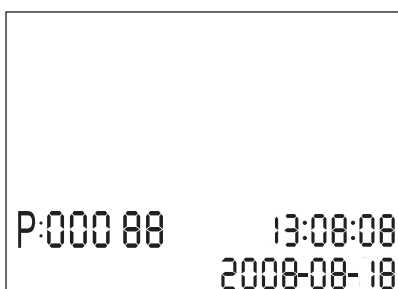
For Example:

The serial number is E00001. The cycle number is 00012. The file name in the USB stick is 01001200.txt. The first two numbers represent the machine number. The middle four numbers represent the cycle number. The last two numbers represent the error code. 00:no error; 01 error E01

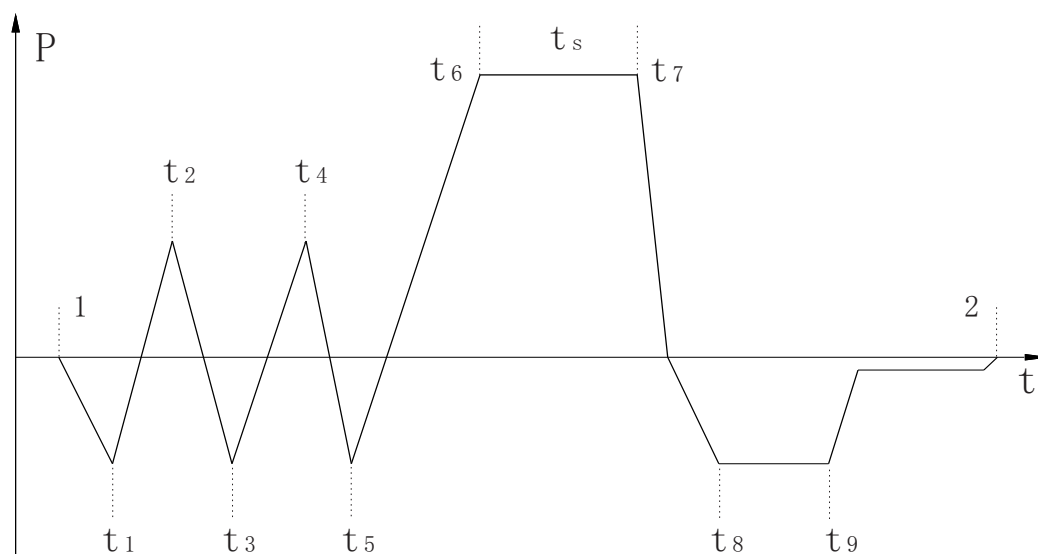
6.7 Retrieve information from a prior cycle.

Press  repeatedly until you enter to the prior program storage screen. This will show the cycle No. Press the  button to toggle between different cycles.

To print or send details to the USB drive, press the  button. The most recent 20 records are stored.



When analysing printed data records, refer to the diagram below:



Program: WRAPPED

Temperature: 134°C

Pressure: 210.0 kPa

Dry Time: 03Min

Ster Time: 4.0Min

	time	temp.	pressure
Start	15:24:20	042.0°C	
T1:	15:32:11	040.0°C	-75.2kPa
T2:	15:36:08	105.3°C	052.7kPa
T3:	15:39:21	061.3°C	-80.4kPa
T4:	15:44:32	110.3°C	051.6kPa
T5:	15:47:12	067.0°C	-80.4kPa
T6:	16:00:11	135.2°C	220.3kPa
TS:		134.8°C	221.6kPa
MAX.Temperature:		135.5°C	
MIN.Temperature:		134.1°C	
MAX.Pressure:		230.4kPa	
MIN.Pressure:		212.9kPa	
T7:	16:04:02	135.0°C	223.5kPa
T8:	16:06:32	92.8°C	-60.1kPa
T9:	16:09:22	90.4°C	-60.1kPa
End	16:14:12	78.2°C	

Cycle No: 0005

Ster Value: Success

Date: 2011-01-18

SN:E00001

Operator:

Program: Vacuum test

Tp: 1°C

P1: -70.0kPa

P2: -69.0kPa

rate of pressure rise: 0.10

Start Time: 08:22

End Time: 09:01

Date: 2011-01-18

Cycle No.:0001

Test Value: Success

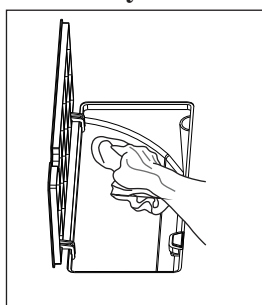
SN: E00001

Operator:

7. Maintenance

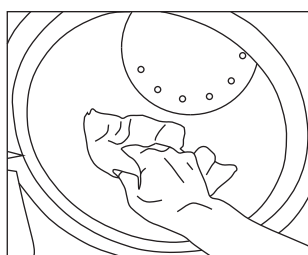
Frequency	Maintenance operation
Daily	Clean the door seal
	Clean the external surface
Weekly	Clean the distilled water tank
	Clean the sterilization chamber
Every month (depending on the use)	Clean the filter inside the chamber and tank
Every 3/6 Months (depending on the use)	Replace the bacteriological filter
Every year	Replace the door seal

7.1 Clean the distilled water tank every week with isopropyl alcohol or a medical disinfectant.



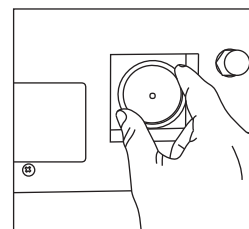
7.2 Clean the chamber weekly.

- 7.2.1 Remove all trays and the tray rack from the chamber.
- 7.2.2 Clean the chamber with a smooth cloth saturated with distilled water.
- 7.2.3 Apply the same procedure for the trays and rack.



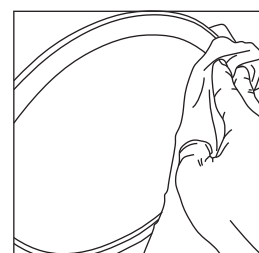
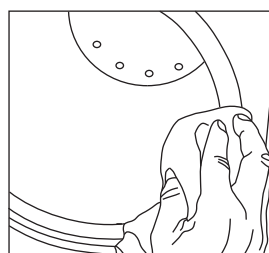
7.3 Replacement of the bacteriological filter.

- 7.3.1 The bacteriological filter is in the back of the sterilizer.
- 7.3.2 Unscrew the filter by hand in an anti-clockwise motion.
- 7.3.3 Place the new bacteriological filter in.
- 7.3.4 Screw the new filter in by hand in a clockwise motion.



7.4 Clean the door seal.

Clean the door seal weekly with a smooth cloth saturated with distilled water.



7.5 Door adjustment

Under normal circumstances the chamber door does not require adjusting. However, if the seal fails (resulting in steam leaking from the front of the chamber), you may use the spanner tool to tighten the door seal.

7.5.1 Open the door.

7.5.2 Insert the spanner tool in the gap beneath the plastic cover; use the spanner to grip the adjusting nut (Fig. 1). Turn the nut anti-clockwise shown in the figure below (Fig 2). This will tighten the sealing plate.

7.5.3 Turn the nut until the sealing plate is tight. If the door knob is too tight, you may also turn the nut clockwise to loosen it.

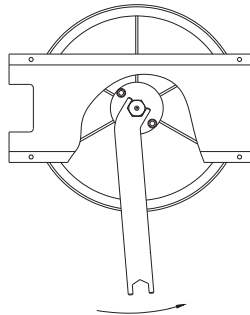


Fig 1

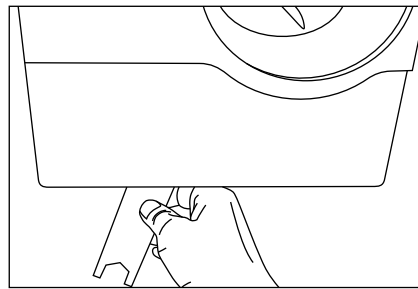


Fig 2

Caution: Never adjust the chamber door while the door is closed.

7.6 Replacement of the door seal

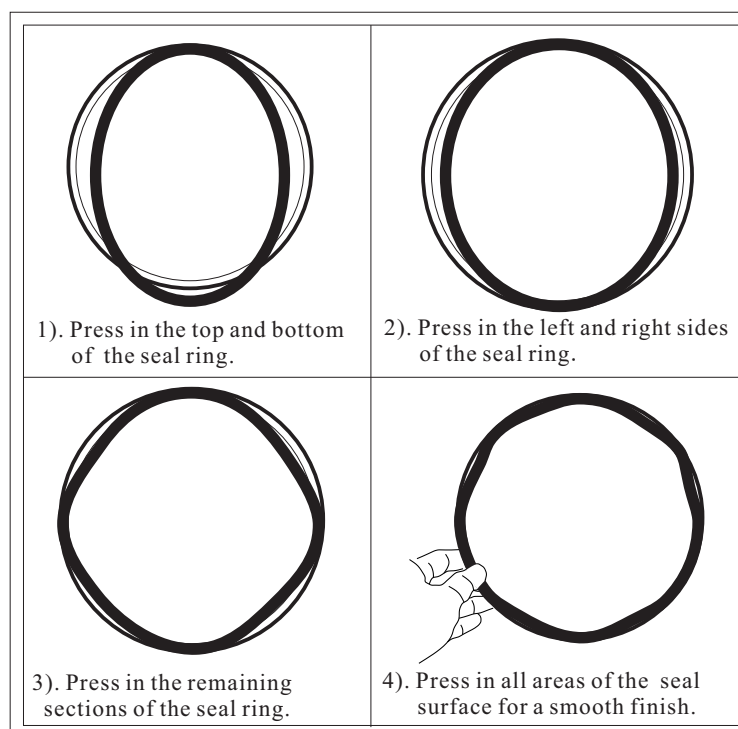
7.6.1 Open the chamber door.

7.6.2 Remove the door seal ring carefully by hand.

7.6.3 Clean the door seal ring carefully with a smooth cloth saturated with distilled water.

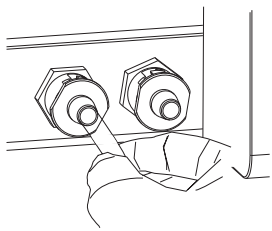
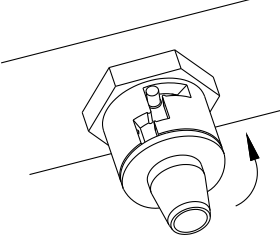
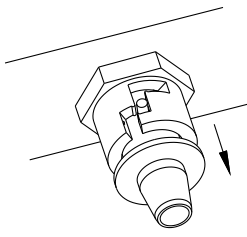
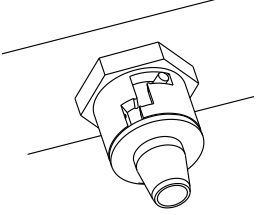
7.6.4 Moisten the new seal with medical disinfectant or isopropyl alcohol.

7.6.5 Insert the new seal and press in sequence as follows:-



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

7.7 The drain valve

 <p>1. Press the included hose on to the drain valve firmly.</p>	 <p>2. Set the drain valve to the open position by turning it anti-clockwise.</p>
 <p>3. Pull the drain valve outward, the tank will begin to drain.</p>	 <p>4. After finish draining the tank, push the drain valve inward and turn clockwise into the closed position .</p>

8. 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 the chamber wall error	Carefully ensure that the chamber wall is heated and contact your supplier.
E4	Fails to rise the temperature	Power off & run a new cycle Contact your supplier if error persists.
E5	Fails to rise the pressure	Power off & run a new cycle Contact your supplier if error persists.
E6	Door lock problem during the cycle	Make sure you have turned the door handle to the max position or check the door switch.
E9	Fails to hold temperature	Ensure the distilled tank isn't empty. Check the inner temperature sensor. Check for leaking.
E11	Fails to preheat the steam generator	Power off & run a new cycle Contact your supplier if error persists.
E12	Fails to preheat the chamber	Power off & run a new cycle Contact your supplier if error persists.
E13	Vacuum fails	Power off & run a new cycle Contact your supplier if error persists.
E20	Program manually interrupted	Turn off the power and restart.

9. Transportation and storage

- 8.1 Switch off the sterilizer before transportation or storage. Pull out the plug. Let the machine cool down.
- 8.2 Drain the distilled water tank and the used water tank.
- 8.3 Conditions for transportation and storage

Temperature: $-20\text{ }^{\circ}\text{C} \sim +55\text{ }^{\circ}\text{C}$.
Relative humidity: $\leq 85\%$
Atmospheric pressure: $50\text{ kPa} \sim 106\text{ kPa}$.

10. Safety devices

- 1. Main fuses: Protects the instrument against possible failures of the heating resistor.
Action: Interruption of the electric power supply.
- 2. Thermal cutouts on the main transformer windings: Protects against possible short circuit and main transformer primary winding overheating.
Action: Temporary interruption of the winding.
- 3. Safety valve: Protects against possible sterilization chamber over-pressure.
Action: Release of the steam and restoration of the safety pressure.
- 4. Safety micro-switch for the door status: Comparison for the correct closing position of the door.
Action: Signal of the wrong position of the door.
- 5. Manually reset thermostat on chamber heating resistors: Protects for possible over heating of the chamber heating resistors.
Action: Interruption of the power supply of the chamber resistors.
- 6. Manually reset thermostat on steam generator heating resistors: Protects for possible overheating of the steam generator heating resistors.
Action: Interruption of the power supply of the steam generator resistors.
- 7. Door safety lock: Protects against accidental opening of the door.
Action: Impediment of the accidental opening of the door during the program.
- 8. Self-leveling hydraulic system: Hydraulic system for the natural pressure leveling in case of manual cycle interruption, alarm or black-out.
Action: Automatic restoration of the atmospheric pressure inside chamber.






Appendix 1

Water Properties / Characteristics

Description	Feed water	Condensate
Evaporate residue	$\leq 10\text{mg/l}$	$\leq 1.0\text{mg/kg}$
Silicium oxide SiO_2	$\leq 1\text{mg/l}$	$\leq 0.1\text{mg/kg}$
Iron	$\leq 0.2\text{mg/l}$	$\leq 0.1\text{mg/kg}$
Cadmium	$\leq 0.005\text{mg/l}$	$\leq 0.05\text{mg/kg}$
Lead	$\leq 0.05\text{mg/l}$	$\leq 0.1\text{mg/kg}$
Rest of heavy metals	$\leq 0.1\text{mg/l}$	$\leq 0.1\text{mg/kg}$
Chloride	$\leq 2\text{mg/l}$	$\leq 0.1\text{mg/kg}$
Phosphate	$\leq 0.5\text{ mg/l}$	$\leq 0.1\text{mg/kg}$
Conductivity	$\leq 15\mu\text{s/cm}$	$3\leq\mu\text{s/cm}$
pH Value	5-7.5	5-7
Appearance	Colorless, clean	Colorless, clean
Hardness	$\leq 0.02\text{ mmol/l}$	$\leq 0.02\text{mmol/l}$

Appendix 2

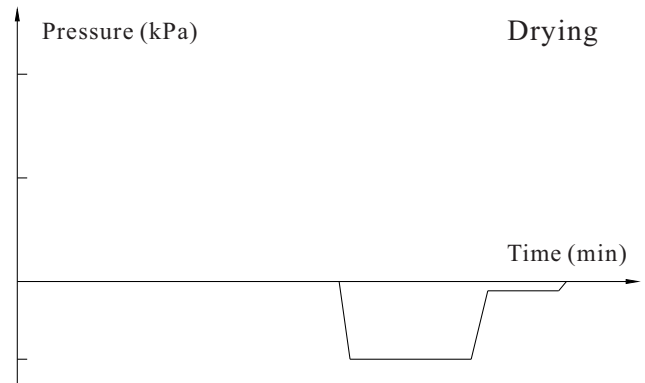
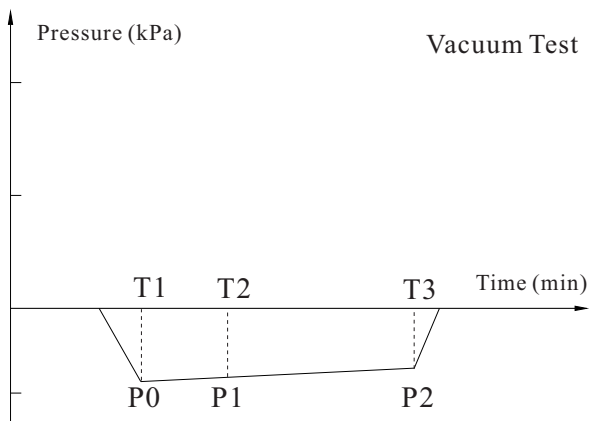
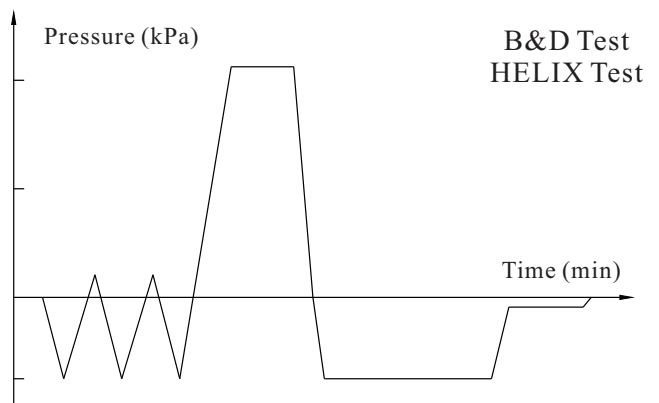
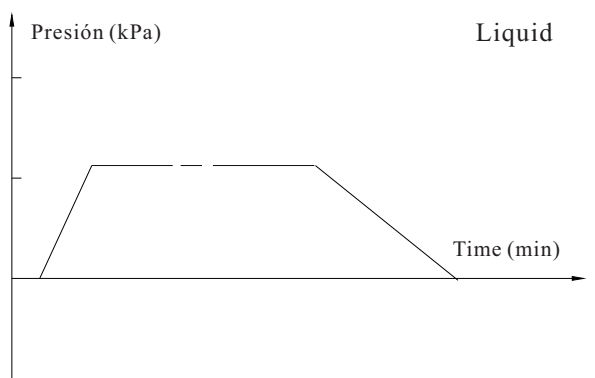
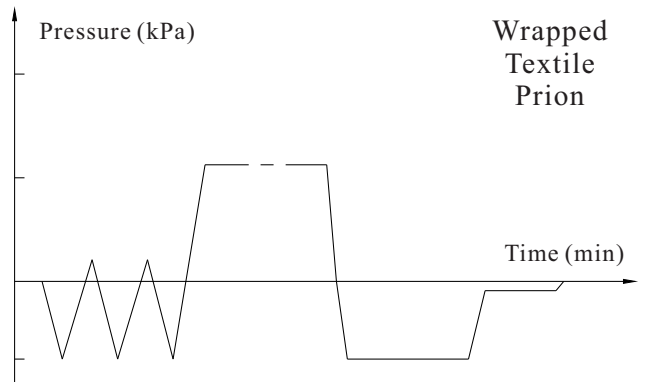
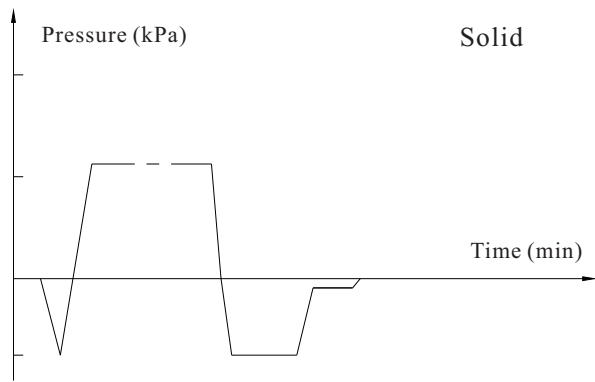
Diagrams of the sterilization programs

Programs	Temperature °C	Pressure kPa	Holding time (min)	Total time (min)	Type	Max. Load (kg)	Max. Load per tray (kg)
 SOLID	134	210	4	14-25	Unwrapped solid material	2.00	0.60
	121	110	20	25-40			
 LIQUID	134	210	10	25-50	Liquid	0.60	0.20
	121	110	30	30-55			
 WRAPPED	134	210	4	20-45	Unwrapped solid material	1.50	0.60
	121	110	20	30-50	Single-wrapped solid or hollow material	2.00	0.60
 TEXTILE	134	210	8	25-50	Unwrapped porous material	0.50	0.15
					Single-wrapped porous material	0.35	0.10
					Dual-wrapped porous material	0.25	0.10
	121	110	30	30-55	Single-wrapped hollow material	1.50	0.30
					Dual-wrapped solid and hollow material	1.00	0.30
 PRION	134	210	18	30-50	Unwrapped porous material	0.50	0.15
					Single-wrapped porous material	0.35	0.10
					Dual-wrapped porous material	0.25	0.10
					Single-wrapped hollow material	1.50	0.50
					Dual-wrapped solid and hollow material	1.00	0.30
Drying (Optional)	—	—	—	1-20	—	—	—
B&D Test	134	210	3.5	15-35	—	—	—
Helix Test	134	210	3.5	15-35	—	—	—
Vacuum Test	—	—	—	17-20	—	—	—

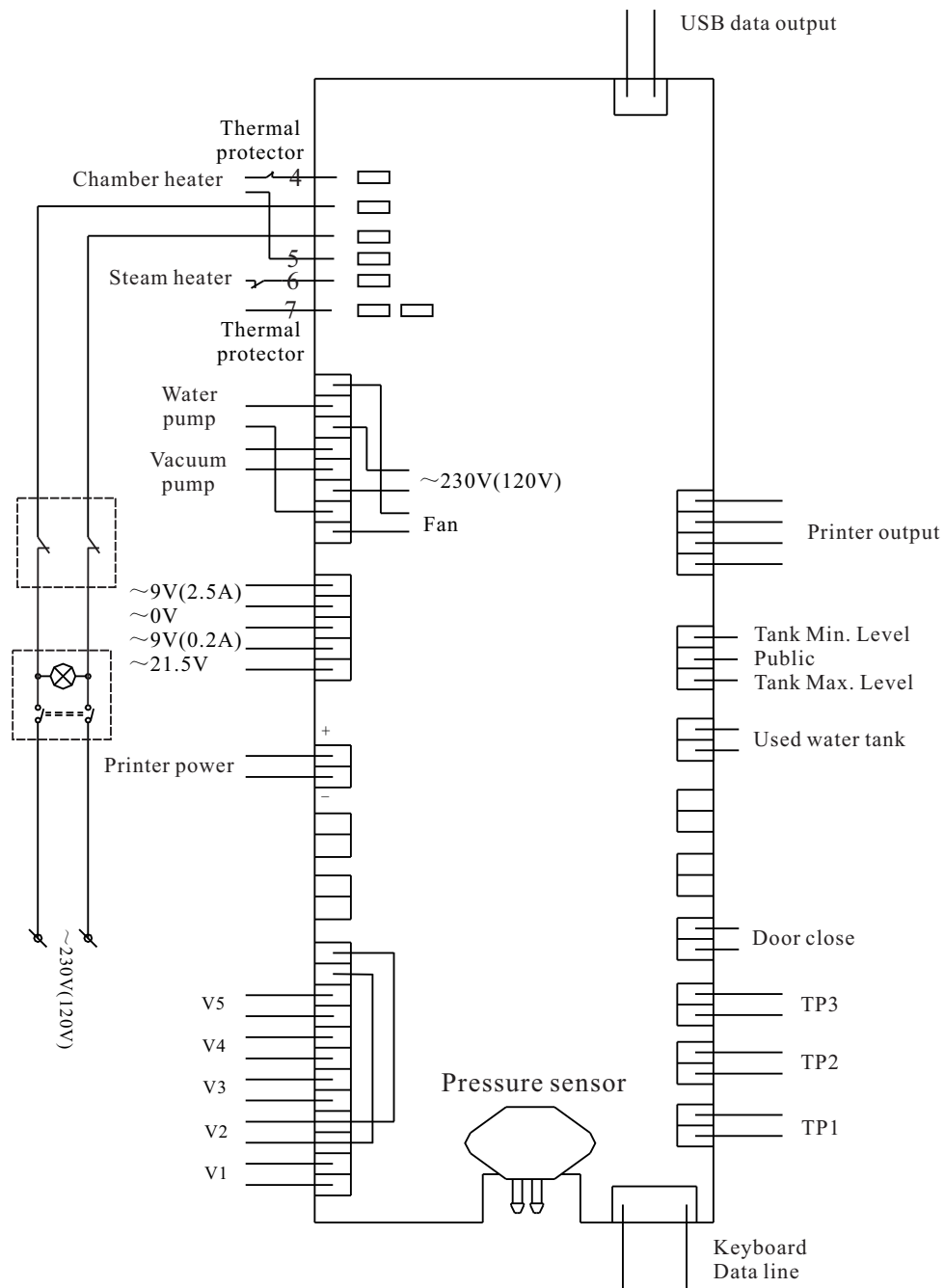
The time required for the sterilizer to be ready for routine use, after the power is switched on is less than 5 minutes.

The max temperature of the 134°C sterilization cycle is 137 °C

The max temperature of the 121°C sterilization cycle is 124 °C



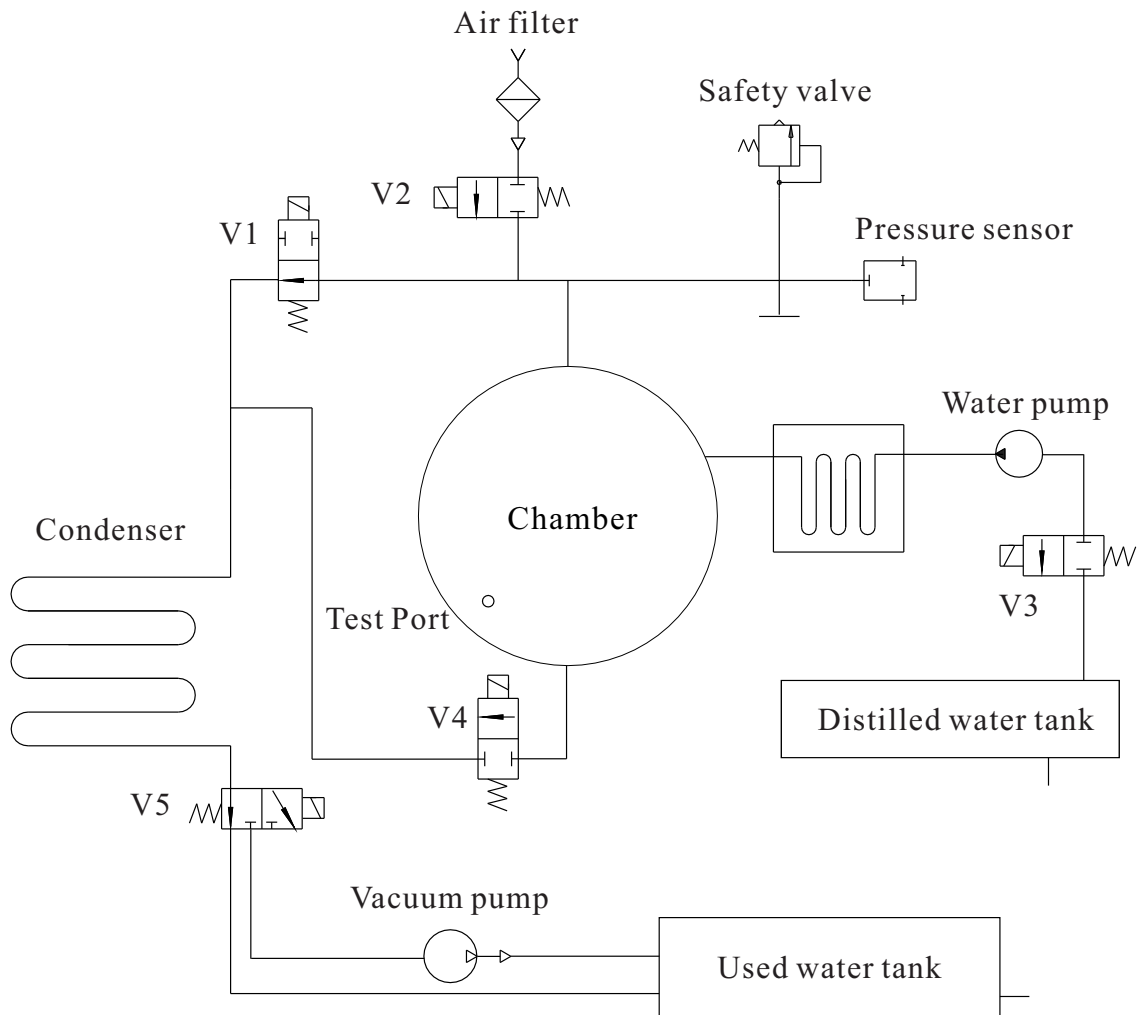
Wiring diagram



- Tp1: Steam generator temperature sensor
- Tp2: Inner temperature sensor
- Tp3: Temperature sensor of chamber wall
- V1: Air release valve
- V2: Air filter valve
- V3: Pump valve
- V4: Water release valve
- V5: Vacuum pump valve

Appendix 4

Hydraulic diagram



- V1: Air release valve
- V2: Air filter valve
- V3: Pump valve
- V4: Water release valve
- V5: Vacuum pump valve