# Series steam sterilisers

# **Operation Instruction**

## Enigma 17 Litre N Type



# **Series Steam Sterilisers** Operation Instruction

# **Dear End User:**

Welcome to your instructions for using your high quality steriliser! Please fill in the "User Registration" form before using your machine. With your record in our files, we will be able to trace your machine and provide you with fast and effective services.

# **User Registration**

On the inscription plate at the back of the machine, you will find the units model, serial and reference number. Please double check the number and fill in the form with them, you should quote the reference number when you are in contact with your distributors.

Model: Seri	al Number:
-------------	------------

Reference Number: \_\_\_\_\_\_

\* Before using the steriliser, please read these safety cautions and instructions carefully. This manual will help you understand all functions of Autoclaves as far as possible.

\* Please follow the instructions carefully in this manual whilst servicing and maintaining the machine.

#### \* PLEASE KEEP THIS MANUAL SAFE FOR YOUR FUTURE REFERENCES

\* If an error occurs during operation of the machine, please get in touch with your local distributor for the best qualified services and assistance.

# Important information on safety



- Please plug the power into a correct voltage (according to nameplate) electrical socket.
   Do not use electrical outlets other than the correct voltage; doing so might cause fire or electric shock.
- 2. Ensure your hands are not wet before plugging in or unplugging the power cord.
- **3.** Do not place the steriliser on an unstable table top, moving desk or an uneven surface.
- **4.** Please do not cover or block the door, ventilation or radiation openings on the steriliser.
- 5. Please do not put heavy objects or liquid containers that may spill on top of the machine.
- 6. Please unplug the power cord when the machine is not in use for long periods of time.



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## 1 Description & Usage

We design and make pressurized steam autoclaves specifically to meet the needs for the sterilisation of instruments and devices in clinics, hospitals and laboratories. Operators include doctors or his/her assistance under doctors supervisions. The autoclave is computerised, user friendly and easy to operate. It's real time display shows all data during the sterilisation cycle. The software program provides auto-diagnose, protection against overheating or over pressurising, and thus ensures reliability of the sterilisation results. The built-in condenser water collecting system prevents discharge of waste steam and keeps the machine clean and safe.

#### OU-22L OU-17L Steam Sterilisers

OU uses thermal pressure to force hot steam onto medical instruments. It is suitable for sterilisation of solid medical instruments and 134°c autoclavable devices for Stomatology, Ophtthalmology, surgical theatres or research laboratories. It cannot sterilise porous or dressing materials.



# 2 Specifications

Chamber inner dimensions (Diameter X Depth)	22L:247 mm x 450 mm
Power Supply	17L:247 mm x 355 mm
Sterilising temperature/pressure 121°c/(0.9~1.3) bar (Under	standard atmospheric pressure)
	standard atmospheric pressure)



Note: Temperature/Pressure here means the chamber temperature and pressure during the phase of sterilisation. The value varies under different atmospheric pressure.

Power fuse	T15A (22L) T12A (17L)
Water tank capacity	3.5L
Environment temperature	+5°C ~ +40°C
Relative Humidity Range	30% ~ 75%

Figures



The Autoclave should be installed in a cool place allowing a minimum of 10cm space at all sides and 20cm at the top. The ventilation openings at the side of the machine should not be blocked. The Autoclave should be placed on a levelled counter top. Please see the figures below for the dimensions of the machine.



If the front of the machine is lower than the back the control panel will display "E3" (E3 means it cannot dry completely)

#### Preparation before using

The draining filter is installed in the chamber (Fig 3-3). You should clean the draining filter when the Autoclave has been used for long periods of time. The instructions show you how to clean it. Please refer to P17. C.A.

Fig 3-3

Before using the device, you should make electrical connections by using the power cord that comes with the unit. Insert the hollowed end of the power cord into the inlet of the machine and plug the other end on a power outlet. Caution: The power supply can accomodate a 1800VA load. The machine is now ready for use.



Fig 3-4



The power supply must be able to accomodate (22L) 2300VA or (17L) 1800VA. Tips: before starting the Autoclave, please check the local atmospheric pressure. If the pressure is lower than 0.095 Mpa or the Altitude is higher than 500 metres, you will need to contact your distributor who should reconfigure the controller in the machine.

# **4** Control Panel

#### 1. Pressure

This displays the actual pressure of the chamber, the unit is bar.

#### **2.** Temperature

This displays actual temperature of the chamber.

#### 3. State displays/Error code displays

This displays all the states of cycle (See appendix 1). If an error occurs, it will show the error code, according to error code mode. **Caution:** If you encounter problems, please contact the dealer or manufacturer for more details.

#### 4. SELECT key

Select a cycle. This will need to be changed according to the different instruments to be sterilised. Select the temperature that you require.

#### 5. STEP key

This is a post cycle selection key. When a cycle is completed, you may press this key to keep the cycle working or to stop it. The indication light

turns on, this means that when the cycle is complete the heating element will stop before the chamber door is opened. When the indicator light is off, it means that the chamber will be kept warm after completing a cycle. Heating up time is also shorted during the next cycle. If the user does not start any operation after completing a cycle, the system will enter into a last cycle automatically an hour later.

#### 6. DRY key

This key selects the fast sterilisation cycle. With unwrapped instruments, you may use the fast cycle by pressing the **DRY** key once. The indicator light will turn on which tells you the machine is now in fast cycle mode. You may still use this option to shorten the cycle time.



Fig 4-1

#### 7. "START/STOP" key

When you select your program, push this button to start a cycle. Keep presing the key 3 seconds before desiccation phase and the sterilisation cycle will be stopped. It will then enter into a 3 minute drying phase. In this program if you press the key again, the drying program will stop. If you press the key at the end of the drying phase, the cycle will be stopped completely.

#### 8. "WATER" indication light

When the water volume is low, this light will flicker.

#### 9. "READY" indication light

When this light shows, the machine gets ready for sterilisation and the user can press the **"start"** key to begin the cycle.

#### 10. "RUNNING" indication light

This is the working light, it shows that the sterilising program is working.

In case of faults, please contact your distributor or the manufacturer immediately.



#### 7. "START/STOP" key

Please connect the power cord before you begin. Press the main power switch at the right lower corner of the front panel. The power switch light will turn on, indicating that electrical power is conected. If the screen has no display then please check the power cord. The screen should display "LD" if the power cord is correctly fitted.

#### 5.1 Fill Water

When the power switch is on select the sterilise program. If the water level is lower than the lowest acceptable level, the alarm may beep and the indication light may flash. This means that you need to refill the reservoir. Please open the water tank and pour distilled water into it using a container. Pay attention to the water level during re-filling, you should stop adding water when the surface is close to the red water level mark as shown below.



# <u>Caution</u>:

- 1) Distilled water only must be used in the machine
- 2) Do not tilt the Autoclave when there is water in the reservoir
- 3) The condenser water collector should be emptied frequently. It is advisable to empty it when refilling the water reservoir. (Please refer to section 9.2 "Draining the water").

#### **Series Steam Sterilisers**

5.2 Start a cycle When the water indication light is off, the machine is ready for use.

#### 5.2.1 Press "SELECT" to choose a program

The key toggles between the cycles at 121°c, 134°c and B\* mode. One of the indication lights turns on to show your selected program. (Fig 5-2)

5.2.2 You may need to select the "wrapped instruments" mode, depending on what you are sterilising. Please press "package" to select the wrapped items mode.

5.2.3 You may select the "DRY" key to reduce the sterilisation time. If you press this button on the panel it will display three options; 1min (with 1min LED on), 5min (with 5min LED on, and 10min (with two LED's off).

5.2.4 After selecting your cycle set up as above, please put the instruments into the steriliser.

**Caution:** Instruments that are ready to be sterilised should be placed in the tray with enough space

for steam to pass through. It is advisable to use the tray holder to put the tray with your instruments inside the chamber to avoid burning injuries.

5.2.5 When the instruments are loaded, you may close and lock the chamber door. Turn the door knob clockwise to it's locking position and wait until the indication light turns on, (Fig 5-4, 5-5 & 5-6)

Fig 5-3





Fig 5-5



Fig 5-6

**Caution:** The door knob must be turned properly to it's lock position to prevent steam leaking during a cycle. If this occurs the alarm will go off and error code "E6" will show. If the chamber is in keep warm mode, it is sometimes difficult to close the chamber door because there is still steam inside. You can keep the door open for a while until the steam is vapourized which should make the door easier to close. You may also push the door inwards with some force whilst turning the door knob to it's locking position. If there is still steam leaking after following the instructions as above, please adjust the door mechanism with a door spanner as per item 6. Door adjustments.









#### 5.2.6 Press "START/STOP" key

If the **"ready"** light turns off and the display reads **"HE"** the machine is ready and starts a sterilisation cycle. It takes about 30-60 minutes to complete an automatic cycle that includes heating up, sterilising and drying. The cycle time depends on the volume of the instruments loaded, the chamber temperature at the beginning of the cycle and also the cycle program that you selected.

**5.2.7** When a cycle completes, the display will show **"Ed"**. The indication light **"RUNNING"** turns off and the indication light **"READY"** turns on with sounds. After this you may open the chamber door and unload the instruments that you have sterilised (Fig 5-6).

If you have a printer installed the display may read **"PRT"** which means that the machine is printing your cycle data. This will not affect the process of opening the door and unloading instruments. This display message will disappear when printing is complete.





Fig 5-7



Fig 5-8

**Attention:** To ensure the Autoclave is running safely If the low water level alarm sounds, please add water to the required level. When you add the water do not forget to let the condenser water out.

**Caution:** Always use the tray holder to load or unload the tray with the instruments in, this will help to avoid any possible burning injuries.

**5.2.8** If you do not use the Autoclave for long periods of time, please turn the main power switch off, or unplug the power cord if you intend to not use the machine for a long time.

**Caution:** Never try to open the chamber door if the pressure display does not show "o.o". It is advised that a chemical or bio-indicator is used for each and every cycle to ensure the reliability of each sterilisation cycle.

**5.4** The instrument rack should be put inside the chamber as the following photo shows:

The first way: (Fig 1, Fig 2)







The second way: Clockwise rotate the instrument rack by 90°, based on the first way (Fig 3, Fig 4)



Fig 3



Fig 4

Notes: The circle stamped angle is upwards

# 6 Door Adjustment

Under normal circumstances the chamber door lock needs no re-adjustment. But if steam leaks occur or the seal fails then you may use the spanner to turn the door seal tighter.

6.1 Open the door first.

**6.2** Insert the spanner into the gap beneath the plastic cover; use the spanner to lock onto the adjusting nut (Fig 6-2). Turn the nut counter clockwise as the figure below (Fig 6-1). This will tighten the sealing plate.

**6.3** Turn the nut until the sealing plate is tight. If the door knob is too tight, you can turn the nut clockwise to loosen it but ensure that the seal does not leak.

#### **Caution:**

Never try to re-adjust the chamber door whilst the door is locked.



Fig 6-1



Fig 6-2

# 7 Printer installation & USB

According to your requirements, the steriliser can provide a printing function. If you have a printer, connect the printer and the steam steriliser together with the cord. Switch on the power and two lights should display on the printer panel. This means that the printer has been installed.

**Caution:** The steriliser can only operate with printers provided by us.

Fig 7-1

Printer information explained:	Sterilisation Records
	Date:07.09.40
	<b>Cycle:</b> 00006
Date: Sterilising date	<b>C.N:</b> 132 2.10
<b>CN:</b> Name of cycle	-N-:SP4m DP10m
	<b>C.S.T:</b> 23:15:16
<b>C.S.T:</b> The starting time of the cycle	<b>Pp:</b> 23:23:57
<b>Pp:</b> The phase of pressure	0.0 099.9
	<b>H.S.T:</b> 23:50:24
<b>H.S.I:</b> The starting time of sterilisation	Min:2.10 134.1
H.E.T: The end time of sterilisation	Min:2.00 134.0
DCT. The starting times of during	Ave:2.05 134.0
<b>D.S.I:</b> The starting time of drying	<b>H.E.T:</b> 00:08:27
<b>C.E.T:</b> The end time of cycle	<b>D.S.T:</b> 00:10:44
<b>Operator:</b> The user's name (Or signature)	0.30 106.9
	<b>C.E.T:</b> 00:10:45
	Result:Passed
	Operator:
$\wedge$	Thanks
Caution:	

The steriliser can only operate with printers provided by us.

#### 7.2 USB function

#### 7.2.1 Main Function:

Storage of printed sterilisation data Built-in FLASH memory U-Disk (Download)

#### 7.2.2 Basic Parameters:

Storage Capacity: 2MB Quantity of printed data to be stored: 2048 Supports FAT files

#### 7.2.3 Operation Instruction:

**1.** Turn on the power, the USB mode will start automatically. After self-testing, it goes into alert and the indicator wil flicker once.

**2.** When the sterilisation cycle ends, the data from the steriliser is sent to the USB. (The printer program should be turned on). The indicator light will flicker once after the data transfer is complete.

**3.** When the indicator light flashes, insert the U-Disk. The indicator light will be flickering again which means the download process is now beginning. Do not turn the power off of withdraw the USB stick, this will corrupt or lose your cycle data.

**4.** When the download is finished, the USB indicator will flicker twice, reminding you to withdraw the U-Disk.

**5.** During the sterilisation cycle, do not try to download data or you will risk losing the data.

**6.** Connect the U-Disk to a computer. You will see files like \_2000\_, this is where the downloaded data is stored. It is very easy to print out or save.

**7.** USB mode problems and solutions (According to amount of times indicator is flickering):

Times	Definition	Solution
1	Self-test passed	Normal
2	Operation finished	Normal
3	No definition	No definition
4	U-Disk needs formatting	Format in FAT files
5	Not enough memory	Delete files in U-Disk
6	U-Disk needs formatting	Format in FAT files
7	USB mode error	Contact us

# 8 System setup

**8.1 Enter function setup mode:** Press **"STEP"** key for 20s when on non-work state (time display "Ld") Pressure display "1", enter function setup mode.

**8.2 Function mode setup:** With 7 options, press **"SELECT"** key, you can select 1-7-1 cycle display. The definition and display of the 7 options are below:

**Option 1:** Year, display name "YER", press "STEP" or "↑" key to increase, press "DRY" or "↓" key to decrease, to set up numerical value.

**Option 2:** Month, display name "nth", press "STEP" or "♠" key to increase, pres "DRY" or "♥" key to decrease, to set up numerical value.

**Option 3:** Day, display name "day", press "STEP" or "↑" key to increase, press "DRY" or "↓" key to decrease, to set up numerical value.

**Option 4:** Hour, Display name "hor", press "STEP" or "↑" key to increase, press "DRY" or "↓" key to decrease, to set up numerical value.

**Option 5:** Minute, display name "nin", pres "STEP" or "↑" key to increase, press "DRY" or "↓" key to decrease, to set up numerical value.

**Option 6:** Printing, display name "prt", press "STEP" key to choose the cycle between options "on" and "off". ON means "print" and OFF means "no printing".

**Option 7:** Exit, when "eit" displays, press "START/STOP" button to save and exit setup mode. **Option 8:** Adjust sterilisation time, display name "S-T" When you setup this option, the sterilisation time (SP) will increase at former value. There are three adjustable ranges; One is increased by 1 minute, two is increased by 2 minutes and the third is increased by three minutes.

**Option 9:** Adjust temperature data automatically, display name "D-P", when you setup this option you can adjust the temperature more or less than 2C-3C. It is only advisable for the user to set this up with guidance from a recommended engineer or by an engineer only.

Press the "SELECT" key after setup and you will come back to option 1. After this you must press the "STEP" key for 3 seconds in option 7. You can then start the setup of option 8 etc. Otherwise the machine can only begin a cycle between option 1 and option 7.

# Caution:

If a function setup is changed by accident please switch off the power and restart the machine

# 9 Maintenance

9.1 How to clean the water tank

**9.1.1** Please clean the sterilisation water tank and waste water tank regularly. See instructions below:

**1)** Empty the water from the tank

**2)** Open the tank cover board, you can use the screwdriver to loosen the five screws (See Fig 9-1)

**3)** Pull up the water tank cover board by hand (see Fig 9-2)

**4)** Pull up the tank cover completely and take off the tank cover (see Fig 9-3)

**5)** Now you can start to clean the tank, dip cotton in alcohol or medical disinfectant to clean the tank wall. Then wash it using distilled water then empty and dry the tank. After this you should also take out the filter net to clean.

**6)** After cleaning the tank, assemble the tank cover and tighten the screws.

**9.2** Draining the water from the machine; Drain the condenser water collector and water reservoir. Connect the water outlet using one end of the tube and the other end to a drainage sink. Then turn the draining knob anti-clockwise to drain the water from the machine (see Fig 9-4)



**Caution:** The correct distilled water must only be used. Any instruments that are put into the chamber must be thoroughly cleaned. If some instruments have oil or impurities on them, please seal them in a sterilisation pouch.







Fig 9-2



Fig 9-3

After a long time of using the steriliser, a small amount of build-up or residue may be present on the drain filter which will affect vacuum and drying. The impurities come from the sterilisation of the instruments put inside the steriliser. It could be due to oil, dust or dirt still remaining on the instruments or a cause of using the wrong water. In order to prolong the life of the drain filter, please see the instructions below:



1. Locate water filter



3. Remove filter



2. Unscrew water filter



Fig 9-5

4. Remove the blue rubber and clean/replace if necessary

#### **9.3** Change the fuse (Fig 9-6)



- 1) Switch off the power
- 2) Unscrew fuse holder with a screwdriver counter anti-clockwise
- 3) Pull out the fuse holder with your fingers
- 4) Replace the broken fuse with a new and correct fuse
- 5) Replace the fuse holder and screw it on clockwise with a screwdriver
- 6) You may use your hand to change the fuse

9.4 Clean the seal plate periodically

After using for some time, the seal plate might have some build-up that can cause leaking. You should clean the seal plate periodically, using a soft cloth soaked with distilled water to wipe the rubber seal and seal plate clean. (Fig 9-7 & 9-8). If the machine is still leaking, you may need to take the rubber seal out for cleaning. If the seal is broken, you will need to replace it with a new one.









#### 9.4.1 Change of the seal

You will need a flat screwdriver without a sharp tip. See the installation steps below (Fig 9-9)



Fig 9-9

**1)** Hold the edge of the seal with one hand and insert the screwdriver beneath the seal with your other hand and pull out the seal slowly.

**2)** Once a section of the seal is out, you may remove the whole seal slowly with both of your hands. You can now clean the seal groove and the seal. If the seal is broken or damaged, you must replace it with a new one.

**3)** After the groove and seal are cleaned, you can put the seal back in place.

Caution: The seal should be mounted evenly inside the groove with the first 4 positioning points in place. Use your hand to press the seal into place evenly.

**4) Attention:** When inserting the seal, the inner edge might evaginate. Use a screwdriver to press the edge down into the groove.

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**Caution:** Turn the machine/power off to let it cool down before you change the seal to avoid any possible burning injuries.

9.5 Cleaning the steam generator

**9.5.1 Aim:** Clean the steam generator and steam pipe to avoid any blockages or build-up.

9.5.2 Description: 20min cleaning + 10 min drying

**9.5.3 Purpose:** To clean the steam generator build-up, take it out of the machine pre-vacuum.

**9.5.4 Operation:** When the machine is inactive, press "SELECT" for 5 seconds, the B&D light and LEAK light will flash, which shows you selected the cleaning cycle. Close the door and press "START" to begin to clean.

**9.5.5 Cleaning Reminder:** After cleaning, every 100 cycles the B&D light and LEAK light will display and flash. This will remind you to clean the steam generator.

The cleaning function will not affect the autoclave cycle, it is only a friendly maintenance message.

**9.6** If the machine needs to be repaired or the electrical/spare parts need to be changed, please turn the power off first. Be sure to ask your dealer, manufacturer or a qualified service engineer to replace these parts.



Fig 9-8

# 10 Transport & Storage

**10.1** Preparation for transportation and storage Turn the machine off, unplug the power cord and let the chamber cool down.

10.2 The Autoclave should be transported and stored in the following conditions: Temperature: -40 ~ +55°C Humidity: <85%</li>
Atmospheric Pressure: 500Hpa ~ 1060 Hpa

**Caution:** Do not drag the machine when moving.



The manufacturer provides a warranty for two years after the invoice date with presentation of the invoice. The disclaimers are as following:

11.1 Damage due to improper moving, installation or operation for the machine

11.2 Damage due to dismantling the machine by unauthorized personnel

11.3 No end user guarantee

11.4 Inappropriate operation on the machine without following the operator's manual

11.5 Damage caused by power surge, fire or other external matters.

## 12 Accessories



- Instrument tray rack 1 pc & instrument tray 3 pcs.
- 2) Power cord 1 pc.
- 3) Mainboard fuse 1 pc.
- 4) Water outlet tube 1 pc.
- 5) Tray holder 1 pc.

- 6) Filtrable net 1 pc.
- 7) Sealing ring 1 pc.
- 8) Fuse 2 pcs.
- 9) Draining O Ring 2 pcs.
- 10) Level instrument 1 pc.
- 11) Door adjustment spanner 1 pc.

**Caution:** The above picture of the spare parts may be slightly different. Please check that all of the necessary parts for your machine have arrived with the Autoclave.

# 13 Appendix

## Form 1 Work mode chart

	134°C	121°C	CLEAN test
Sterilising Temperature	134	121	
Sterilising Presure	2.10	1.10	
Classes	N	N	
Pre-heating Min	0-7	0-7	Clean 20
Admission time Min	5	5	
Sterilising time Min	4	16	
Quick-Drying time	1/5	1/5	5
Total time Min	26(16/20)	38(29/33)	25

#### Form 2 Error code chart

ltem	Error Code	Error	Description
1	E1	Sensor Fault	Check sensor
2	E2	Over pressure (>2.6Mba)	Check temp sensor presure
3	E3	Chamber over temp (>145 degree)	Check outer temp sensor
4	E4	Still warm but pressure failed	Rerun auto program
5	E5	Exhaust failed (20S<0.3Mba)	Check air vacuum valve
6	E6	Door open	Check door lock
7	E7	Steam gen over temp(>230 degree)	Check steam gen temp
8	E8	pre-heating fault>20min	Check heating ring or pipes
9	E9	Fill pipe fault>30min	Check steam pipes



## Schematics



## Piping



# 14 Troubleshooting

**1.** During venting or drying you hear a thump sound. This means that the condensed water collector is full. You must drain the water from the collector.

**2.** Hissing from the chamber door (See item 6 Door Adjustment).

**3.** During a cycle you hear a bang sound, steam leaks from the chamber door and the machine displays "E6" code. Please check that the door knob is properly turned and locked. If the steam leaks at the start of a cycle, you need to change the seal. (See instructions on page 18)

**4.** When a cycle is completed, there are water drops on the instruments.

#### You may solve this problem by:

- Checking the drain filter

- Reducing the load of instruments in the chamber, especially the porous, dressing and other water absorbent materials.

- Try waiting longer at the end of a cycle for a better drying result. The autoclave will continue heating the chamber until you open the door.

# **15** Important Information

**1.** The Autoclave must be installed on a levelled counter top.

**2.** When operated at a higher elevation of more than 500 meters, the machine must be reprogrammed. Please get in touch with your distributor for instructions.

**3.** Distilled water only must be used to prolong the life of the machine.

**4.** The radiation openings in the machine must not be blocked or covered.

**5.** Instruments should be placed on the tray to allow space between each piece for steam to pass through.

**6.** Condensed water from the collecter must be emptied from time to time. It should be emptied when refilling the water reservoir. (See item 9.2)

**7.** Chamber door knob must always be turned to it's locking position.

**8.** Never try to open the chamber door before the pressure displays "o.o".

**9.** To avoid posible burning injuries, turn the machine power off and let it cool down before replacing the seal.

**10.** Do not drag the machine whilst trying to move it.

**11.** The power connection must be grounded properly.

**12.** There must be enough power provided (1800VA)

**13.** If the temperature outside is cold, please re-heat the machine without instruments for 30 minutes before sterilising.

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