

## b. AUTOCLAVES

### 1. Purpose of the equipment

To sterilise instruments and materials.

### 2. How the equipment works

Always refer to the manufacturer's instructions for specific advice about the equipment you are using. The following are general guidelines only.

An autoclave is basically a pressure vessel with a lid. The area in the pressure vessel where the load can be put is referred to as the chamber. Autoclaves use pressurised, high temperature steam in order to sterilise; however it is essential that the steam reaches all surfaces of the load. Air in the chamber and load can impair sterilisation performance.

#### Problem of air in the chamber and the load

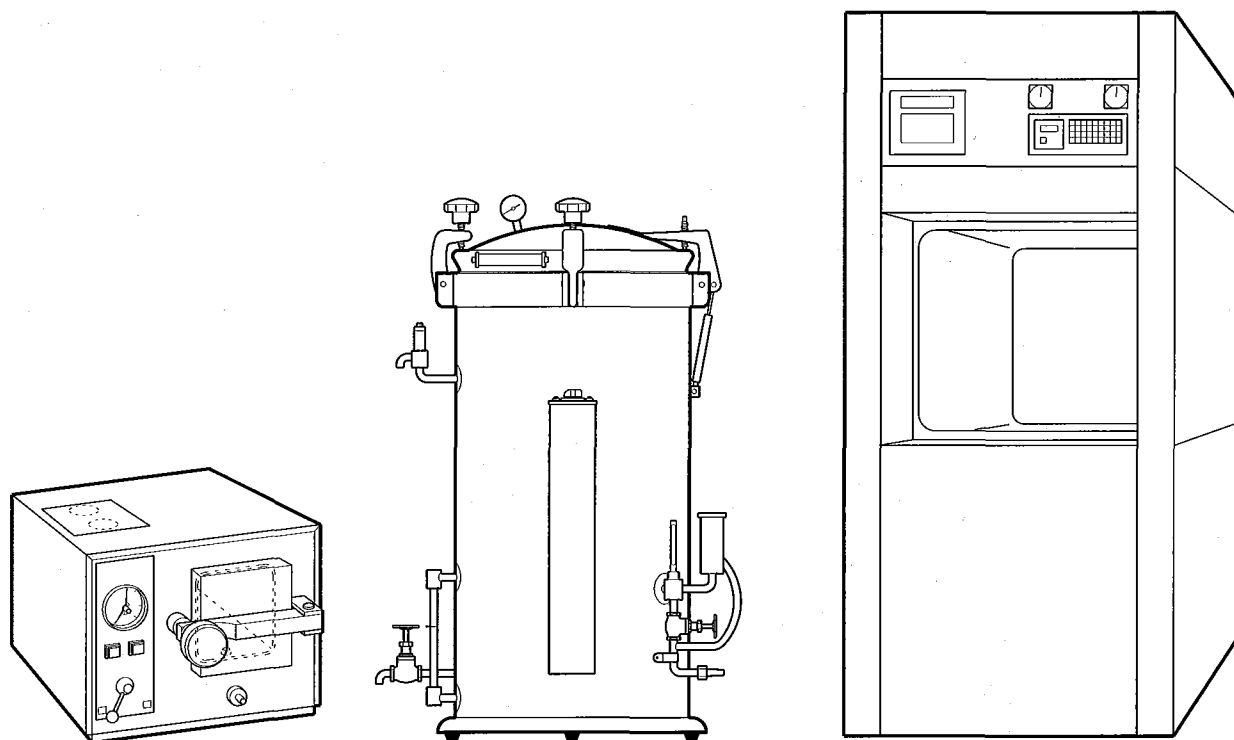
Air transfers heat very poorly, and is therefore much less effective in killing organisms than steam. Air in the chamber or in the load may prevent the load from being in direct contact with the steam, seriously reducing the effectiveness of the sterilisation process. This is why air must be removed from the chamber and the load before the actual sterilisation time starts. Air removal from the load can be significantly improved by steam pulsing (see Section 4: **How to use the equipment**).

#### Autoclaves designed for various purposes

A well designed and well operated autoclave ensures that the air in the chamber and in the load is removed properly before sterilisation begins, and that the load is dry at the end of the sterilisation process. Differences in the design of sterilisers are mainly determined by the way air is removed from the chamber and the load. As the method of air removal depends on the type of load, sterilisers can be grouped according to the load they are to be used for:

- for **non-porous loads**: materials which do not contain air, e.g. unwrapped, non-hollow instruments
- for **porous loads**: materials which do contain air, e.g. drapes, gloves, wrapped instruments, hollow instruments
- for **watery fluids** such as intravenous fluids, water for injections, etc.

Certain models of autoclave may be suitable for more than one application. To check which application an autoclave is designed for, read the manufacturer's instructions or ask a trained technician.



A small tabletop autoclave for non-porous loads: this type is suitable for sterilising unwrapped, non-hollow instruments. It is an electrically heated, automatic model with a horizontal chamber.

A medium-size, vertical, single-chamber autoclave. It is electrically heated and hand-operated. These models are also available for heating by kerosene. They are common in rural hospitals and are used for various types of loads.

A large, fully automatic autoclave for the Central Sterilisation Department of a major hospital. It has a horizontal chamber and is equipped with a vacuum pump for air removal and drying. There is a vertical sliding door at each end of the chamber facilitating separation of the non-sterile and sterile areas.

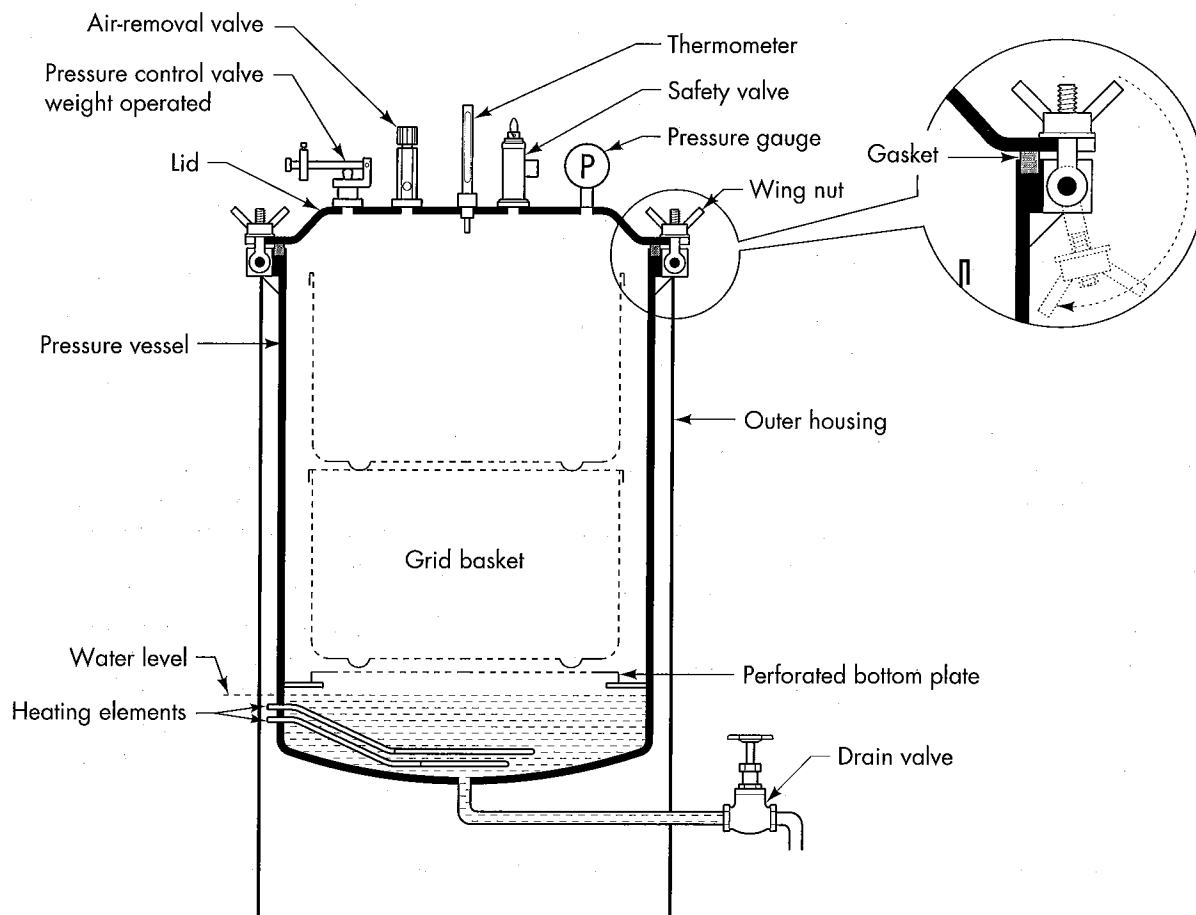
**Figure 28:** Autoclaves are available in a wide range of sizes and for various applications

### Autoclaves for non-porous loads

Autoclaves for non-porous loads can be of fairly simple design, as no special arrangements are necessary for the steam to reach all parts of the load. The most common design used in remote hospitals and clinics is the single-chamber, vertical autoclave. See Figure 29. This mainly consists of a pressure vessel in which the water is filled up to a certain level. The water is fed directly into it by opening the lid and pouring the water into the vessel. During heating-up the air from the chamber and load is removed via an air-removal valve which is opened until the water has been boiling for about five minutes. See Figure 30. A pressure control valve, which may be spring- or weight-operated, or a pressure/temperature sensor ensures the correct sterilisation pressure/temperature. An additional safety valve is installed. It is activated if the pressure control valve fails to operate.

The heating of the autoclave can be by one or more electric heating elements or a kerosene or gas burner. In order to check the temperature and pressure inside the chamber a thermometer and pressure gauge are usually installed.

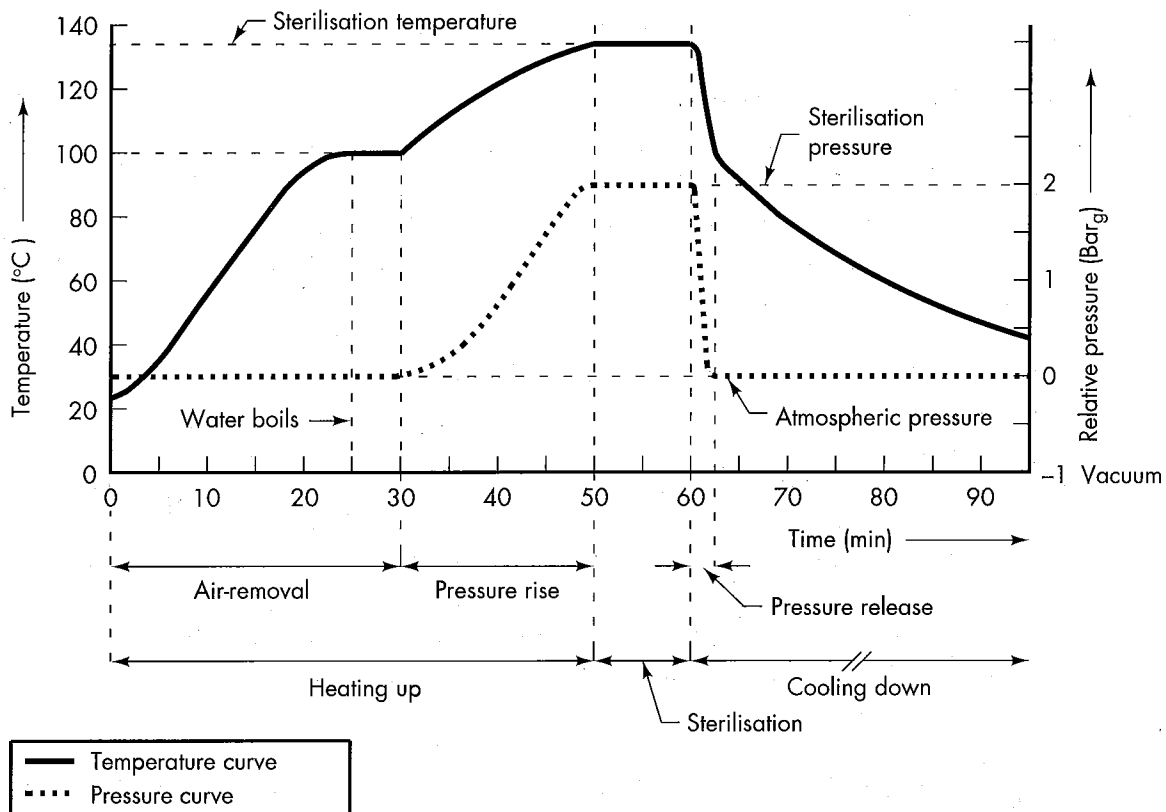
The technology of the hand-operated models is simple; they are easy to maintain and thus suitable for remote hospitals where access to a maintenance service by a supplier is not feasible.



**Figure 29:** Vertical build, single-chamber, non-vacuum type autoclave; electrically heated

The smallest autoclaves are the pressure cooker types. They are available in various sizes and complexity, from simple hand-operated multi-fuel types to advanced, fully automatic cycle, electrically heated models.

For larger loads, autoclaves with bigger chamber volumes are available. They may be equipped with additional features such as a water-level gauge, pressure gauge and thermometer. Steam may be generated inside the chamber, as in the pressure cooker types, or may be supplied from an outer jacket or an external source. Most common in rural hospitals are the vertical autoclaves with a single chamber, approximately 60cm deep and 40cm in diameter.



**Figure 30:** The temperature/time and pressure/time diagram of a typical sterilisation cycle of a non-vacuum autoclave. Sterilisation is done here at 134 °C/2 Bar<sub>g</sub> for a period of 10 minutes.

### If you have to sterilise porous loads in a single chamber autoclave without a vacuum system

Non-vacuum sterilisers are not designed for porous loads and hollow instruments. If however you are in a situation where you have to use such a steriliser for such loads perform two steam pulses before starting the sterilisation time. This greatly improves air removal from porous loads. See Section 4: **How to use the equipment.**

### Autoclaves designed for porous loads

For fast and efficient removal of air from the load, sterilisers designed for porous loads are equipped with a vacuum pump. The vacuum system is also used for drying the load after the sterilisation time.

Basic hand-operated autoclaves with a vacuum system are usually of the double-chamber type, using a steam ejector (steam-jet pump) as a vacuum pump. In order to operate these properly, it is essential to follow the manufacturer's instructions carefully.

Fast cycle, advanced automatic autoclaves are equipped with an electric water ring type vacuum pump. Usually they have short heating-up times and use several cycles of vacuum and steam injections (steam pulses) before the sterilisation time starts. After the sterilisation time a deep vacuum is drawn to dry the load. If you

have such a model, refer to the documentation which came with your steriliser or refer to the book *Sterilisation of Medical Supplies* listed in the Bibliography.

### **Sterilisation of fluids in sealed glass containers**

When sterilising fluids in sealed glass containers (for example, glass bottles containing intravenous fluids), a basic non-vacuum steriliser can be used. Be aware that the heating-up time and time for reaching the sterilisation temperature may take considerably longer than when sterilising other goods. This is due to the high heat-capacity of the fluids.

**After the sterilisation time has passed the pressure should not be released. Do NOT open the air-removal/steam release valve:** the autoclave should be left to cool down by itself. The door must not be opened until the temperature inside the bottles has gone down to 80°C. Opening the door too early could cause the bottles to explode, resulting in serious injuries to the user. Newer models of sterilisers for fluids are equipped with a door-interlock which prevents the door from being opened until the temperature inside the bottles decreases to 80°C. A vacuum must never be applied after sterilisation of fluids. If you cannot measure the temperature inside the bottles, you should leave the autoclave to cool down overnight before opening the door.

Normal autoclaves **cannot** be used for sterilisation of fluids in plastic containers or bags. For these purposes, **only** specially designed autoclaves can be used.

Modern, automatic autoclaves are extremely advanced equipment which require specialist know-how and equipment for installation and servicing. Usually maintenance and repair is done by the supplier or a well-trained steriliser technician.

### **Testing the performance of autoclaves**

Sterilisation of goods is a process in which the steriliser, the sterilisation process and the load all influence the result. The performance of an autoclave for each different type of load must be tested by using the appropriate process. For example, typical loads may be: textile packs, containers with instruments and bottles containing intravenous fluids. Each of these loads has to be tested separately. Available test methods are summarised in Figure 31. Materials for sterilisation performance testing are available through various manufacturers.

Performance test method	How to use	Remarks
Sterilisation tape	The tape is used as adhesive tape for packaging, or can be stuck on the load as a "was sterilised" indicator.	Lines of heat/moisture sensitive ink on the indicator tape change colour when the tape has been exposed to a steam sterilisation process. It cannot be used as a real performance indicator as it does not indicate whether all sterilisation conditions were met. When ordering specify that the tape is to be used for a steam sterilisation process.
Maximum thermometer	Can be put in the most critical location of the load.	The thermometer indicates the maximum temperature which was reached during a process. It does not indicate for how long the temperature was reached and whether it was actually steam which reached this temperature.
Chemical indicators	Indicators can be put in critical locations of the load such as the centre of a textile pack or inside hollow instruments.	The indicator is usually a small strip of paper or cardboard which has a spot or area with a special ink, which can change colour. Various types are available. Some types verify the presence of steam at a specific temperature for a minimum period of time. Usually the indicators are designed for fast cycle vacuum sterilisers. These are not suitable for the basic non-vacuum sterilisers. When ordering mention the type of steriliser and the time/temperature for which you want to use the indicators.
Steriliser control tubes	Can be put in critical locations of the load or inside the fluid in a test bottle.	The glass tube verifies that it was exposed to a temperature for a minimum period of time by changing colour. It does not distinguish between air and steam. Steriliser control tubes are commonly used for testing performance of sterilisation of fluids. Test tubes are available for various sterilisation times and temperatures.
Bowie and Dick test	The test pack should be in the centre of the chamber.	Standardised steam penetration test for autoclaves with a vacuum system. It is used to verify the presence of steam at a specified temperature for a minimum time. It consists of a standard size pack of folded cotton sheets: approx. 22cm (length) x 32cm (width) x 25cm (height). A chemical indicator paper is placed in the middle of the sheets, which are put inside the steriliser and a normal sterilisation cycle is run. The indicator sheet will indicate the presence of any air inside the pack by a non-even colour change. Mini-Bowie and Dick test packs are now available which are much smaller than the standard packs. Their main advantage is that they are easy to use: you do not have to prepare sheets and fold your own full-size pack.
Biological indicators	Can be put in the most critical location of the load.	They are a direct method of checking the performance of a steriliser as they show the destruction of microbiological life. They do not provide an instant result; they must be incubated or processed to determine 'pass or fail'. Their reliability depends on strict quality control during manufacture and decreases during storage. This method is not recommended.

**Figure 31:** Methods for testing the performance of autoclaves

### **3. Routines and safety**

#### **Installation**

Make sure that the autoclave is installed on a level surface which is well ventilated and dust free. The steam exhaust should be connected to a hose or piping with a gradual fall in the direction of the steam flow. Water should never be trapped inside the piping. Follow the manufacturer's instructions.

In order to limit the possibility of recontaminating sterile goods, plan a routing of the goods to and from the autoclave: crossing of routing of sterile and non-sterile materials should be avoided. This can be done by dividing the sterilisation department into at least three areas:

1. A 'dirty' area for cleaning; if possible in a separate room
2. An area for inspection, sorting and packaging of the equipment. This will be at the 'non-sterile' approach side of the autoclave
3. A clean area, for storing sterile materials. This will be at the 'sterile' approach side of the autoclave.

The autoclave should be installed between the inspection/package area and the clean area.

#### **i. Routines**

##### **Daily:**

Before using the autoclave:

- fill with distilled or demineralised water. Clean rain water can be used in emergencies. Do not use water which has a high mineral or salt content as this will corrode the steriliser and instruments
- check that the machine is not damaged and does not have any leaks
- check that the electricity supply/gas ring/kerosene burner is ready for use
- check that the chamber is clean after previous use
- make sure that you follow the correct instructions for each type of load (non-porous load, porous load or fluids)
- when running the autoclave, check that the appropriate temperature and pressure are reached by checking the gauges (if your autoclave is equipped with a thermometer and pressure gauge)
- keep the autoclave clean; prevent damage due to cleaning. Do not use abrasive powders, metal cleaners or bleaches as they will damage the surface

Report any damage or incorrect readings immediately

Enter any abnormalities in the autoclave log book

##### **Weekly:**

- check that the door opens and shuts easily. Lubricate the hinges if necessary as described in the manufacturer's handbook
- test the performance of the autoclave with its load by using indicator strips
- check the lid/door gasket for any deterioration or damage
- check that all valves turn easily, and are not leaking

**Every three months:**

- when the autoclave is under pressure: check that the safety valve opens and blows off steam when activating the test lever
- the autoclave technician should carry out a complete examination of the autoclave. User entries in the log book over the previous three months can be used as a reference for possible necessary repairs

**ii. Safety**

An electric autoclave should have a proper earth connection

When you are using a paraffin-heated autoclave:

- immediately wipe up any accidentally spilled fuel with a rag to avoid a fire hazard
- make sure there is sufficient ventilation

Do always make sure there is sufficient water inside the chamber. Heating up without enough water can damage the autoclave beyond repair and may cause great danger to the operator

Do check for steam leakages around the lid, valves and piping

Do make sure that the clamps/fastening bolts of the lid can be secured tightly

Do make sure that personnel operating the equipment are well trained and understand their duties properly

Do keep unauthorised people away from the sterilisation department

Do take great care when opening the lid, as the load may still be very hot, even after a period of cooling down

Do NOT interrupt the sterilisation cycle unless there is an emergency. If a cycle is interrupted, the whole cycle has to be started again from the beginning

Do NOT leave the autoclave unattended when in use

When sterilising fluids:

Do NOT open the air-removal/pressure-release valve at the end of the sterilisation time. Let the autoclave cool down by itself

Before opening the lid, do make sure that the temperature inside the fluid has reduced to 80 °C. If you cannot measure the temperature inside the fluid: let the autoclave cool down overnight

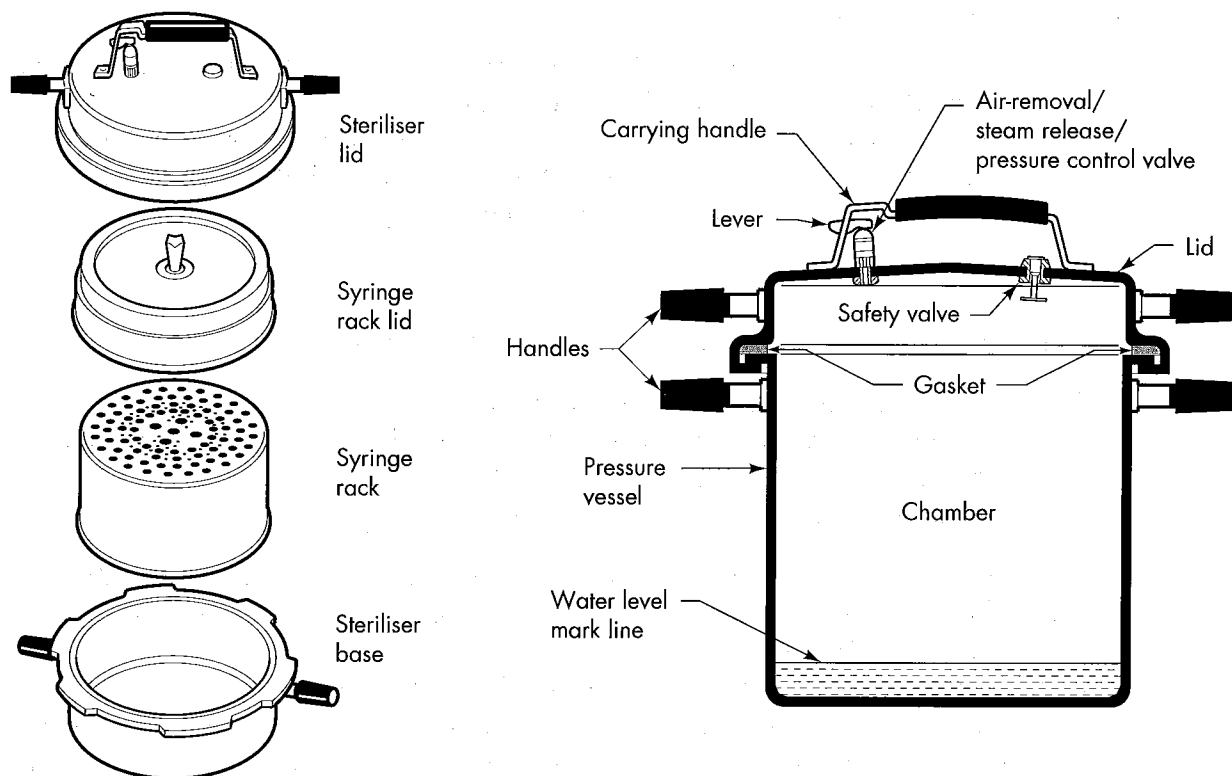
**4. How to use the equipment**

There is a great variety of autoclaves for various applications, a wide range of sizes and different types of control and design. Always refer to the manufacturer's instructions for specific advice on the equipment you are using. The following are guidelines for the use of a typical hand-operated pressure cooker-type autoclave (see Figure 32) and a typical, hand-operated, single-chamber, non-vacuum autoclave for large volumes as shown in Figure 33.

**A pressure cooker-type autoclave**

This fuel-heated model has been introduced by the World Health Organisation for the sterilisation of syringes and needles for the worldwide *Expanded Programme on Immunisation (E.P.I.)* and it can also be used for sterilisation of other materials. Various sizes are available; it is designed to operate at 121 °C and it can be heated by any heat source. Refer to Figure 32.





**Figure 32:** Fuel-heated, pressure cooker-type autoclave as used in the WHO Expanded Programme on Immunisation

#### i. Preparation of the autoclave and the load

- if you have water with high mineral or salt content, place the hard water filter pad, which is supplied with the autoclave, in the base of the autoclave
- fill with water up to the water level mark (ridged step mark) on the inside of the steriliser wall
- prepare the load so that it is ready for sterilisation (cleaning, packaging, arranging, etc.)

#### ii. Loading the steriliser

- put the load in the steriliser
- check that the rubber seal is in place and in good condition
- put on the steriliser lid. The mark on the lid should line up with the handle on the base
- pressing down on the lid, turn it clockwise until it will not turn any more; the handles are now aligned
- check that the small pin in the safety valve is down
- make sure that the pressure-control valve is opened: the lever of the valve should be pushed upward

### **iii. Heating of the autoclave and the load; air removal**

- place the burner on a firm surface. Then place the steriliser on the burner and turn the burner on full
- after a few minutes, water will start boiling and steam will come out strongly from the pressure-control valve
- set the timer to five minutes. During this period, air will be flushed from the chamber with the steam
- when the timer clock rings push the lever of the pressure-control valve down. The pressure in the chamber will start rising. After a few minutes the required pressure is reached and steam will again come out strongly from the pressure-control valve
- turn the burner down until steam can still be clearly heard escaping from the valve

### **iv. Sterilisation**

- reset the timer to the required sterilisation time (refer to Figure 23)
- make sure that the steam can be heard escaping from the pressure-control valve all the time

### **v. Ending the sterilisation**

- when the sterilisation time has passed, turn off the heat and lift the pressure-control valve lever. A lot of steam will escape and the pressure will be reduced
- close the pressure-control valve (lever down) after all the steam has escaped, so that sterility is maintained

### **vi. Cooling down, opening and removal of the load**

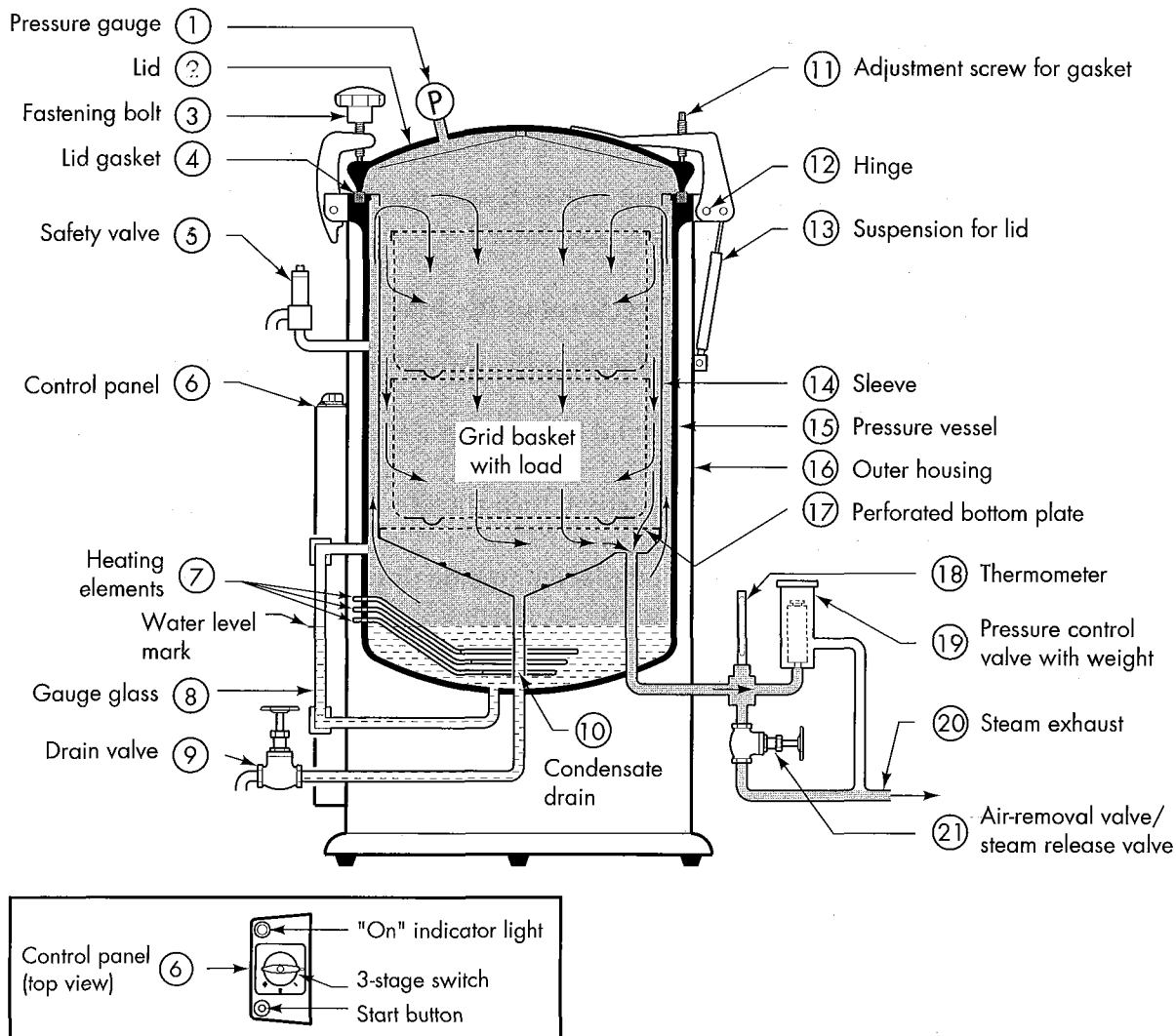
- allow 15 minutes for the steriliser to cool down before opening or draining the water
- do not open the steriliser lid until the materials which you sterilised are about to be used
- when the materials are needed, turn the steriliser lid anti-clockwise until it will not turn any more
- lift the lid off the base and place it upside down on the table
- take the load out of the steriliser chamber

## A basic, larger-volume, hand operated single-chamber autoclave without a vacuum system; electric heating

These instructions for use are specific to the model shown in Figure 33.

This type has a sleeve (14) inside the pressure vessel (15), forcing the steam to enter the chamber from the top. The steam passes from top to bottom through the chamber and the load. It leaves the chamber through a pipe in the bottom of the chamber. Air is heavier than steam. By this downward movement of the steam in the chamber, the removal of the air is improved. The pressure is controlled by a weight-operated pressure-control valve (19).

- For sterilisation of non-porous loads follow steps i-iv below without steam pulsing: step iii(a) is not necessary.
- For sterilisation of porous loads and hollow instruments follow steps i-vi including the steam pulses described in step iii(a)
- For sterilisation of fluids perform steps i-iv and step v(a) without steam pulsing. Step iii(a) should not be performed.



**Figure 33:** Vertical, single-chamber, non-vacuum type autoclave for large volumes; electrically heated. This type has a sleeve (14) inside the pressure vessel (15), forcing the steam to enter the chamber from the top. Fuel heated models are also available.

### **i. Preparation of the autoclave**

- close the drain valve (9) and air-removal valve (21)
- open the lid (2) and pour distilled or demineralised water into the chamber up to the water level mark on the gauge glass (8)
- the water flows through the perforated bottom plate (17) and condensate drain (10) into the vessel bottom
- select the sterilisation temperature/pressure. If necessary insert the correct weight in the pressure control valve (19) (for 1 Bar/121 °C or 2 Bar/134 °C)

### **ii. Loading the autoclave chamber**

Keep the following in mind:

- make sure that the load has been cleaned thoroughly
- ensure proper packaging
- make sure there is sufficient space between the items: at least 2cm
- if you use containers or nets, do not pack them too densely. You should be able to put your hand between the sheets of textile packs
- limit the size of the load. No packs or materials should ever touch the chamber wall
- containers/drums should be perforated top and bottom. The perforations should be covered with a bacterial filter
- there should be a distance of at least 2cm between containers/drums
- if the packaging material is textile, use the goods as soon as possible

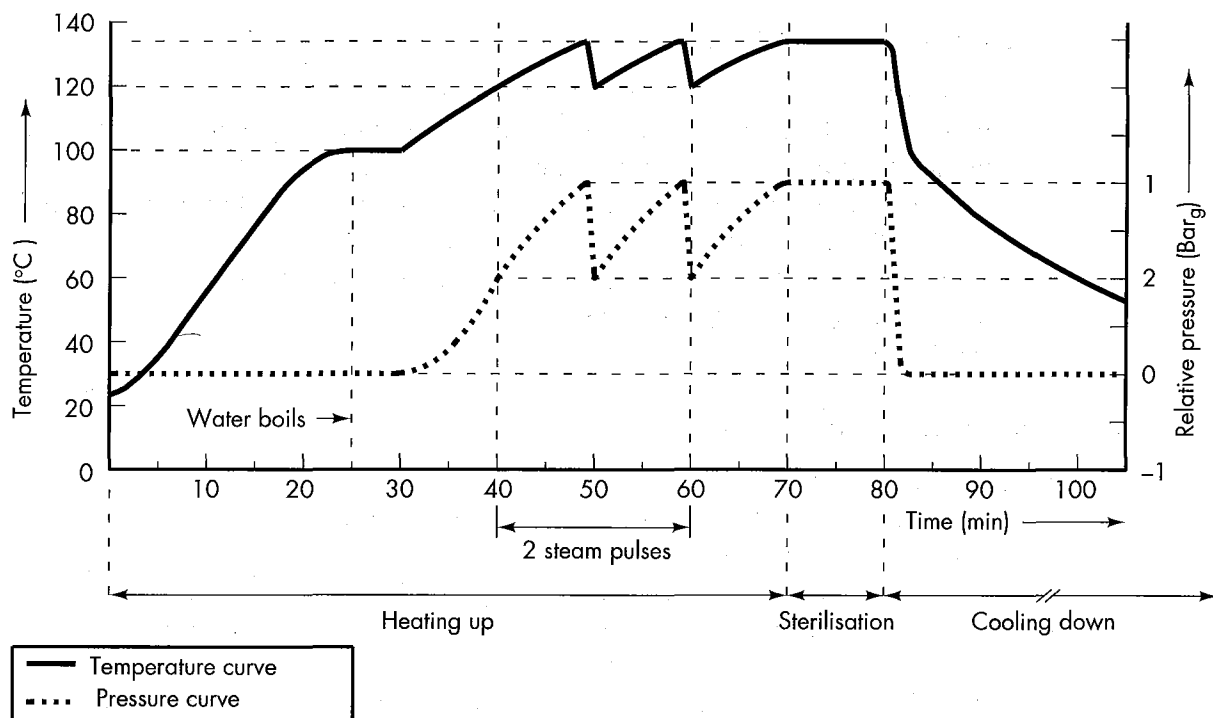
### **iii. Heating of the autoclave and the load; air removal**

- close the lid and tighten the fastening bolt(s) (3)
- open the air-removal valve (21)
- switch on the heating to maximum power by putting the switch on the control panel (6) to position III and pressing the 'start' button. The indicator light will be on
- the pressure will rise. At a certain moment the water will start boiling and the thermometer (18) will indicate 100°C. Steam will be blowing out of the exhaust pipe (20). Let the steam blow off for five minutes
- close the air-removal valve (21)
- now the pressure and temperature in the chamber will start rising. The pressure can be read from the pressure gauge (1)

#### **iii (a). When sterilising porous loads only: additional air removal by steam pulsing**

Porous loads require a more rigorous method of air removal. This can be done by performing two steam pulses. See Figure 34.

- let the pressure increase to the set sterilisation pressure
- open the air-removal/steam release valve (21) quickly. Let the pressure drop by 1 Bar. Then close the air-removal/steam release valve (21) again
- let the pressure increase to the desired sterilisation pressure again
- again open the valve and let the pressure drop by 1 Bar
- close the air-removal/steam release valve (21)
- let the pressure increase to the required sterilisation pressure



**Figure 34:** Process for sterilisation of porous loads in a non-vacuum autoclave. By performing two steam pulses before the sterilisation time the removal of air from the load is greatly improved.

#### iv. Sterilisation

- the moment when the pressure, as set by the weight of the pressure control valve, is reached, the weight will be lifted intermittently and the pressure will remain constant. At this moment the actual sterilisation time starts
- set your timer to the desired sterilisation time. Refer to Figure 23. Throughout the sterilisation time a small amount of steam will blow off from the steam exhaust pipe (20). Operation of the pressure control valve (19) can be heard as a soft hissing sound from the valve housing
- the heating can be reduced by putting the control switch down to position II

#### v. Ending the sterilisation (if sterilising fluids, see v(a). below)

- when the sterilisation time has passed, switch off the heating by turning the control switch on the control panel (6) to zero ('0')
- open the air-removal/steam release valve (21). The steam now escapes through the steam exhaust pipe (20). The pressure will gradually go down.

#### vi. Cooling down and removal of the load

- in order to improve drying, drain residual water by opening drain valve (9)
- to economise on distilled water you can catch the water in a bucket and use it again in a following cycle
- leave the load in the autoclave for about 15 minutes to cool down. The heat will help to dry the load
- loosen the fastening bolt(s) (3), open the lid and remove the load

**v (a). When sterilising fluids: ending sterilisation and cooling down**

- when the sterilisation time has passed, switch off the heating by turning the control switch on the control panel (6) to zero ('0')
- do not open the air-removal/steam release valve. Let the autoclave cool down by itself until the temperature inside the bottles has reduced to 80°C. If you cannot measure the temperature inside the bottles, leave the autoclave to cool down overnight

**5. Simple fault-finding and maintenance**

Autoclaves are potentially dangerous machines. Moreover modern autoclaves, especially the automatically controlled models, are complex equipment. In the majority of countries their use is covered by mandatory regulations which include the rule that repairs and overhauls must be carried out by qualified technicians.

**Example a:** The autoclave does not heat up

**i. If the autoclave is heated by electricity:**

- check the power supply and the fuses

If these are satisfactory

- call a qualified technician

**ii. If the autoclave is heated by fuel or gas:**

- check the fuel supply
- check that the burner or stove is clean, that it is positioned correctly under the autoclave and that it is not in a strong draught

If these conditions are satisfactory:

- call an autoclave technician

**Example b:** The load is wet at the end of the cycle

Re-run the cycle observing the following points:

- prevent condensation from dripping onto the load below a pack. Put the heaviest materials at the bottom
- do not pack too densely. In textile packs you should be able to put a hand between the sheets
- limit the size of the packs and the total load
- make sure that the chamber wall is not touched. Keep sufficient distance between packs: at least 2cm from the wall and from each other
- after sterilisation drain the water from the vessel (in the case of a single-chamber, non-vacuum autoclave). The residual heat will help to evaporate the condensation left inside the load
- make sure you follow the manufacturer's instructions for use
- if your autoclave has a vacuum system, check that the vacuum is sufficiently deep (see the manufacturer's instructions)

**Example c:** Autoclave does not reach the required temperature/pressure

Re-run the cycle

- check that the door fits accurately and the gasket is in good condition. There should be no leaks
- check the setting of the pressure-control valve or pressure/temperature control system
- check the elements for 'furring'

**If all are satisfactory:**

**i. If using an electric autoclave**

- call an autoclave technician for a further check-up

**ii. If using an autoclave heated by gas or kerosene**

- check that the burner or stove is clean, correctly positioned and not in a draught

**If satisfactory:**

- call an autoclave technician

**Example d:** Door gasket is worn

A new gasket has to be fitted. For small pressure cooker-type autoclaves and also some larger models this may be easy.

- Remove the old gasket by pulling it out of the groove. Remove any bits and pieces that are left behind. Clean the groove carefully
- Replacing the gasket: Insert the new gasket in the groove or inside the rim of the lid. However watch carefully: some have a fixed location point and may have a top and bottom side. Check your instructions for use

In certain models the gasket consists of a length of tubing with loose ends. In that case it may be more difficult to replace the gasket. Follow this procedure:

- put one end of the new gasket in its groove at a suitable point
- push it into place around the chamber, making sure that it is not stretched and that the corners fit smoothly with no kinks
- leave an overlap of approximately 5mm and cut off any excess tubing, ensuring that the butting ends are cut square
- pull the cut end out of the groove for about half the tube's length, then butt the ends together firmly
- work back along the tube, pressing it into the groove until the excess has disappeared

**IF THE AUTOCLAVE IS NOT WORKING PROPERLY, DO NOT USE IT. REPORT TO THE MAINTENANCE OFFICER AT ONCE!**

## 6. Spares

A full set of spare parts as recommended by the supplier should be held in stock. The spares needed will depend on the make and model of the autoclave.

In general the following should be kept in stock:

- door gasket
- silicone spray
- water level gauge glass and gasket kit (if fitted)
- valve washers for each type of valve on the autoclave
- valve gland string

If the autoclave is heated by electricity:

- two spare sets of heating elements

If the autoclave is heated by a gas burner:

- spare gas burner and rubber tubing
- spare gas bottle and regulator

If the autoclave is heated by a pressurised paraffin stove:

- gasket set
- nozzle cleaning tool and nozzle spanner

It is recommended that each health institution has alternative sterilisation facilities or a second autoclave in case of major breakdowns.



## **7 User Checklist (to be displayed near the equipment)**

Always refer to the manufacturer's instructions

- i. keep the environment around the autoclave clean
- ii. check that the electricity supply/gas ring/kerosene burner is ready for use
- iii. check that the autoclave chamber is clean
- iv. make sure you follow the correct instructions for each type of load
- v. when running the autoclave, check that the appropriate temperature and pressure are reached by checking the gauges (if your autoclave is equipped with a thermometer and pressure gauge)
- vi. do NOT interrupt the sterilisation cycle unless there is an emergency. If a cycle is interrupted, the whole cycle has to be started again from the beginning
- vii. check the steriliser's performance by using indicator strips at least once a week
- viii. when cleaning the autoclave do NOT use abrasive powders, metal cleaners or bleaches for cleaning as they will damage the surface

Report any damage or incorrect readings immediately.

Enter any abnormalities in the autoclave log book.

### **Follow these SAFETY points**

Do make sure that an electric autoclave has a proper earth connection  
When using a paraffin heated autoclave:

Do make sure there is sufficient ventilation

Do immediately wipe up any accidentally spilled fuel with a rag to avoid a fire

Do always make sure there is sufficient water inside the chamber when heating the autoclave

Do take great care when opening the lid, as the load may be very hot, even after a period of cooling down.

Do check for steam leakages around the lid, valves and piping

Do check the operation of the safety valve each month. This can be done by pressing the lever or by letting the valve blow off steam (check the manufacturer's instructions for the proper test procedure). This check should be done when the autoclave is under pressure

When sterilising fluids:

Do NOT open the air-removal/pressure-release valve at the end of the sterilisation time. Let the autoclave cool down by itself

Do make sure that, before opening the lid, the temperature inside the fluid has reduced to 80°C. If you cannot measure the temperature inside the fluid, let the autoclave cool down overnight before opening the lid

Do make sure that personnel operating the equipment are well trained and understand their duties precisely

Do keep unauthorised people away from the sterilisation department

Do NOT leave the autoclave unattended when in use