

## b. BOILING WATER DISINFECTORS

### 1. Purpose of the equipment

To disinfect equipment and materials.

### 2. How the equipment works

The boiling water disinfecter consists of a metal box with a closely fitting lid; in some cases a gasket is fitted between the box and the lid. The water vapour should pass without obstruction via the lid. Inside, the disinfecter has a perforated tray which is positioned to allow the water to circulate. The tray may be fitted with removable handles to take it out. Some models of disinfectors are equipped with a handle-operated mechanism for lifting the tray out of the water.

The disinfecter stands on four small feet allowing air to circulate around it and preventing damage to the underlying surface. Heating can be provided by electricity, a paraffin stove or any other heat source. In the electric models, heat is generated by an electric heating element, either of the immersion or the panel type.

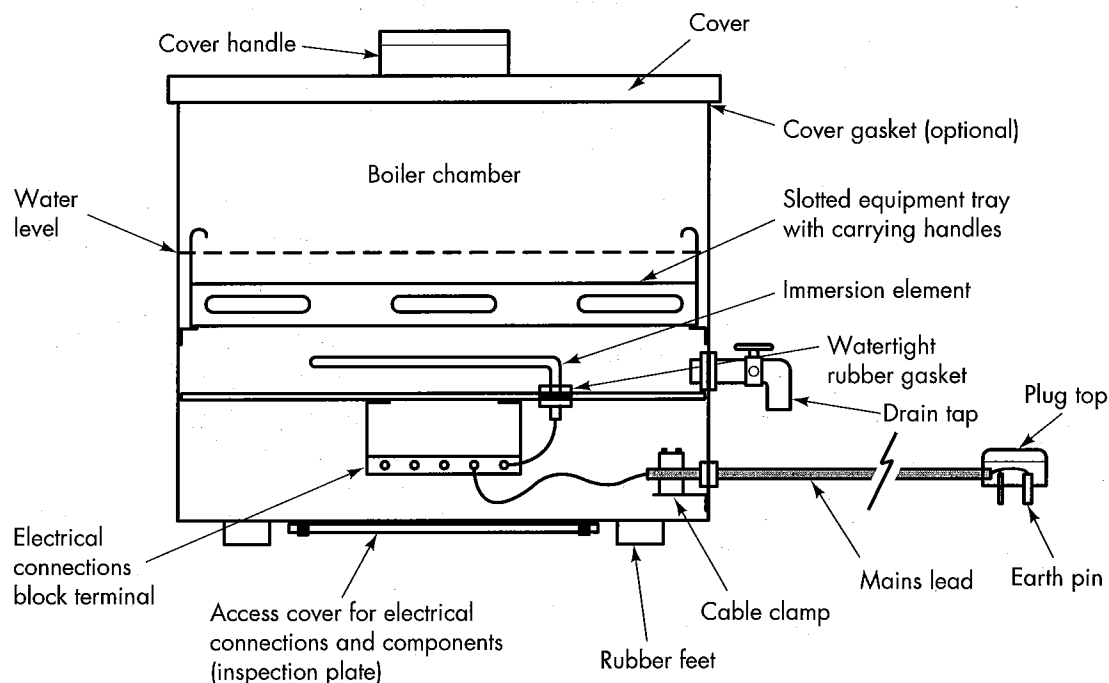
The **immersion-type element** (see Figure 25a) is fitted at the bottom of the boiler, completely immersed in and directly heating the water. Its terminals through the bottom are sealed by watertight rubber gaskets.

The **panel-type element** (see Figure 25b) is clamped under the boiler and does not come into direct contact with the water. To obtain maximum conductivity of heat, the clamp must be secured tightly. Depending on the size and model of the disinfecter, one or more elements may be installed.

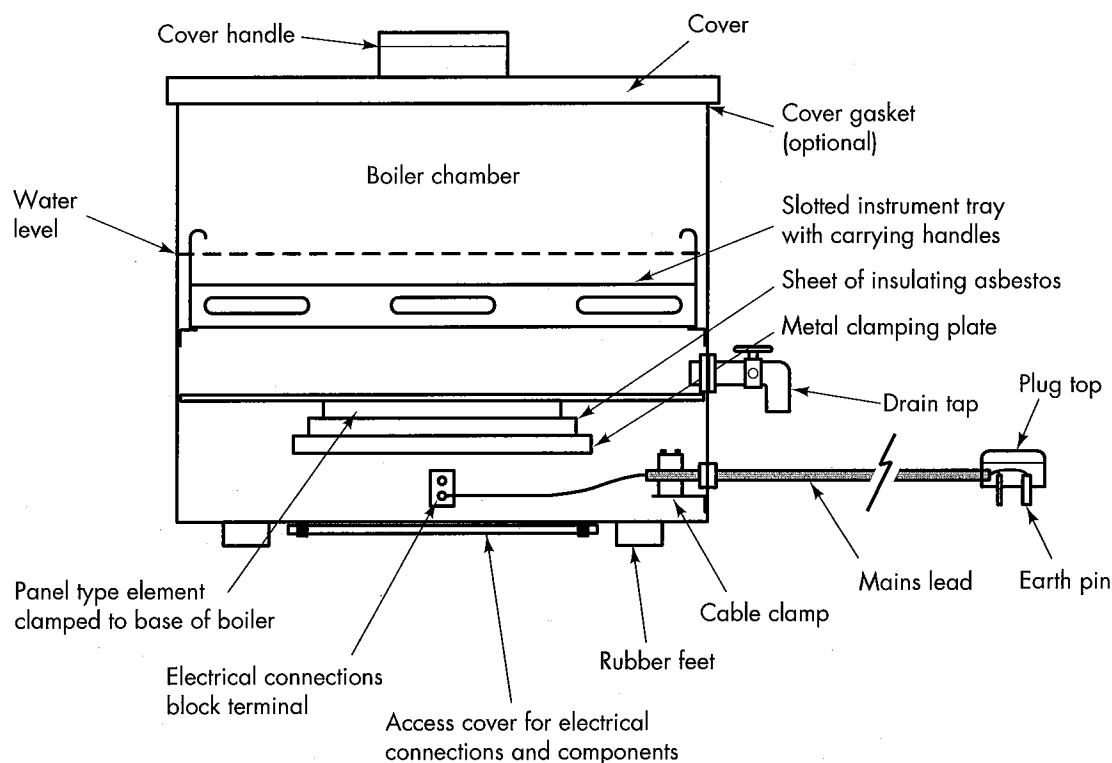
### Controls

- i. **On/off switch.** This is the basic control
- ii. **Low/medium/high three-level switch.** This is fitted to disinfectors which have more than one element. As well as acting as an on/off switch, it also controls the heat generated by selecting elements in various combinations. Thus three levels of heat are made available to the user.
- iii. **Bi-metallic controller.** In some models the heat generated by the heating element is regulated by a bi-metal control switch. Depending on the setting of the controller it switches the element on and off for longer or shorter periods, thus controlling the heat which will be generated by the element. It is used in boilers with only one heating element.
- iv. **Simmerstat switch.** This is also an on/off switch, but offers a fine, graduated control of temperature. Attached to the switch is a fine copper tube which is immersed in the water and acts as a temperature sensor. It allows the simmerstat to switch on or off at pre-determined temperature settings (Figures 26 and 27). For disinfection it should be set to 100°C.
- v. **Safety cut-out.** This switches off the disinfecter automatically when it is in danger of overheating or boiling dry. There are two types. One type has a metal probe immersed in the water (like the simmerstat switch) and the other has a bi-metal strip fitted under the boiler. Both are usually re-set by hand.
- vi. **Indicating lamps.** Some disinfectors have small indicating lamps. Usually one indicates green when the power is switched on. A second one indicates red when the disinfecter is overheated.

- vii. **Timer switch.** Some more sophisticated types of disinfectors have a timer switch which allows the disinfection process to be set up by the user over a specified time. The machine switches off automatically.

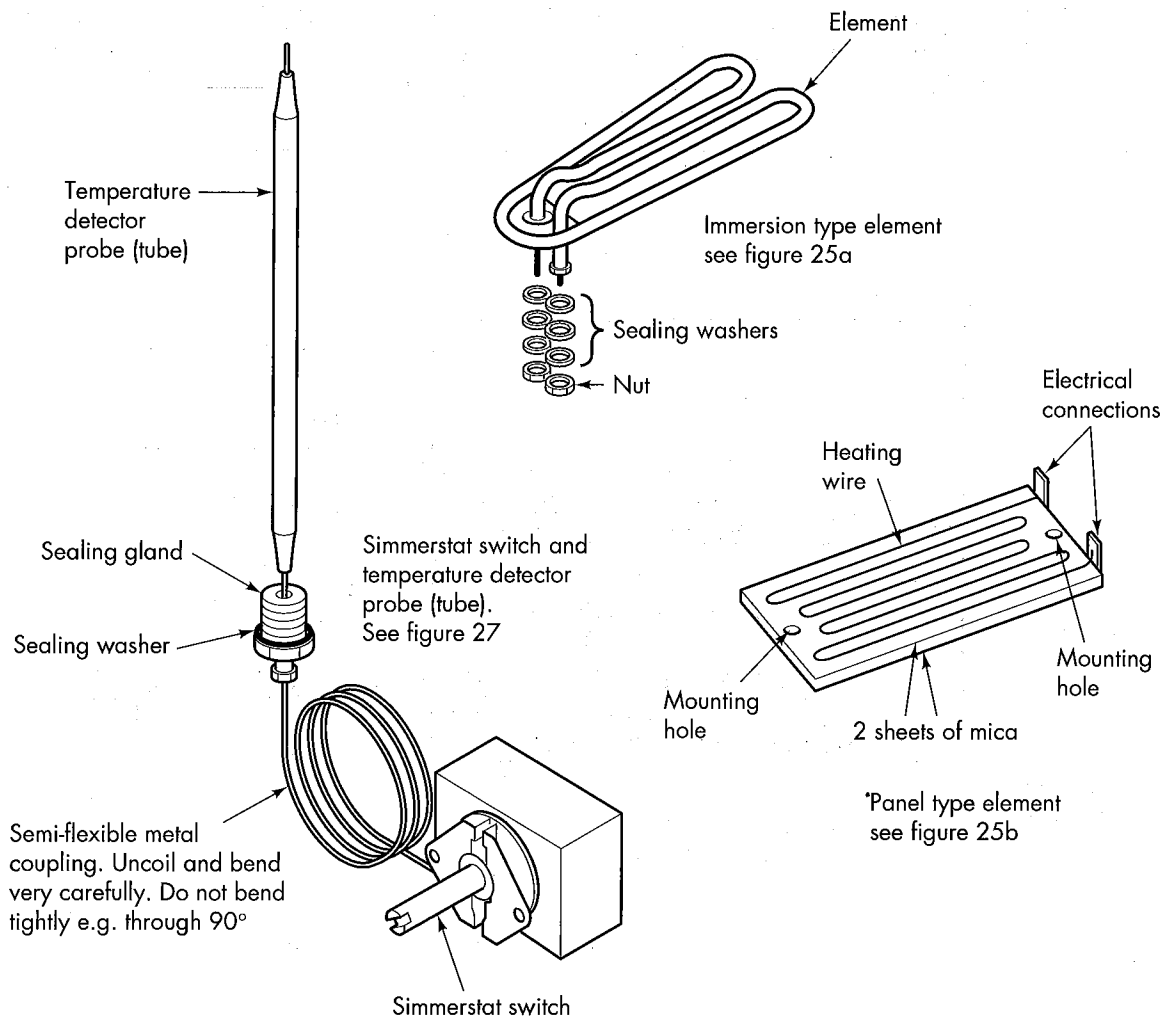


25 a. With an immersion-type heating element



25 b. With a panel-type heating element

**Figure 25:** Boiling water disinfectors in cross-section



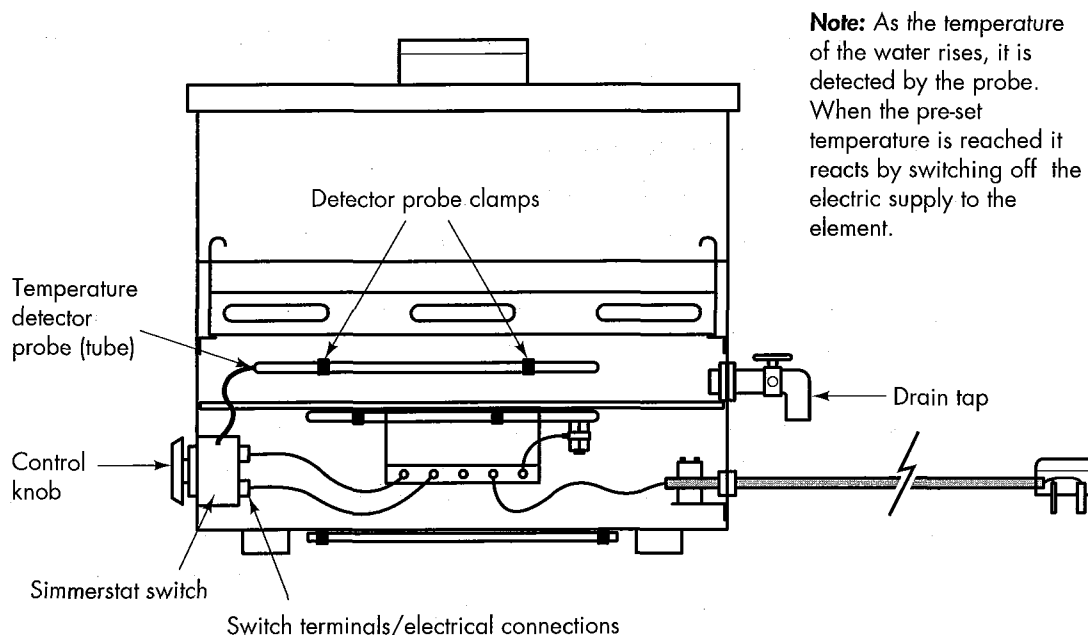
**Figure 26:** Typical heating elements and simmerstat switch

### 3. Routines and Safety

#### i. Routines

##### Always:

- site the disinfector in a clean, well ventilated working environment and on a level surface
- use distilled, demineralised or rain water in the boiler if there is a high concentration of minerals and salts in local water. This will prevent corrosion and scaling ('furring') of the instruments and the disinfector. This is especially important for disinfectors with immersion-type elements
- ensure that the boiler is never switched on without water. Even if there is an automatic cut-out, over a period of time elements and control devices can be damaged
- keep the outside clean and polished
- after each day's use clean the inside of the disinfector
  - wash with liquid soap solution
  - rinse three times
  - dry with a clean, soft cloth



**Figure 27:** Cross-section of a boiling water disinfector equipped with a simmerstat switch. It can be set at different temperatures. For disinfection it should be set at 100 °C. This model is heated by a single panel-type heating element

### Weekly:

- examine the mains lead and plug for visible signs of damage or wear
- check for leaks. These usually occur around the drain tap or immersion element terminals
- check that the inner side of the bath and drain tap is free from debris, limescale and corrosion
- if a gasket is fitted, apply silicone grease, vaseline or talcum powder to the cover gasket to keep it supple
- clean the outside of the disinfector with a mild detergent and soft cloth. Materials such as harsh scouring powders (particularly those containing bleach) and wire wool pads should be avoided. Wire wool pads tend to leave tiny particles of ferrous metal on the surface, which will develop into rust spots.

### Monthly:

- check for 'furring'. If necessary remove the limescale

### ii. Safety

- Do keep children well away from the disinfector
- Do unplug the boiler from the mains socket when not in use

Do make sure the disinfectant is connected to a socket with an earth connection.  
Ensure that the earth connection of the socket is in good condition

Do NOT attempt to fit the instrument tray when the boiler is switched on  
Do NOT overload the tray

#### **4. How to use the equipment**

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

- i. check that the inside of the disinfectant has been cleaned since previous use
- ii. ensure that the mains socket is suitable and that there is an earth connection
- iii. check that the drain tap is closed
- iv. if applicable, disassemble instruments to be disinfected into parts
- v. wash instruments in detergent to clean them of any visible blood and debris. Rinse well in clean water. Do the cleaning in a deep sink or basin, to prevent splashing. When cleaning, wear an apron, strong rubber gloves and mask
- vi. load the equipment or instruments onto the tray. Space them so that the boiling water can circulate around each one and each part
- vii. replace the loaded tray in the disinfectant
- viii. fill the disinfectant with water up to the marked level or not more than two-thirds full. All instruments should be covered. Check that no air is trapped inside tubing or hollow instruments by holding the instrument or tubing with one end submerged and the other end above the water so that the air can escape. Then slowly submerge the whole item
- ix. plug the disinfectant into the mains socket and switch on to full heat
- x. when boiling point has been reached, reduce the heat by the three-level switch or other heat controller, but maintain boiling point for the required length of time. The absolute minimum is 10 minutes (at sea level). During the whole period the instruments should remain completely immersed
- xi. switch off the disinfectant, open the lid and raise the tray
- xii. allow the equipment/instruments to dry

Never add instruments or equipment once the disinfection cycle has begun. If the cycle is stopped at any point, it must be restarted from the beginning.

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

**Example a:** Scaling or 'furring' of immersion element

In areas where the local water contains a high percentage of minerals, scaling or 'furring' of the immersion elements and the inside of the boiler may occur. The most common problem is limescale.

To descale (remove scale):

- pour enough pure vinegar into the boiler to cover the furred part and/or the element.
- switch on the boiler and boil for five minutes
- wash out the boiler with clean water
- wipe with a soft dry cloth and allow to dry
- repeat if necessary

If you do not have vinegar you can use a solution of 50 grams of citric acid powder in each litre of water.

**Example b:** The boiler does not heat up

- check the safety cut-out. If the cut-out has been activated, check the water level. If necessary, re-set the safety cut-out and refill with water

If the boiler still does not heat up

- check the mains socket, lead and plug

If those are satisfactory:

- there is an internal fault. Call a qualified technician; see Example c

If a qualified technician is not available locally:

- send equipment away for expert repair

**Example c:** Work with a qualified technician to identify the fault.

Take the following steps. Make a written note of each step you take.

- unplug the boiler from the mains socket
- using a screwdriver, remove the inspection plate (and feet, if necessary)
- place all removed parts in a small container
- inspect all electrical connections
- remake connections which are either loose or burnt
- refit washers and heat-resistant sleeving

If spade connections need to be repaired:

- a special tool is required and equipment should be sent away for expert repair

If all connections are satisfactory:

- check for components fault

If spare components are available:

- change them one at a time, in the order below, until the faulty component is identified:  
 element  
 three-way switch, bi-metallic controller or simmerstat switch  
 on/off switch  
 overheat cut-out switch  
 timer (if installed; the mechanical models usually make a quiet ticking noise if it has been set)

Re-test the boiler as each component is fitted:

- ensure all covers are in place
- copy existing component installation (make step-by-step written notes for each component which you replace)
- before replacing the inspection plate, check that the wires are not touching any surface which will become hot when the boiler is working. Intense heat will damage them and may cause electric shock

If spare components are not available:

- send equipment for expert repair

**Example d:** Boiler overheating with vigorous bubbling of water throughout the disinfection cycle:

- replace three-way switch, bi-metallic controller or simmerstat as described in Example c

**Example e:** Water gets hot but does not boil:

- replace components one at a time as in Example c

Do work with a qualified technician

Do make component changes one at a time, otherwise confusion can lead to unsafe practice

Do NOT make component changes if identical components are not available

**DO NOT TAKE SHORT CUTS!**

## 6. Spares

The spares required for local maintenance are:

- a second boiler which can be heated over fire
- three-way switch, bi-metallic controller or simmerstat switch
- on/off switch
- element
- sealing washers for element (for immersion-type only)
- cut-out unit
- timer (if applicable)
- heat-resistant wire and/or sleeving for repairs of internal wiring
- bulbs for indicator lights
- lid gasket (if applicable)
- plug (and fuse if required)
- length of mains power lead
- main circuit fuse
- vinegar or citric acid powder (use 50 grams for each litre of water)
- silicone grease/vaseline/talcum powder

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

Always refer to the manufacturer's instructions

In order to obtain good and long service from this equipment the following points should be observed:

- i. before use, check that the disinfectant is clean
- ii. use distilled, demineralised or rain water if the local water supply contains a high percentage of minerals
- iii. ensure that the water reaches the marked level or is not more than two-thirds full
- iv. the equipment should be covered throughout the disinfection cycle
- v. ensure that no air is trapped in tubing or hollow instruments
- vi. change the water after each disinfection cycle

### **Report to Maintenance Officer**

- i. any damage to the boiler, mains lead or plug
- ii. any build-up of scale or 'furring' of the element of the disinfectant
- iii. any fault or breakdown

### **Follow these SAFETY points:**

Do take great care when using boiling water  
 Do keep children well away from the disinfectant  
 Do ensure the disinfectant is on a firm and level surface  
 Do use the boiler for unwrapped instruments only  
 Do ensure that the disinfectant is connected to a wall socket with functioning earth connection

Do NOT use the boiler for rubber gloves and porous loads, e.g. drapes, towels or wrapped instruments  
 Do NOT overload the tray  
 Do NOT attempt to put the instrument tray in the boiler when it is switched on