Water Bath Heater/Stirrers
MH750 & MH753

Impact Test Equipment Ltd
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User Guide
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MH750 & MH753 OPERATOR'S MANUAL

SAFETY AND INSTALLATION

Please read all the information in this booklet before using the unit.

WARNING

HIGH TEMPERATURES ARE DANGEROUS: they can cause serious burns to operators and ignite combustible material.

Great care has been taken in the design of these units to protect operators from hazards, but operators should pay attention to the following points:

- USE CARE AND WEAR PROTECTIVE GLOVES TO PROTECT HANDS;
- DO NOT put hot objects on or near combustible objects;
- DO NOT operate the unit close to inflammable liquids or gases;
- At all times USE COMMON SENSE.

OPERATOR SAFETY

All operators of this equipment must have available the relevant literature needed to ensure their safety. It is important that only suitably trained personnel operate this equipment, in accordance with the instructions contained in this manual and with general safety standards and procedures. If the equipment is used in a manner not specified by us the protection provided by the equipment to the operator may be impaired.

All units have been designed to conform to international safety requirements and are fitted with an over-temperature cut-out. On some models, the cut-out is adjustable and should be set to suit the application. On all other models the cut-out is preset to protect the unit.

If a safety problem should be encountered, switch off at the mains socket and remove the plug from the supply.

INSTALLATION

1. All units are supplied with a power cable. This may be integral or plug-in.
2. Before connecting the mains supply, check the voltage against the rating plate. The rating plate is on the rear of the unit. Connect the mains cable to a suitable plug according to the table below.

Note that the unit must be earthed to ensure proper electrical safety.

Connections	220V-240V	110V-120V
Live	Brown	Black
Neutral	Blue	White
Earth	Green/yellow	Green

The fused plug supplied with the mains lead for use in the UK is fitted with the following value fuse to protect the cable: 5 AMP for MH750 and MH753.

The fuse in the unit protects the unit and the operator

Note that units marked 230V on the rating plate work at 220V; units marked 120V work at 110V. In both cases, however, the heating rate will degrade by approximately 8%.

3. Plug the mains cable into the socket on the rear of the unit.

4. Do not switch on until the unit is fully installed, see page 19.

5. Note that the following symbols may be next to the indicator lamps on the front panel of the units and have the following meanings:

   ~ the power indicator

   the heater indicator

   the over-temperature indicator

6. Symbols on or near the power switch of the unit have the following meanings:

   I mains switch On

   O mains switch Off

WORKING ENVIRONMENT (all units)

The Thermoregulator units are designed to work safely under the following conditions:

Ambient temperature range 5°C to 40°C

Humidity - up to 95% relative humidity, non-condensing

Note: The control specifications quoted are for an ambient temperature range of 10°C to 30°C. The specification may deteriorate outside this range but the unit will still work safely.

Radio frequency interference tested and passed to EN50081-1.

Immunity Tested and passed to EN50082-1

GUARANTEE

The unit is guaranteed against any defect in material or workmanship for the period specified on the enclosed guarantee card. This period is from the date of purchase, and within this period all defective parts will be replaced free of charge provided that the defect is not the result of misuse, accident or negligence. Servicing under this guarantee should be obtained from the supplier.

Notwithstanding the description and specification(s) of the units contained in the operator's manual,Impact hereby reserves the right to make such changes as it sees fit to the units or to any component of the units.

This manual has been prepared solely for the convenience of customers and nothing in this instruction book shall be taken as a warranty, condition or representation concerning the description, merchantability, fitness for purpose or otherwise of the units or components.

OPERATOR MAINTENANCE

NOTE: THAT THIS EQUIPMENT SHOULD ONLY BE DISMANTLED BY PROPERLY TRAINED PERSONNEL. REMOVING THE SIDE, FRONT OR REAR PANELS EXPOSES POTENTIALLY LETHAL MAINS VOLTAGES. THERE ARE NO OPERATOR MAINTAINABLE PARTS WITHIN THE EQUIPMENT.

In the unlikely event that you experience any problems with your unit which cannot easily be remedied, you should contact your supplier and return the unit if necessary. Please include any details of the fault observed and remember to return the unit in its original packing. Impact accepts no responsibility for damage to units which are not properly packed for shipping: if in doubt, contact your supplier. See the Decontamination Certificate supplied with your unit.

1. Cleaning

Before cleaning your unit ALWAYS disconnect it from the power supply and allow it to cool below 50°C.

Your unit can be cleaned by wiping with a damp soapy cloth. Care should be exercised to prevent water from running inside the unit. Do not use abrasive cleaners.

2. Over-temperature cut-out

In the event of no heater power, check the mains plug and lead. Repeated operation of the cut-out indicates a serious fault: you may need to return the unit to your supplier for repair.

3. Fuses

Your unit is protected by one or two fuses. These should only be changed by suitably qualified personnel. If the fuses blow persistently, a serious fault is indicated and you may need to return the unit to your supplier for repair.

MH750 & MH753 THERMOREGULATOR

Before using the thermoregulator make sure you have read this manual carefully.

UNPACKING

When unpacking the unit, check that the following have been removed from the packing: The unit; a Guarantee card; a Decontamination Certificate.

Within the guarantee period, shown on the Guarantee Card, we undertake to supply replacements free of charge for parts which may on examination prove to be defective, provided that the defect is not the result of misuse, accident or negligence. Any instrument requiring service under this guarantee should be sent to the supplier through whom it was purchased, or, in the case of difficulty, it should be carefully packed in its original packing and consigned to us. Impact takes no responsibility for returned goods damaged in transit.

Returned goods will not be processed without a Returns Authorisation Number. On all correspondence, please quote the Serial Number in full and/or the Sales Order Number. Please write the Returns Number on the outside of any packing.

DESCRIPTION

The thermoregulators are designed to fit all standard laboratory baths. They will heat, circulate and safely control the temperature of the liquid in the bath within precise limits. In a suitable bath, the MH750 or MH753 will control the temperature of the liquid within the range -40°C to 250°C (see the specifications for details). However, temperatures from -40°C to 5°C above ambient require an additional cooling system such as a Flow Cooler.

The instrument consists of the following main parts:

- The pump assembly and base moulding in PPS plastic. The pump can circulate liquid externally under pressure via its support tubes.
- A heater assembly in 316 Stainless Steel.
- A base plate made from stainless steel to which are mounted the motor, over-temperature cut-out, mains switch, fuse holder and PCB assembly.
- A cover made from Noryl plastic which is fitted over the main controls.

In the MH750, bath temperature is monitored and controlled by a thermistor in conjunction with a proportional controller.

In the MH753 bath temperature is monitored and controlled by a PRT in conjunction with a 3 term controller.

Protection in all the units is provided by means of an adjustable over-temperature cut-out. The pump motor and the transformer are also fitted with thermal fuses.

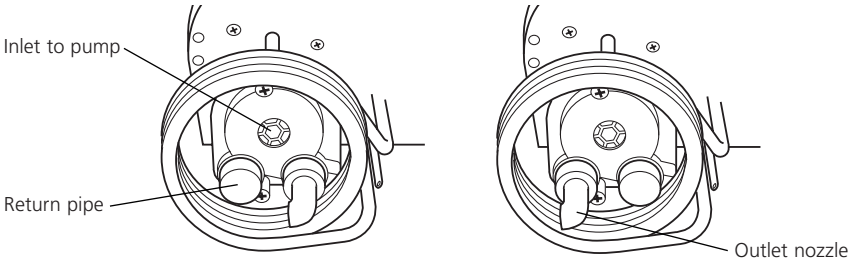
A portable clamp or a bridge piece are available as alternative ways of fixing the thermoregulator to the bath.

Set Up

1 There are two modes of operation for the pump; circulation internal to the bath; circulation external to the bath. For internal circulation the blanking caps on the top of the outlet and return pipes should be securely in place. They screw on and, for safety, they may be tight. For external circulation these need to be removed.

The outlet nozzle is supplied fitted to the bottom of the pump housing in the internal circulation position. In this position and with the blanking cap on the outlet pipe the pump will circulate internally.

If maximum external flow is required: Remove the outlet nozzle from the pump base and reposition it on the bottom of the return pipe. Remove the blanking cap from the return pipe and screw it onto the hole from which the nozzle was taken. This redirects the full flow externally. Screw the pipe connectors supplied with the unit to connect the appropriate pipe to the unit.

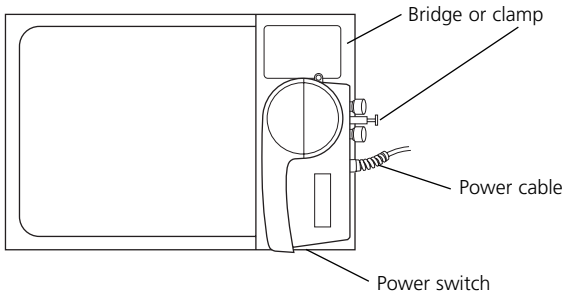


Set for internal circulation Set for external circulation

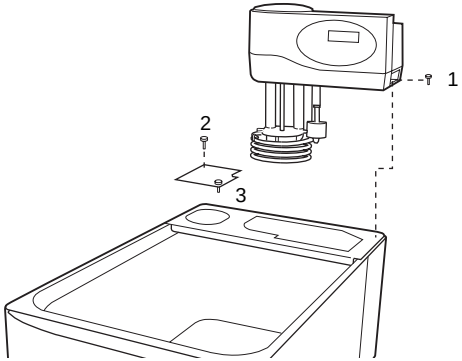
2 **CAUTION: DO NOT SWITCH THE THERMOREGULATOR ON UNLESS EITHER THE BLANKING PLUGS ARE FITTED TO THE TOP OF THE PIPES or AN EXTERNAL CIRCUIT IS FULLY CONNECTED. NEVER SET THE UNIT SO THAT THE FLOW IS SPLIT INTERNALLY AND EXTERNALLY.**

3 Ensure that the bath is set up on a flat level surface.

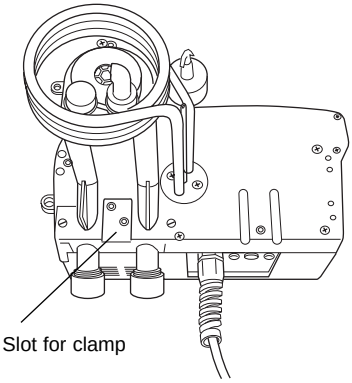
4 Fit the unit securely to the bath using the correct bridge piece for the unit/bath or a portable clamp, see the list of accessories. **THE UNIT MUST ALWAYS BE MOUNTED WITH THE BACK AND THE SWITCH END OUTSIDE THE AREA OF THE BATH.** This will reduce the infiltration of hot vapours into the cooling system of the thermoregulator. Ensure that at all times the air inlet and outlet remain clear of obstructions. Free circulation of air inside the unit is essential for proper cooling of the electronics and pump motor.

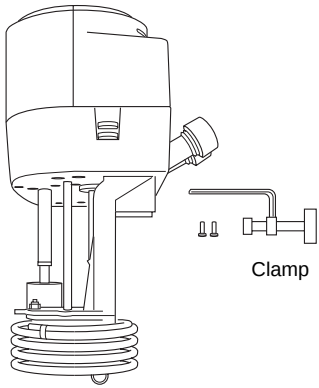


5 Use the M4 screw provided with the bridge kit to secure the bridge piece to the thermoregulator at the heater end of the thermoregulator, do not over tighten it. Thumb screw 1 secures both the unit and the bridge to the bath. Thumb screw 2 secures both the cover and the bridge to the bath. Thumb screw 3 is fitted at manufacture and secures the cover to the bridge. A bung is provided to seal off the thermometer hole in the bridge piece if a thermometer is not used. It is necessary to fit this bung to reduce heat losses and prevent steam or other vapours getting to the thermoregulator.



6 If you do not want to use a bridge piece to secure the unit to a bath then you must use a clamp. The clamp bracket fits between the pump legs in the slot provided. Slide the bracket into the slot and use the two screws in the clamp kit to secure the clamp to the unit.

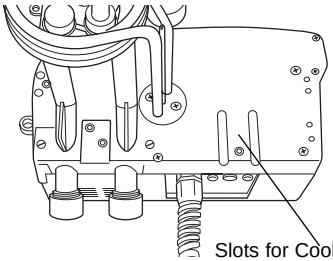




7 If the pump has been set correctly for external circulation, suitable hoses should be fitted to the outlet and return pipes. A suitable hose must be capable of withstanding both the temperature of operation and the liquid being used. Always securely clip the hoses in place.

Hose material	Allowable temperature range	Comments
PVC	10°C to 60°C (50°F to 140°F)	For water only
Silicone	-40°C to 200°C (-40°F to 362°F)	NOT for silicone oil
Viton	-20°C to 250°C (-4°F to 482°F)	

8 A cooling coil will give control for temperatures between 5°C above ambient and 5°C above the temperature of the water supply.

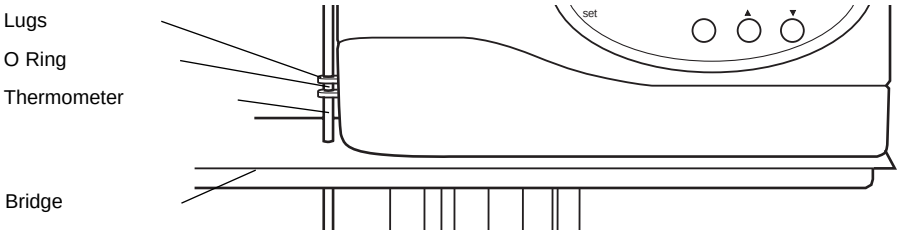


The cooling coil is fitted to the thermoregulator just below the over-temperature cut-out reset button. You will find a rubber moulding screwed to the base and filling two slots. Remove the screw and moulding and use the screw to fit the cooling coil in the slots. Keep the moulding in a safe place in case you need to replace it. Connect a hose from a tap to one end of the coil and from the other end of the coil to drain. Adjust the water flow to give the required cooling.

9 For lower temperatures, a Dip Cooler or a Flow Cooler is required.
Alternatively you could use a refrigerated bath, which has integrated fridge coils and no additional cooling mechanism is required.

See the individual instruction manuals for installation information.

10 If a thermometer is to be used it may be fitted in the end of the top cover using the O-ring, supplied with the unit, between the two lugs. If a bridge is fitted it is necessary to remove the blanking plug.



11 Fill the bath to between the minimum and maximum levels stated in the specification. If water is used, demineralised water is preferred to reduce the formation of scale. If scale should form, use only mild de-scaling agents to remove it. DO NOT attempt to hammer, chip or scrape the deposits from the surface of the bath.

12 Recommended liquids:

Temperature	*Liquid*
-40°C to 0°C	40% water, 40% ethylene glycol and 20% alcohol
-20°C to 30°C	50% water and 50% ethylene glycol
5°C to 95°C	Water, preferably de-ionised with neutral pH
10°C to 150°C	Dow Corning Silicone Oil 200 series *****
10°C to 250°C	Dow Corning Silicone Oil 210H/100cs series*****

***Warning:** check gel life at top end of range.

Extraction may be necessary at high temperatures; always check the manufacturer's data and safety sheets before using any of the liquids.

In all cases the OVER-TEMPERATURE CUT-OUT must be **set correctly** for the liquid being used and the temperature at which it is to operate

13 A bath that is fitted with a lid or insulating ball blanket gives the best operating conditions. A lid or ball blanket will prevent vapour loss, heat loss and give better temperature control. If an open bath is used above 80°C (ie where steam or other readily condensing vapours are present) the operation of the unit, particularly the digital display on the TE-10D and the TU-20D, may be affected.

Below about 80°C a cover becomes less important but will still give better temperature control.

14 The symbols next to the indicator lamps on the front panel of the thermoregulators have the following meanings:

~ : the power indicator

: the heater indicator

: the over-temperature indicator

15 Symbols on the switch have the following meanings:

I : mains switch On

O : mains switch Off

SPECIFICATION

MH750

Operating temperature range	-20 to +95°C	
Temperature range without cooling mechanism	Ambient +5 to 95°C	
Temperature selection	Analogue	
Temperature display	Analogue scale	
Temperature stability	±0.01°C	
Set point accuracy	±2°C	
Method of control	Proportional	
Temperature sensor	Thermistor	
Nominal heater power	230V	1000W
	120V	1000W
	100V	850W
Maximum watts density	6 W/cm^2	
Pump capacity	Maximum flow	10 l/min
	Maximum pressure	145 mbar

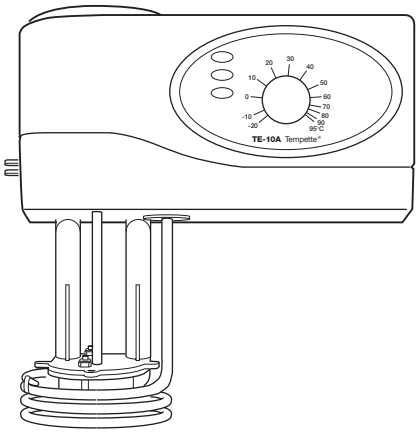
The MH750 has passed:

EN 50081-1:1992 Electromagnetic Compatibility; Generic emission standard.

EN 50082-1:1992 Electromagnetic Compatibility; Generic immunity standard (Performance criterion B).

The specification was achieved in an 8 litre bath with a ball blanket according to DIN 58966.

Protection against hazards	IP30
Safety device classification	1W



SPECIFICATION

MH753

Operating temperature range	-40 to +120°C	
Temperature range without cooling mechanism	Ambient +5 to 120°C	
Temperature selection	Digital	
Temperature display	Digital LED	
Temperature stability	±0.01°C	
Set point accuracy	±1°C	
Method of control	PID	
Temperature sensor	PRT	
Nominal heater power	230V	1000W
	120V	1000W
	100V	850W
Maximum watts density	7.6 W/cm^2	
Pump capacity	Maximum flow	10 l/min
	Maximum pressure	145 mbar

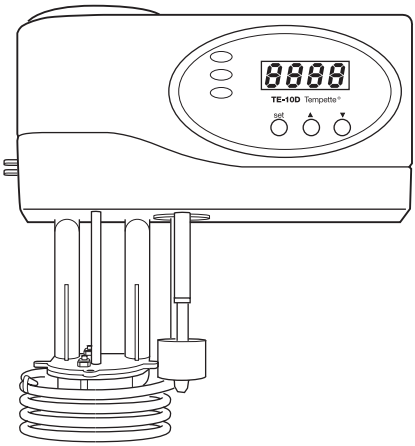
The MH753 has passed

EN 50081-1:1992 Electromagnetic Compatibility; Generic emission standard.

EN 50082-1:1992 Electromagnetic Compatibility; Generic immunity standard (Performance criterion B).

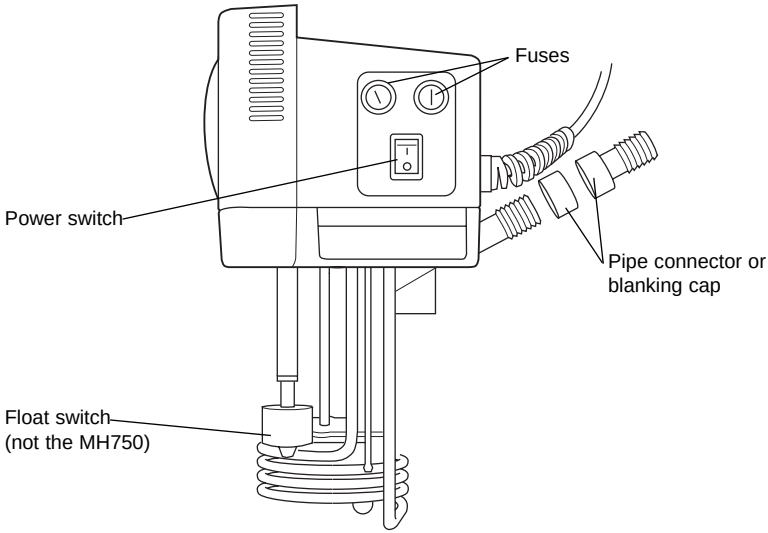
The specification was achieved in an 8 litre bath with a ball blanket according to DIN 58966.

Protection against hazards	IP30
Safety device cassification	2



OPERATION

- Ensure that either the outlet and return pipes have their caps on or an external system is properly set up.



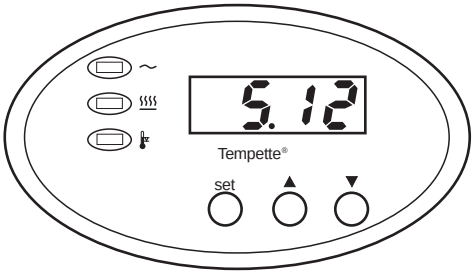
- Switch the unit on by pressing the power switch. The switch and the POWER indicator on the front will light up.

Setting the temperature on the MH750

- Turn the knob until the line on the knob points to the required temperature.
- The heater (and heater indicator) comes on if the set temperature is higher than the current bath temperature. When the measured temperature approaches the set temperature, the heater indicator will begin to flash. As the measured temperature stabilises the indicator will stay on for shorter periods.
- Due to variations in heat losses, the actual temperature may vary. If you need to control the temperature to a greater accuracy than the MH750's accuracy, place a thermometer in the lugs as shown on page 21. For greater accuracy still you can place the thermometer in one of the samples. In either of these cases, it may be necessary to readjust the set temperature to achieve the precise temperature required. Allow the temperature to stabilise after each adjustment.

WHEN SWITCHING ON THE MH753

When first switched on the display will show the edition of the software currently installed.
For example software issue “5.12” would be shown as follows:

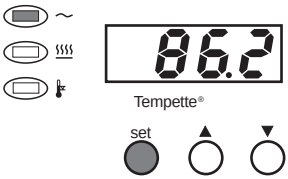


It will display this for 1 second, then the actual temperature of the bath will be indicated.

THE FRONT PANEL CONTROLS

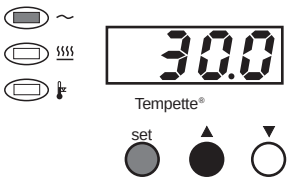
The front panel controls consist of three buttons for controlling the display, a four digit LED display and three indicators.

The SET temperature button



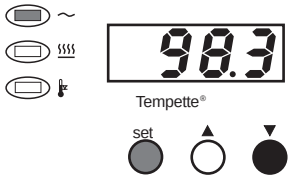
The SET temperature button displays the set temperature when pressed.

The UP ARROW button



When the SET temperature button is held down and the UP ARROW button is pressed, the set temperature is increased.

The DOWN ARROW button

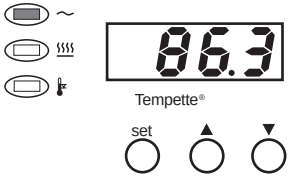


When the SET temperature button is held down and the DOWN ARROW button is pressed, the set temperature is decreased.

Speed of change of set temperature

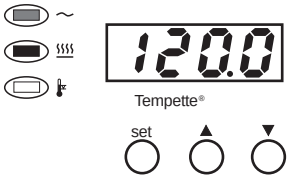
Each press of the UP ARROW or DOWN ARROW buttons will increase or decrease the set temperature by 0.1°C. If the buttons are held down the temperature change will accelerate to 5°C per second.

Power indicator



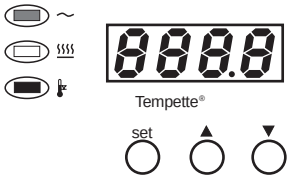
The top indicator shows that there is power to the unit.

Heater indicator



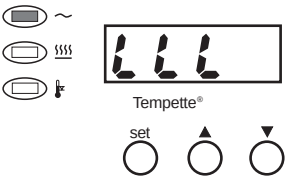
The middle indicator shows when the heater is heating. When the temperature is being set, and the new set temperature is higher than the temperature already in the unit, the heater indicator will light as the unit tries to follow the set temperature. If the light is on continuously the heater is getting constant power. The only exception is described under over-temperature indicator. As the temperature approaches the set temperature the heater indicator will flash. When the set temperature is reached the indicator will stay on for shorter periods. If the bath temperature is above the set temperature then the indicator will be off, as the heater is not getting any power.

Over-temperature indicator



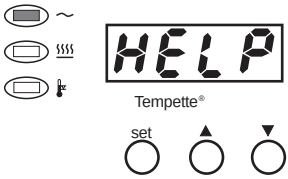
If the unit should, for any reason, exceed the temperature set for the over-temperature cut-out, the over-temperature indicator will light. The heater will have been switched off and the unit will begin to cool even if the heater light is on (the light staying on or not depends on which circuit has sensed an over-temperature).

Low liquid level



The float switch will trip if the liquid gets below a safe level; the display will change to "LLL". The heater will be switched off. Fill the bath to above the minimum level of 100mm and the display will return to the 'present' temperature; the unit will again work.

Sensor fault indicator



If the unit there should, for any reason, be a sensor fault, the bottom indicator will light. The power to the heater will have been switched off and the unit will begin to return to ambient even if the heater light is on (the light staying on or not depends on which circuit has sensed a fault).

AFTER USE

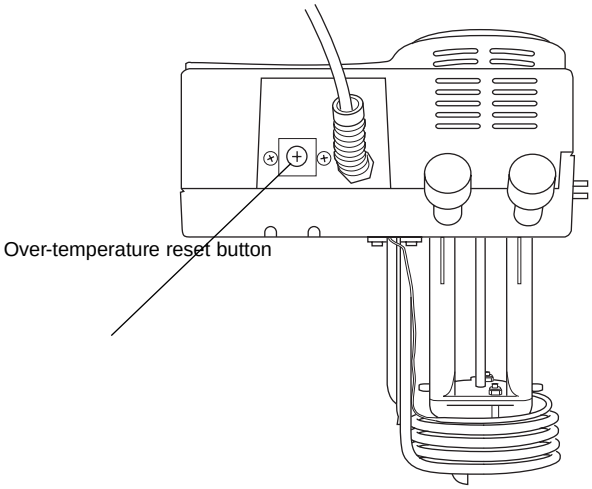
When you have finished heating samples, remember that parts of the unit and the samples may be very hot. Take the precautions listed earlier. We recommend that the samples should be allowed to cool to 50°C before being removed from the bath. They will still have to be handled with care.

Should you want to remove the unit from the bath, it too should be allowed to cool to 50°C before being removed.

Remember the bridge, the lid (if used), the bath and all other parts close to the bath will be hot while it is in use.

SETTING THE OVER-TEMPERATURE CUT-OUT

An adjustable over-temperature cut-out is fitted. When the cut-out operates, the heater will stop working and the 'over-temperature cut-out indicator' will illuminate.
The pump will continue working on all units.



It should be set to approximately 10°C ABOVE THE OPERATING TEMPERATURE. This can be done in one of two ways; The first is more accurate and the second quicker (and better if you do not want to overheat the liquid). For both, first turn the reset button fully clockwise then:

1 Heat the bath to the desired cut-out temperature and turn the reset button anticlockwise until the cut-out just trips.

  Either: Switch off at the mains power. Remove the unit from the liquid and press the reset button. Return the unit to the liquid, switch on the mains power. The heater will again work.

  Or: Allow the liquid to cool, may be as much as 40°C, and press the reset button. The heater will again work.

2 Heat the bath to the required maximum operating temperature and turn the reset button anticlockwise until the cut-out just trips. Turn the reset button clockwise one small division on the label and press the reset button. The heater will again work.

ADDITIONAL INFORMATION

NOTE THAT THIS EQUIPMENT SHOULD ONLY BE DISMANTLED BY PROPERLY TRAINED PERSONNE REMOVING THE TOP CASE EXPOSES POTENTIALLY LETHAL MAINS VOLTAGE. THERE ARE NO OPERATOR MAINTAINABLE PARTS WITHIN THE EQUIPMENT.

In the unlikely event that you experience any problems with your Thermoregulator which cannot easily be remedied, you should contact your supplier and return the unit if necessary. Please include any details of the fault observed and remember to return the unit in its original packing. Impact accept no responsibility for damage to units which are not properly packed for shipping: if in doubt, contact your supplier.

OPERATOR MAINTENANCE

1. Cleaning

   Before cleaning your unit ALWAYS disconnect from the power supply and allow to cool below 50°C.

   Your Thermoregulator can be cleaned by wiping with a damp soapy cloth. Care should be exercised to prevent water from running inside the unit. Do not use abrasive cleaners.

2. Over-temperature cut-out

   The over-temperature cut-out is a sensitive mechanical device and mechanical shock can cause it to trip.

   • In the event of no heater power, check the mains plug and lead, then reset the cut-out control.

   • Repeated operation of the cut-out indicates a serious fault: you may need to return the unit to your supplier for repair.

3. Fuses

   Your unit is protected by two fuses.

   MH750 & MH753 230V 2 x F5A; 120/100V 2 x F10A

   These should only be changed by suitably qualified personnel.

   The fuses must only be replaced by a fuse of the same type and value.

   If the fuses blow persistently, a serious fault is indicated and you may need to return the unit to your supplier for repair.

CALIBRATION OF THE MH753

Remember that if you change the calibration from that set at the factory you may change the calibration at all temperatures. You may get different calibration with different baths and/or liquids.

In order to ensure that the calibration you are setting is correct, you will need to use an independent calibrated probe or thermometer.

Set the temperature display to the particular temperature at which you require to control. Measure the actual temperature of the bath liquid using a calibrated probe or thermometer.

If the calibration is not correct then you can follow this procedure.

a Hold down the Up and Down buttons and then press the Set button at the same time for 5 seconds.

b The display will change from the bath temperature to “EEEE”.

c Press the ‘SET’ button and either the ‘UP’ or the ‘DOWN’ button to adjust the display to the same temperature as the measured value.

d Press ’UP’ and ‘DOWN together to confirm the value. The display will return to the bath temperature and the unit will control with the new calibration parameters.

Replacement parts

Each unit is supplied with an O ring for a thermometer. The following parts may be purchased if replacements or alternatives are required:

Part number	*Description*
6007349	O ring (thermometer)
6103913	Cap seal
6103475	Cap
6103804	Pipe connection seal
6103771	Pipe connection nozzle
6103460	Bottom outlet nozzle