

# Operating & Maintenance Instructions

## 750 Vacuum Forming Machine

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# 1. Introduction

The 750 will produce professional, quality and high definition vacuum formings on a small/medium scale as required by model makers, development engineers and students quickly, efficiently and consistently. The machine embodies design features, manufacturing techniques and proprietary component specifications unique to our equipment. The following instructions will guide you through installation and use, please read and implement them carefully and if any further help or advice is required do not hesitate to refer back to our Technical Sales Department for assistance.



## 2. Installation

All 220-240V machines are fitted as standard with BS 1363A 13A moulded on plug tops, suitably fused. Non UK customers will need to replace the plug supplied and fit one compatible with local requirements. 110-120V machines will require a plug to conform with BS 4343 for low voltage supplies, a 1000VA supply will be required.

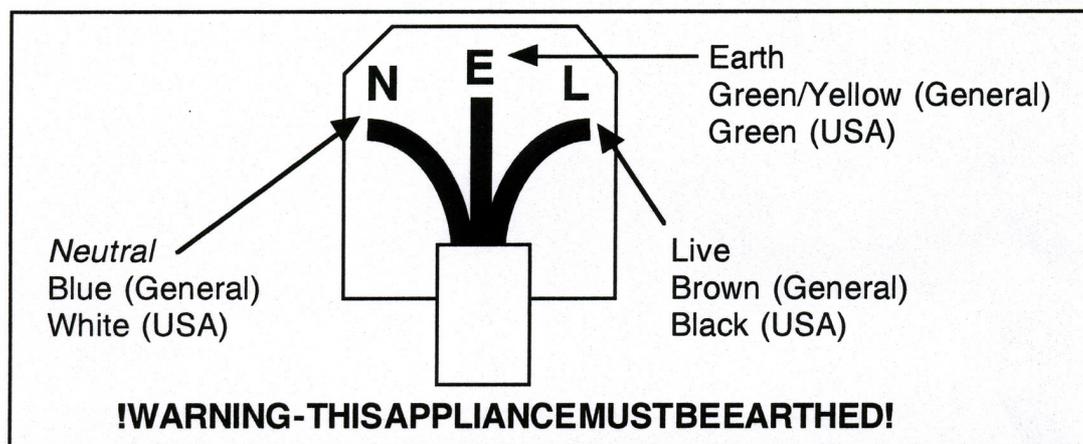
Electrical supply to the unit must be in accordance with the details shown on the rating label.

In the event of plug replacement, for whatever reason, connections must be in line with the following:-

### **!IMPORTANT!**

The wires in this mains lead are coloured in accordance with the following code:

<b>General</b>	<b>Earth</b>	<b>USA</b>
Green & Yellow		Green
Blue	<b>Neutral</b>	White
Brown	<b>Live(Hot)</b>	Black



### **General**

The green and yellow wire must be connected to the terminal marked with the letter E, or the earth symbol, or coloured green and yellow or green.  
The blue wire must be connected to the terminal marked with the letter N, or coloured blue or white.  
The brown wire must be connected to the terminal marked with the letter L, or coloured brown or red.

### **USA (115V)**

The green wire must be connected to the green pin (the largest).  
The white wire must be connected to the silver pin.  
The black wire must be connected to the brass pin.

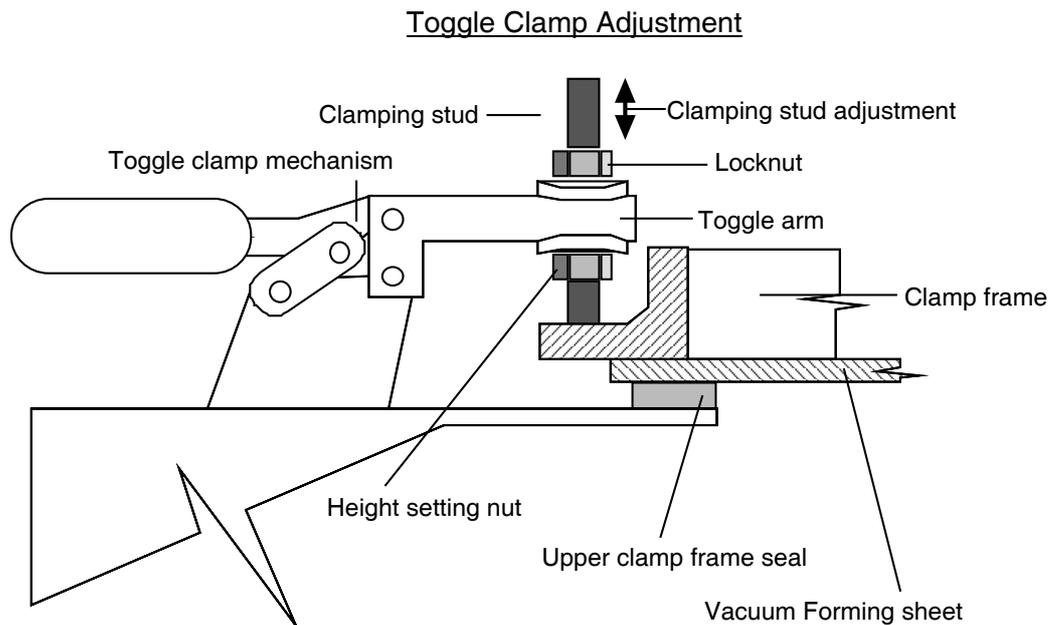


**Warning - read instructions before installation and use.**

**If in doubt about electrical supply or connection refer to your supplier or consult a qualified electrician.**

### 3. Before Starting

Remove the machine from the packaging. Position on a suitable bench and remove packing pieces from the rear of the clamp frame. Adjust the toggle clamps using the M4 locknuts so that they can be clamped comfortably but firmly when a thermoplastic sheet is in place.



Become familiar with the controls and their operation before using the machine. Sometimes it's a good idea to carry out a 'cold run' without material, to get used to the sequence in which the controls are used during vacuum forming.

## 4. Controls

Heater Canopy - Covers the heater hood when it is in the idling position.

Heater Hood - contains the ceramic element system, is pulled towards the front of the machine for the heating cycle.

Heater Slide Bars - on which the heater hood is mounted.

Clamp Frame - swings down to clamp a sheet in place and up to release it.

Toggle clamps - secure the clamp frame in place over a sheet ensuring an air tight seal.

Heat Output Indicators - illuminated when the heaters are energised; pulses on and off in a 60 second cycle when Energy (Heat) Regulator is below full.

Digital Timer - for setting cycle times.

Vacuum/Blow diverter valve - converts the air flow at the platen from vacuum to blow for releasing formings at the end of the vacuum forming process. At rest - vacuum. Pushed - blow.

Vacuum Pump On/Off switch - turns the vacuum pump on and off.

Energy (Heat) Regulators - regulates the power supplied to the elements.

Circuit Breakers - protecting the vacuum and heater circuits, they 'pop up' if there is a system overload. Push in to reset.

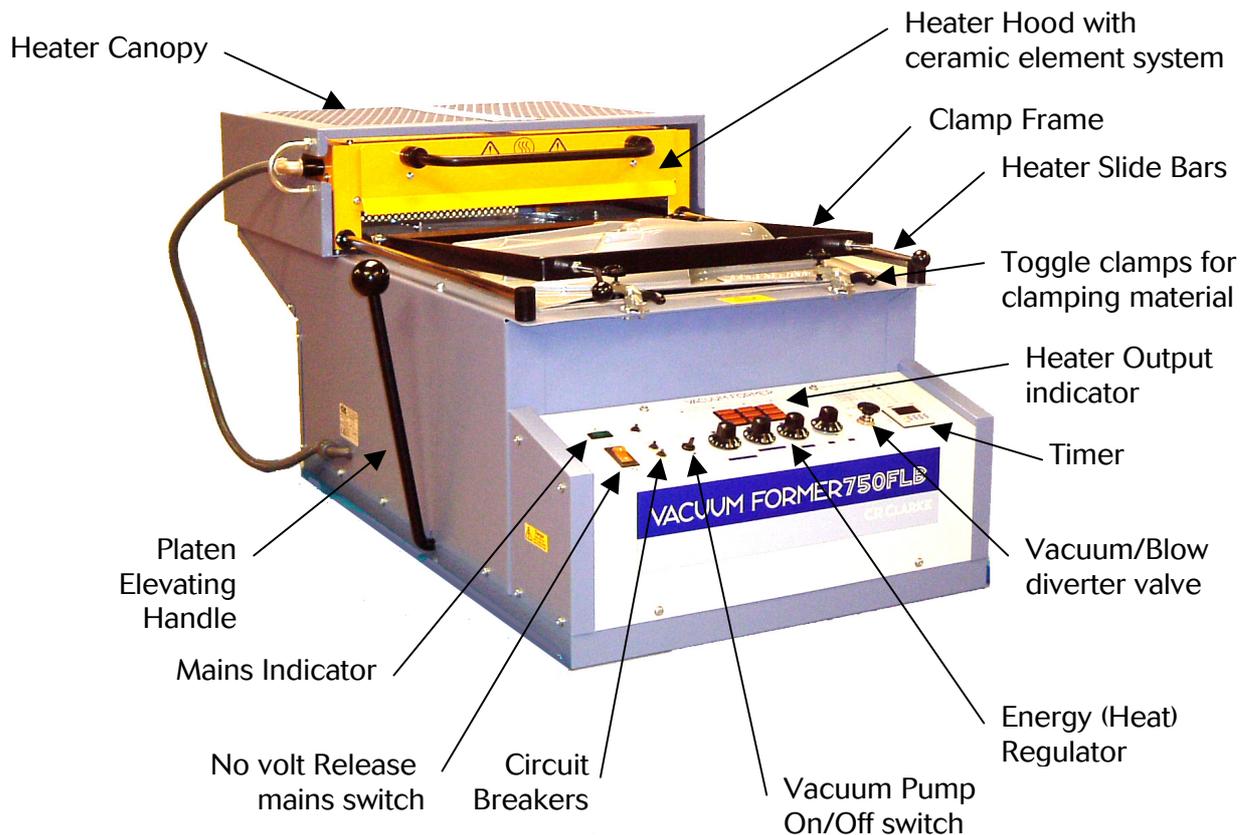
No Volt Release Mains Switch - makes power available to the machine. It will cut out and need to be reset if the power supply is interrupted. I=on, O=off.

Mains Indicator - illuminated green when there is power available to the machine.

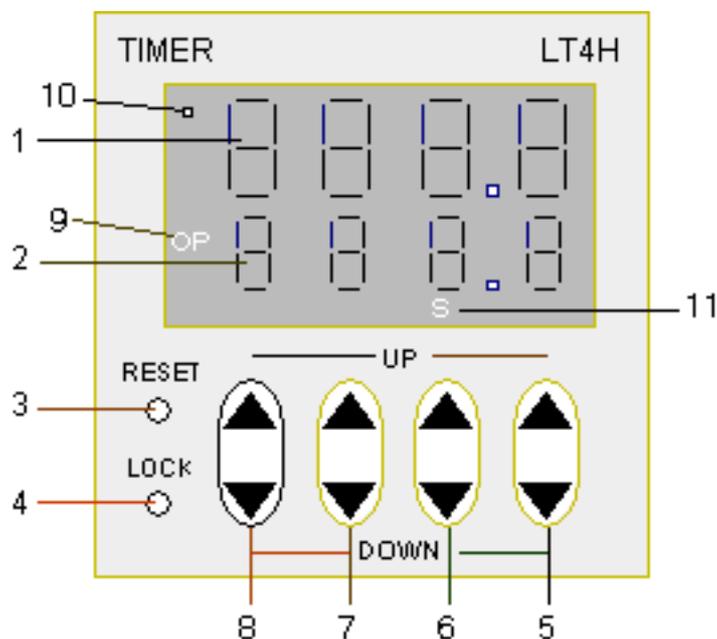
Platen Elevating Handle - lifts and lowers the platen.

Pressure Outlet (not shown) - for connecting Dip Coating Units (150R) and Dome Blowing Units (320).

Platen - moving platform onto which the mould is placed. Connected to the vacuum pump. Operated by the Platen Elevating Handle.



## 5. Timer



- 1 Live display. Displays time elapsed since cycle start (in seconds). Red illuminated display.
- 2 Set time display. Displays time set (in seconds) and can be adjusted when the timer is at rest or during a cycle. Orange illuminated display.
- 3 Reset button. Cancels timing cycle.
- 4 Lock button. Locks the Set Time, so that it cannot be adjusted by pressing toggle buttons 5,6,7 or 8. Press to lock and to unlock.
- 5 Tenths of seconds toggle button. Press on the down arrow to decrease tenths of seconds and the upward arrow to increase tenths of seconds (between 0 & 9).
- 6 Seconds toggle button. Press on the down arrow to decrease seconds and the upward arrow to increase seconds (between 0 & 9).
- 7 Tens of seconds toggle button. Press on the down arrow to decrease tens of seconds and the upward arrow to increase tens of seconds (between 0 & 9).
- 8 Hundreds of seconds toggle button. Press on the down arrow to decrease hundreds of seconds and the upward arrow to increase hundreds of seconds (between 0 & 9).
- 9 Operational indicator. Illuminated orange, flashes during cycle.
- 10 Secondary operational indicator. Illuminated red, flashes during cycle.
- 11 Format indicator. Illuminated orange, displays the time format (normally seconds).

Note: The timing cycle is automatically started when the Heater Hood is pulled over the TP sheet. Make sure the timer is set to the correct time before starting the heating cycle. Correct times must be ascertained by experiment - see page 10. The timer resets automatically when the Heater Hood is pushed back into the Heater Canopy.

## 6. Health & Safety Information

The Heater Hood can become hot during use, as indicated by:



Always wear protective gloves when operating the machine.

This equipment is designed for the vacuum forming of thermoplastic sheet material of 6 mm or less thickness. It should not be used for heating any other materials or for any other process - except the supply of air for use with other compatible units via the Pressure Outlet.

Do not cover or place items on the Heater Hood and canopy while the machine is in operation or cooling down as this might impair ventilation and could lead to items becoming burnt or melting.

Do not leave the machine unattended while it is in use.

## 7. Machine checks

Plug the machine into a suitable supply, switch on at the socket and the green Mains Indicator will illuminate. Switch on the No Volt Release Mains Switch. The switch is illuminated orange when in the 'On' position.

Set each of the Energy Regulators to full, the Heat Output Indicators will illuminate, showing there is power to the heaters, and they are warming up. This setting will be suitable for vacuum forming most thermoplastics but, in some cases such as thick materials or foams, one of the lower settings may be needed. As indicated on the panel, the four Energy Regulators operate different areas of the heater; the front, back, centre, and sides of the Heater Hood. Should the material need to be heated by different amounts in some of these areas, the Energy Regulators should be adjusted accordingly.

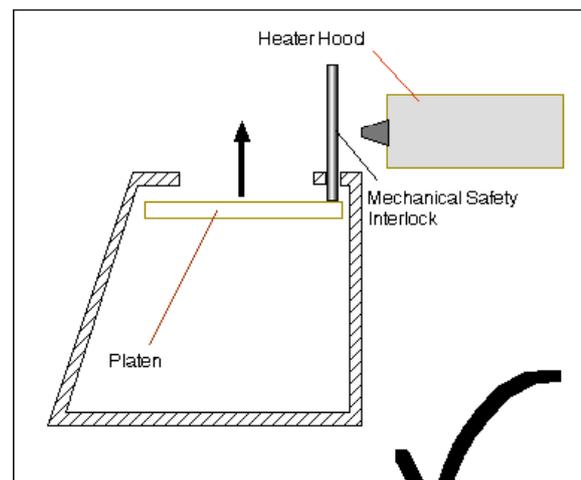
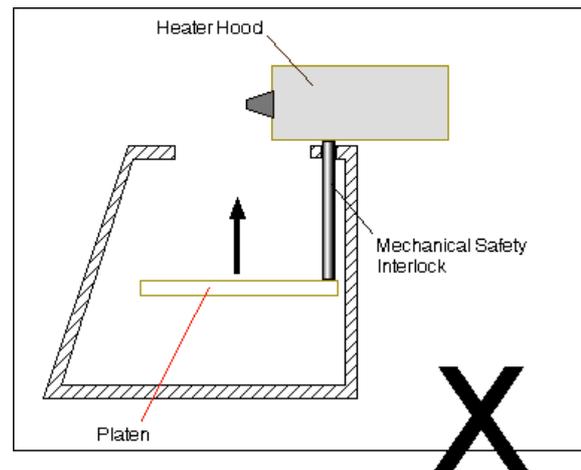
Set the Energy Regulators to off with power to the machine and switch on the vacuum pump, you will be able to hear it running.

Operate the vac/blow plunger knob and observe the different note caused by the air flowing in different directions through the platen. Turn the vacuum pump off.

Slide the heater hood fully forward to the stop and return to the idling (fully back) position, to make sure there are no obstructions to the slide track.

Pull the Platen Elevating Handle down, towards the front of the machine until it clicks into the over-centre locked position. In this position the platen will be locked in the raised position to form an air-tight seal on the under side of the clamp frame seal. Release the handle by pulling it upward - keep your hand on the handle and take care not to let it drop once it has gone back over centre (all the weight of the platen and mould is on the handle at this point).

A mechanical safety interlock is fitted to prevent the platen being raised and damaging the heaters when the Heater Hood is in the heating position. If raising the platen meets with any resistance DO NOT FORCE IT. Check that the Heater Hood is in the idling position first and then check for other obstructions.



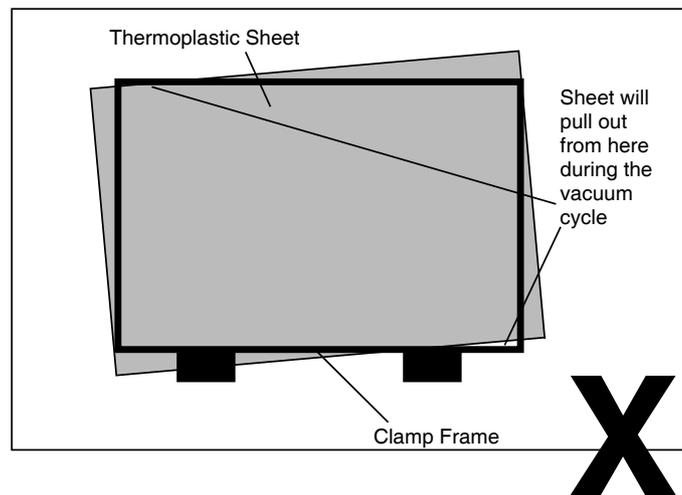
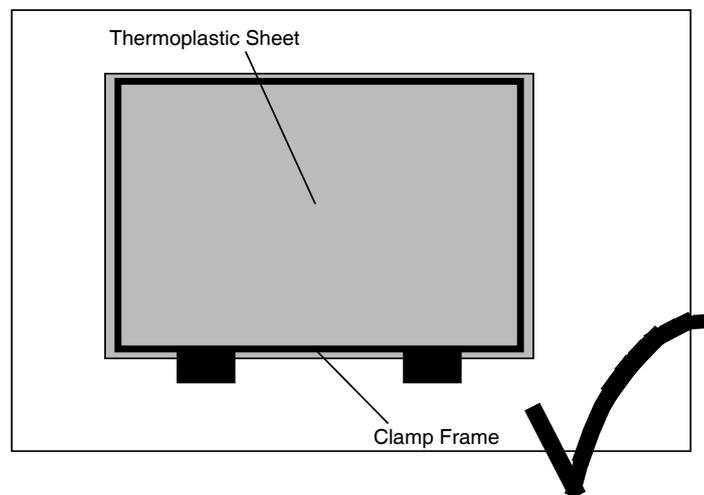
**The mechanical safety interlock**

## 8. Elements of the forming process

Turn the machine on as described in the previous section and turn the Energy Regulators to the desired setting. The heaters will take 10 - 15 minutes to warm up.

Place a mould mounted on a base board 432 x 482 mm 17 x 19ins on the platen\* and make sure that the platen is in the lowered position.

Place a thermoplastic sheet over the silicone rubber Clamp Frame seal, lower and clamp the Clamp Frame. Make sure that the clamp frame does not overhang the sheet at any point on it's perimeter ie. that material can be seen on the inside and the OUTSIDE of the clamp frame.



### Positioning a sheet under the clamp frame

\* see our technical information sheet no. 4 for information on mould making and base boards.

Pull the Heater Hood to the front of the unit - over the thermoplastic sheet - and begin heating. As the material gets hot it will soften. It is ready for vacuum forming when you can easily make an indentation in the sheet with a blunt instrument, such as a screw driver handle (don't use your fingers!) or you can see the sheet sagging under its own weight\*\*.

When the sheet is ready:

Turn on the vacuum pump

Slide the Heater Hood back to its idling position

Raise the platen using the Platen Elevating Handle until it is locked in the up position - the material will drape over the mould before being pulled down onto it once the platen is locked in position.

As soon as the material has pulled all the way down over the mould, press the Vacuum/Blow Diverter Valve. The reverse air flow will push the material off the mould and it will go out of shape. This is normal and it will recover the shape of the mould as soon as the Diverter Valve is released and the vacuum pulls the material down again. Using the Blow function like this prevents the forming gripping the mould and makes subsequent Blowing operations easier. The Blow function only needs to be used for a few seconds - as soon as the forming has released from the mould, revert back to vacuum ie. let go of the Vacuum/Blow Diverter Valve.

Continue the Vacuum/Blow cycle (ie. when the forming has pulled down fully press the Vacuum/Blow Diverter Valve until the forming releases from the mould, then revert to Vacuum) until the forming has cooled and is rigid.

Release and lower the platen and switch off the Vacuum Pump. If the mould remains inside the forming, lock the platen in the up position again, turn on the Vacuum Pump and operate the Blow function before lowering the platen again.

Release the Clamp Frame Toggle Clamps, lift the Clamp Frame and remove the completed forming from the machine.

**The unit can be operated on a continuous basis, however, remember to turn the unit off at the No Volt Release Mains Switch when not in use.**

\*\*It is a good idea to record the time it takes for sheets of particular materials and thickness to reach vacuum forming temperature. These times can be used for subsequent formings (making use of the timer - see page 6), removing the need to test the sheet's readiness by hand. When recording times make sure the machine is up to its full operating temperature ie. it has been in use for more than twenty minutes.

## 9. Reducing Frames

Reducing frames are available to handle half size (254 x 458mm) and quarter size (228 x 254mm) sheets. Whilst a reducing frame increases the sheet size options of any machine they should not be considered as suitable for virtually permanent fixture. Even with four heating zones, it is mechanically impracticable to configure the heating system to cover the reducing frame area only. They therefore tend to run at relatively high temperatures because they are insulated from the heat sinking capability of the main casing by the clamp frame seals and subsequently the life of these seals is considerably shortened. As a policy use the reducing frames, if purchased, for short periods and do not leave them mounted with their own or the main toggle clamps closed. Use of the reducing frames is explained by the instructions that accompany each frame.

**It is important to remove the original air distribution mesh from the platen before loading the lower sub-platen. Failure to do so will raise the reducing frame sub-platen above it's design height, cause the top edge to make premature contact with the forming aperture, put excessive strain on the mechanism and impair air seal efficiency.**

## 10. Servicing

No regular servicing is necessary other than to lubricate the platen and hood slide bars if operation becomes sticky. **To maintain effectiveness of the vacuum seals when not in use always leave the platen lowered and the clamp frame resting on top of closed toggle clamps, clear of the sheet seal.**

### Filter

The vacuum pump contains precision components which will not tolerate particle contamination. An in line filter is located adjacent to the right hand control panel side cover and the cover is appropriately marked. Filter elements should be replaced when performance is affected by reduced flow through the filter due to contamination. **Isolate machine from electrical supply before carrying out any servicing.** Remove the side cover and filter bowl. Replace with Crossland, Part No. 489 or equivalent and ensure that the small rubber seal fitted around the central bolt and the large seal fitted in the filter head recess are in place. Frequency of service cannot be predicted as it will depend upon operating conditions. Replacement filters are available as spares or may be available locally.

### Heating Element replacement.

If an element becomes broken due to misuse or mechanical failure, proceed as follows:-

- 1) Pull the hood fully forward
- 2) Unscrew the right hand chrome slide bar and remove
- 3) Remove four screws (top of heater hood) securing heater bank
- 4) Pivot hood to one side without disconnecting feed cables to gain access to heater terminals and securing clips
- 5) Remove faulty heater and disconnect from terminal block
- 6) Fit new unit and reassemble in reverse order

To establish if an element is non-operational, energise the machine from cold and touch heaters in turn to establish if they are warming up. Warmth should be felt within 1-2 minutes. If unable to touch all elements, remove hood as described above and test alongside machine. Note that if an element is found non-operational, it is more likely to be a loose or corroded connection at the terminal block than a faulty element.

# 11. Problems with vacuum forming

Following are some of the common problems and their solutions associated with vacuum forming.

## **Sheet Doesn't Pull Down over the Mould**

Air may be trapped between the mould and the sheet - check that you have enough evacuation holes (resin and aluminium moulds only).

The sheet may not be hot enough - increase the heating time or power output.

The clamp frame or platen seals may need replacing - check and renew if necessary (see Fault Diagnosis later).

The vacuum pump filter may need cleaning/replacing.

The sheet may be cast acrylic, which does not vacuum form very easily or to very high definition.

## **Sheet Burns or Blisters**

The sheet may have become too hot - reduce the heating time or power output (turn down the Energy (Heat)•Regulator).

The sheet may be hygroscopic and moisture in the sheet is causing it to blister, - dry the sheet thoroughly before heating.

If the sheet is thick (over 5 mm)•it may need more time for the heat to soak all the way through - reduce power and increase the heating time.

## **Sheet Pulls out of Clamp Frame when Raising the Platen & Mould**

The sheet was not positioned correctly - see page 9.

The sheet was not hot enough - increase the heating time.

The material may not be vacuum formable - check source and type.

The mould may be too large or it's edges too close to the perimeter of the forming aperture - modify the mould design.

## **Webbing Occurs on the Finished Forming**

The sheet may have got too hot and sagged too far during heating - reduce heating time or power output.

The design of the mould may need to be modified.

## **Forming will not Release from the Mould**

There may be undercuts on the mould which are holding the forming in place - check mould for undercuts.

The forming may have 'shrunk' onto the mould - start the blow cycle earlier.

The mould material may have bonded with the forming material - put a thin coating of silicone oil or similar on the mould before forming.

The mould may have become too hot - turn the machine off and wait for the mould to cool before attempting another forming.

The mould surface may be too rough - make sure there is a good, even finish on the mould before vacuum forming.

## 12. Fault diagnosis

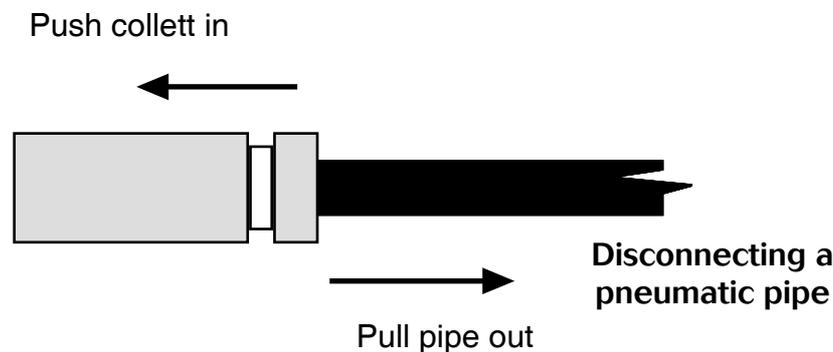
Your 750 should provide long and reliable service but in the event of any operational problems the following checks can be carried out to identify the source of any problems.

### Loss of vacuum

Are the toggle clamps adjusted so that an airtight seal is formed between the upper seal and the material?

Check that the lower platen seal is in good condition, stands proud of the platen edge by at least 2mm all the way around and forms an air-tight seal when the platen is elevated. To check this, take a currency note and clamp it between the platen and the underside of the casing. The seal is good if it grips the note so that it cannot be pulled out. If the note can be pulled out without tearing it, then you need to replace the lower platen seal.

Remove the back cover and check that there are no loose or displaced pipes. **IMPORTANT-Disconnect from mains supply before removing any machine covers.** The pneumatic lines are terminated by the use of push fit connectors. To release a pipe, push the pipe and collet firmly into the fitting and then pull the pipe out. To connect a pipe, push the end of the pipe firmly into the collet.



### Uneven heating

Ensure the machine is not in the path of any draught.

Check all heaters are intact. With the machine switched off and cold check each heater element by touching each one in turn. If one or more heaters is cracked or broken, note their position, size and wattage and replace.

Check all heaters are operational. Switch on the machine from cold and check each heater element is heating up by touching each one in turn within the first few seconds of powering the heater. If one or more heaters fails to heat up there may be a loose or corroded connection above the reflector.

Note the element's position, size and wattage and replace.

## **Failure to heat**

If the complete heater bank is non-operational check the circuit breaker on the control panel. To reset push the circuit breaker back in.

Check the No Volt Release Mains Switch and replace if it is not operational. Check each of the Energy Regulators. Replace if one or more is not operational.

If all of the above are okay, unscrew the control panel, tilt it forward and check all the cable terminations are intact and there are no loose wires. If any are found, refer to the wiring diagram in the back of this manual or refer back to your distributor or the manufacturer.

**IMPORTANT DISCONNECT FROM MAINS ELECTRICAL SUPPLY BEFORE SERVICING.**

## **Non-operation of vacuum pump**

Check the circuit breaker on the control panel. To reset push the circuit breaker back in.

Check the No Volt Release Mains Switch and replace if it is not operational. If both the above are okay, unscrew the control panel, tilt it forward and check all the cable terminations are intact and there are no loose wires. If any are found, refer to the wiring diagram in the back of this manual or refer back to the your distributor or the manufacturer.

**Mains indicator glows but goes out when main isolator/overload switch is operate.**

Check neutral connections within machine, power supply or extension lead (if applicable). Re-connect any loose connections.

## **Low vacuum performance**

After considerable use (12 months continuous or equivalent) the vacuum pump flap valves or filter may become contaminated or blocked with residue from the forming process. Remove the control panel and identify the vacuum pump. Remove vacuum pump head and clean valves or replace filters as necessary.

**FOR SPARES AND ADVICE ON MAINTENANCE AND REPAIR, REFER TO YOUR DEALER OR THE MANUFACTURER.**

## 13. Technical specification

### General

Cut sheet size	458mm (18ins) x 508mm (20ins)
Max. forming aperture	432mm (17ins) x 482mm (19ins)
Max. material thickness	6mm (0.25ins)
Platen stroke	152mm (6ins)
Vacuum (typical)	635mm Hg (-0.86 bar)
Heater system	Ceramic

### Shipping - Bare Machine

Width x Depth x Height (metric)	720 x 1270 x 600mm
Width x Depth x Height (imperial)	28 x 50 x 24ins
Weight	91kg (200lb)

### Electrical

Voltage	220-240
Current (max)	11A
VA (Total)	2650
VA - Heater	2400
VA - Vac pump	250
Circuit Protection - Heater	12A Circuit Breaker
Circuit Protection - Vac Pump	5A Circuit Breaker
Circuit Protection - Control	0.5A Circuit Breaker

**FAILURE TO OPERATE THIS EQUIPMENT IN ACCORDANCE WITH THESE INSTRUCTIONS MAY RESULT IN IMPAIRED PERFORMANCE OR FAILURE OF CERTAIN SYSTEMS**