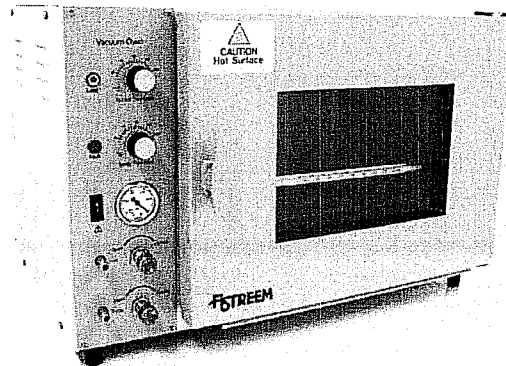


FISTREEM™

Instruction Manual



Fistreem Vacuum Oven



READ BEFORE USE!


Fistreem International Ltd

Fistreem International Ltd

Health and Safety at Work

Fistreem International Ltd is required under the Health and Safety at work, etc. Act, 1974 and other UK legislation as designers, manufacturers, suppliers and importers of articles for use at work to ensure that, as far as is reasonably practicable, articles which we design, produce, supply or import are safe and without risk to health.

We are required to provide information on the safety and handling precautions to be observed when installing, operating, maintaining and servicing our products. Such advice is contained in this manual.

We are also obliged to update this information should circumstances change and to operate a system to this end.

We should also like to point out, however that **you as users have an important responsibility in the provision and maintenance of safe working practices and conditions.**

Accordingly, we draw the following matters to your attention:

- 1. This apparatus should only be used as intended and within its design parameters by suitably qualified and trained personnel who have read and understood the relevant sections of this manual.**
- 2. This manual should be readily available to such personnel at all times.**
- 3. In addition to that which is written in the manual, normal common-sense safety precautions must be taken at all times to avoid the possibility of accidents. Particular care is required when working with apparatus at high temperature or pressure.**
- 4. Installation, maintenance, repairs and servicing should only be carried out by an approved engineer, and connection to electrical supplies should only be carried out by suitably trained personnel.**

TECHNICAL SUPPORT, WARRANTY SERVICE AND MAINTENANCE

UK customers; if you are in any doubt whatsoever regarding the correct use of this apparatus, or if you require any technical data or assistance, please contact the Fistreem International Ltd Technical Support Department at;

Fistreem International Ltd

Monarch Way

Belton Park

Loughborough

Leicester LE11 5XG United Kingdom

Telephone +44 (0) 1509 224613

Fax +44 (0) 1509 260210

E-mail: sales@fistreem.co.uk

OVERSEAS CUSTOMERS: Should contact their local Distributor..

ELECTRICITY SUPPLIES: Voltage and frequency

This apparatus is offered and labelled for one, or for a choice of two or more voltage ranges and, where necessary, different frequencies of mains supply. Fistreem International Ltd does not accept any responsibility for the operation of any such apparatus should it be connected to electricity supplies which are normally outside, or vary outside, the stated voltage and frequency values for which it is designed, nor for any consequential loss, damage or injury, howsoever caused.

Read This Before Use!

FISTREEM INTERNATIONAL LTD PRODUCT WARRANTY
Terms and Conditions

We hope that you do not have the need to use the extensive warranty cover that Fistreem International Ltd. extend to you. However should you have a problem, our prompt response is greatly helped if you have filled in and posted the pre-paid Warranty Registration Card supplied with your new equipment.

Fistreem International Ltd. gives a one year warranty from the date of delivery. During this period, component parts proven to be defective in materials or workmanship will be repaired or replaced at our expense. Installation, commissioning and calibration are not covered by this warranty agreement. The Fistreem International Ltd. approved service agent must be contacted for warranty determination and direction prior to any work being carried out.

These warranties are only applicable to new products, and not second hand nor refurbished products even if repaired by Fistreem International Ltd. Any such products are covered by separate warranty terms and conditions which will be made available on request.

Replacement or repair of component parts or equipment under this warranty shall not extend the warranty to either the equipment or the component part beyond the original one year warranty period unless agreed in writing by Fistreem International Ltd .

The above warranties are extended to the original purchaser upon full invoice payment. A purchase receipt or other proof of purchase may be required before warranty service will be performed. These warranties only cover failures due to defective workmanship which occur during the normal operation of the product by the original purchaser, and not failures which result from accident, misuse, abuse, neglect, mishandling, misapplication, alteration, faulty installation, electrical power fluctuations, dust, or other environmental extremes, modification or service other than by an approved service agent or following the written authority of the manufacturer, or damage that is attributable to acts of God. Expendable or consumable items such as motor brushes, door seals, lid seals, "O" rings, heating elements or lamps are excluded.

Fistreem International Ltd, or its approved service agent, reserves the right to repair defective equipment on the premises of the customer, or at a service station, at the sole discretion of Fistreem International Ltd or their approved agent. In the event of return to an approved service centre the customer is responsible for the safe packaging of the instrument and notification to the service centre. Neither. Fistreem International Ltd nor its agents are responsible for any damage occurring during shipment.

Specification and Material Changes:-. Fistreem International Ltd reserves the right to supply our latest and improved models at time of shipment.

Taxes:- The prices quoted do not include any taxes imposed by the State or Country in which the purchase was made.

Installation:- Installation of all equipment shall be by, and at the expense of the purchaser unless stated otherwise. Access to the site, and the provision of required utilities e.g. Power, water and drainage to suitable connections, will be the responsibility of the purchaser, and at the purchaser's expense.

Limitation of liability:- In no event, whether as a result of breach of contract or warranty, shall Fistreem International Ltd. be liable for any consequential or incidental damages including, but not limited to, loss of profit or revenues, loss of use of the equipment or any associated equipment, down time costs, costs of substitute equipment, costs of labour, costs due to delays or claims of purchaser's own customers for such damages. The purchaser agrees to indemnify Fistreem International Ltd. and to hold them harmless from any and all liability, claims, demands, actions, suits, expenses or costs, including attorney's fees relating to such consequential or incidental damages.

All expressed and implied warranties, including the warranties of merchantable quality and fitness for a particular purpose, are limited to the application period of one year.

Validity:- Legal rights vary from country to country and states within countries, so some or all of the exclusions or limitations listed above may not apply, but if any part of these conditions shall be found to be unenforceable it shall not affect the validity or enforceability of the remainder of the conditions.

ELECTRICITY SUPPLY

Before connecting this apparatus to the electricity supply, check the information given on the rating plate and ensure that;

- A) Your supply is single phase a/c. (alternating current) of the stated frequency with neutral nominally at earth potential.
- B) Your supply voltage is within the stated range.
- C) The current rating is within the capacity of your outlet.
- D) Your plug or electricity supply circuit should be fitted with a suitable fuse.

Fuse rating - 220v - 240v	100v - 120v
5 amp	N/A

WARNING! This apparatus must be earthed.

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

	220v - 240v	110v - 120v
Live	Brown	Black
Neutral	Blue	White
Earth	Green and Yellow	Green

Connect the wires to a non-reversible 3-pin plug as follows:-

Green and Yellow or Green to terminal marked E (Earth), G (Ground), coloured Green or Green and Yellow or marked with the Earth symbol.

Blue or white wire to terminal marked N (Neutral) or Common or coloured Blue.

Brown or black wire to terminal marked L (Live) or Phase or coloured brown.

Note: 110v - 120v installations to comply with National and State Wiring Codes.

IMPORTANT Consult an electrician if in any doubt or if your supply system has any of the following:

- No earth

- A colour code different from above

- Reversible plugs

- Supply and return leads that are both above earth potential.

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1. ABOUT YOUR OVEN

1.1 How It Works

The vacuum oven provides a heated chamber from which an external pump will remove the air/gas present. Two valves control the exit and ingress of gas into the working chamber.

Typical uses:

1. **Quick drying** (high temperature and low pressure) e.g. for dry weight determinations of powders
2. **Low temperature drying** (low temperature and low pressure) e.g. drying temperature sensitive material
3. **Heating in gas atmosphere** (at atmosphere pressure) e.g. to study effects of the chosen gas atmosphere on samples, or for inert atmosphere drying or curing.
4. **Solvent removal/evaporation**

1.2 Construction

The light alloy 31 litre vacuum chamber has large heater elements strapped to its outer surface and these are insulated from the outer case by glass fibre insulation. The outer case is itself made from tough steel coated with stoved epoxy-polyester paint.

The chamber is closed by a toughened 12mm thick glass plate door which compresses a silicone rubber seal on the door surround. The glass plate is secured by four spring loaded fixing pins ensuring effective, even compression of the seal. As an added precaution a 4mm thick shatter resistant clear polycarbonate sheet covers the door window to the front.

NOTE: Label fixed to door warns that the surface may be hot to the touch.

1.3 Vacuum and Temperature Level

The oven is designed to operate at any internal pressure from 0 to atmospheric.

It must not be operated with the chamber above atmospheric pressure i.e. at positive pressure.

A vacuum meter indicates the vacuum that is being produced inside the oven and reads from 0 (ambient pressure) to 1010 millibars. The hydraulic thermostat is calibrated to show the approximate oven temperature under fully evacuated conditions and the scale is correct at 100°C under this condition. For frequent use at other temperatures and partial vacuum, the scale can be re-calibrated.

The load lamp lights when the oven is heating. The safety thermostat is calibrated in a similar way to the control thermostat. The fault lamp shows when it has cut in to control the oven. A mercury in glass thermometer is used for re-calibration of the two thermostats and for providing reasonably accurate internal temperature readings. It clips to the front of a shelf and can be read by viewing through the door window.

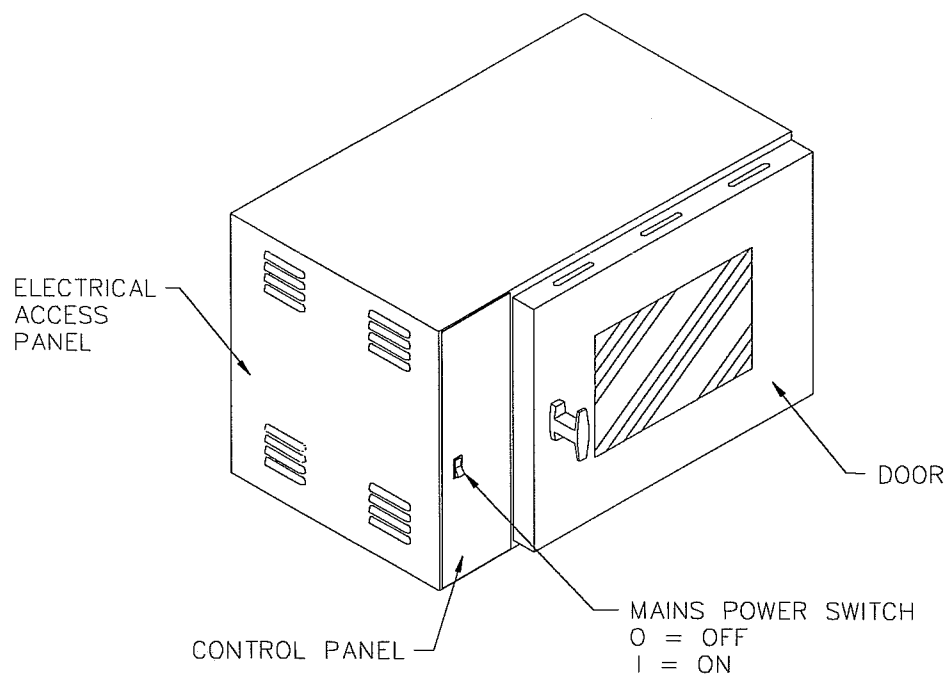


Figure 1
Front View Of Vacuum Oven

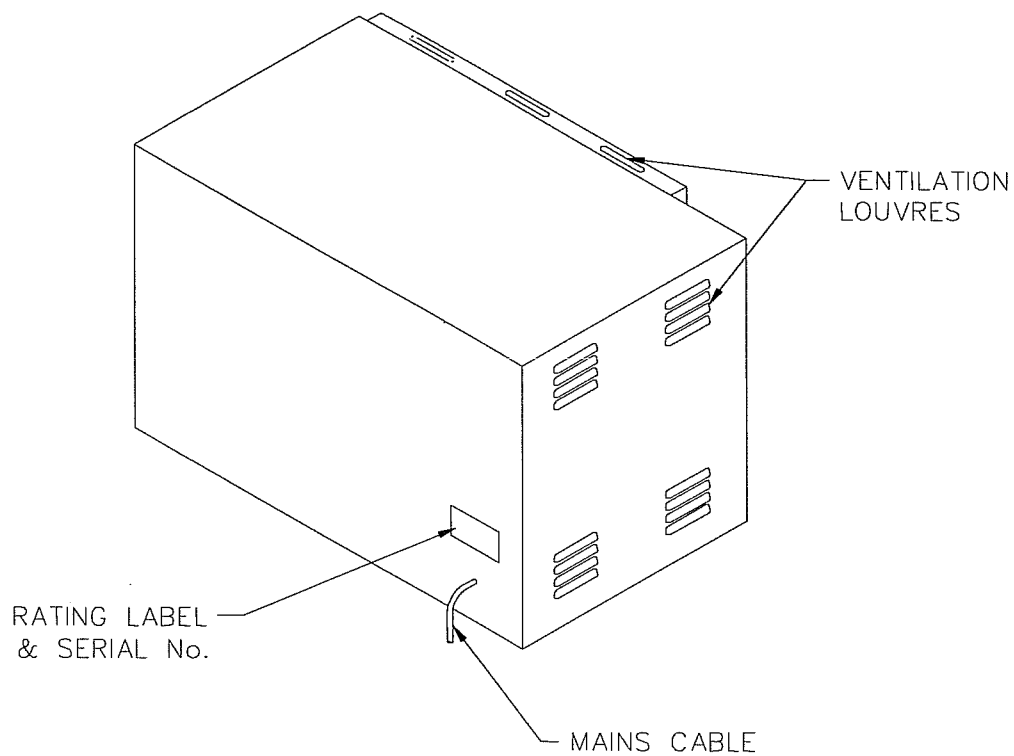


Figure 2
Rear View Of Vacuum Oven

2. UNPACKING

Remove the outer packaging and save it. In the unlikely event of any transit damage or operational failure, the packaging may be required to return the unit without causing any further damage.

Ease the oven out of the packing making sure it is:-

- On a strong level bench
- Near a suitable power socket
- Away from damp, heat, passers by
- Near vent if for solvent removal use

2.1 Check oven rating

Check the rating plate, (at the bottom rear of the oven,), against your order details. In particular note - voltage, amps, frequency and catalogue number.

2.2 Check your supply

See information on 'Electricity Supply' page.

2.3 Unpack shelves and thermometer

Unpack shelves and thermometer which are wrapped in bubble pack inside the oven.

CAUTION - thermometer is mercury in glass type - exercise care in unwrapping.

3. CHECKING AND PREPARING FOR USE

3.1 Check Oven and Packing List

PARTS

2 x shelves, one with clip

1 x thermometer

CHECKPOINTS

Check thermometer OK

Check door seals are clean and fit well

Check door glass and plastic door screen OK

Check over your oven. Make sure the accessories are supplied, the door fits well and the plastic screen slides down.

Complete the warranty card now.

3.2 Fix the thermometer

The thermometer is right angled. The short part with the bulb on it fits through a hole at the front of the shelf and the body clips to the outer edge of the lip, see below.

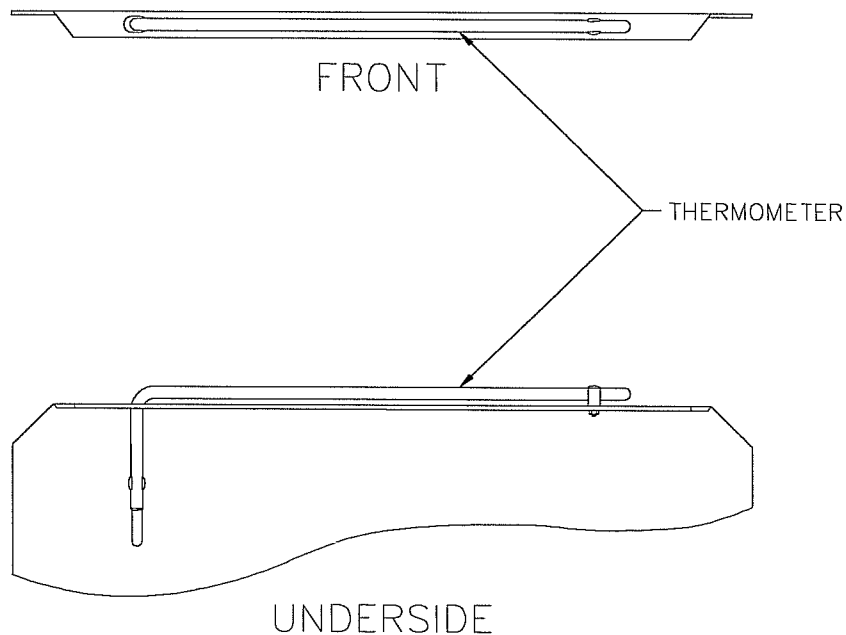


Figure 3
Fitting Thermometer To Front Of Shelf

3.3 Ensure The Oven Is Clean

Use a damp cloth for cleaning outside.

If internal chamber etc. requires disinfecting the following fluids may be used:

TERMINEX 2 (Available from Arrow Chemicals Ltd)

VIRKON (Available from Antec International)

These cleaning agents if used as instructed by the manufacturer should not be harmful to this product, or accessories supplied for use with this product.

3.4 Safety Screen Operation

The plastic safety shield slides out the bottom of the door for cleaning. If experiencing difficulties align its edge with slot in bottom of door to slide down (it does not slide out completely).

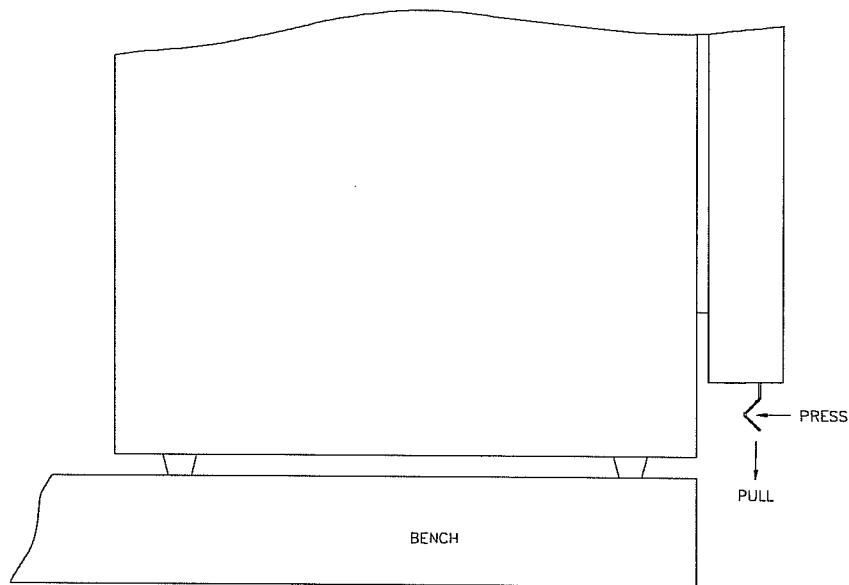


Figure 4
Access To Safety Screen For Cleaning

3.5 Connect Suitable Vacuum Pump

Connect a suitable vacuum pump to the outlet valve labelled 'pump' on the oven. If in doubt about suitable types contact your dealer. Use 6.5mm bore heavy duty heat, gas and solvent resistant tubing.

3.6 Check Pump, Door Seal and Inlet/Outlet

Check inlet is open, pump valve (outlet) is open, the door seal fits properly, the plastic shield and the thermometer are in place before use.

4. THE CONTROL PANEL

The vacuum oven has been designed to be simple to control. There are just 3 types of control parameter:

1. Temperature
2. Pressure
3. Internal atmosphere - gas type

This section contains the **load lamp** and the **temperature control thermostat**. The load lamp lights when the heater is functioning. The thermostat sets the oven temperature. Whilst the oven temperature is below the set level the heater operates and the lamp lights. At the set level the thermostat cuts the heater and the lamp goes out. The scale is factory calibrated at 100°C but may need re-calibration

This section contains the **fault lamp** and the **safety thermostat**. The safety thermostat is normally set above the control thermostat and will only operate to cut off the heater if the control thermostat fails and the oven rises above the set temperature. Under this condition, the fault lamp will light. If the safety thermostat is set very near to the control thermostat temperature or below it, the safety system may take over, i.e. fault lamp lit but no fault.

This section contains the **mains power switch** and a **vacuum meter** calibrated 0-1000 mbar which indicates the vacuum inside the oven. **Remember that the oven is not designed for operation above normal room pressure.**

This section contains **one of two valves controlling entry and exit** of air/gas to the oven chamber. This valve is labelled 'inlet' and allows air or an inert gas to enter the oven chamber via the **valve spout**. This is ribbed to accept tubing. When air is being drawn out of the chamber by the pump and the oven is at or near temperature, this valve can be closed so that air pressure in the oven chamber falls and a vacuum is created.

This section contains the **second valve labelled 'pump'** and it's spout. The pump is connected via tubing to the spout and the valve is opened. With the inlet valve closed or restricted - partially closed, a vacuum is formed. By shutting both valves when the oven pressure drops to the desired level, the vacuum can be maintained. Similarly the pump valve can be left open so that the pump continues to try to lower the pressure as the oven is used.

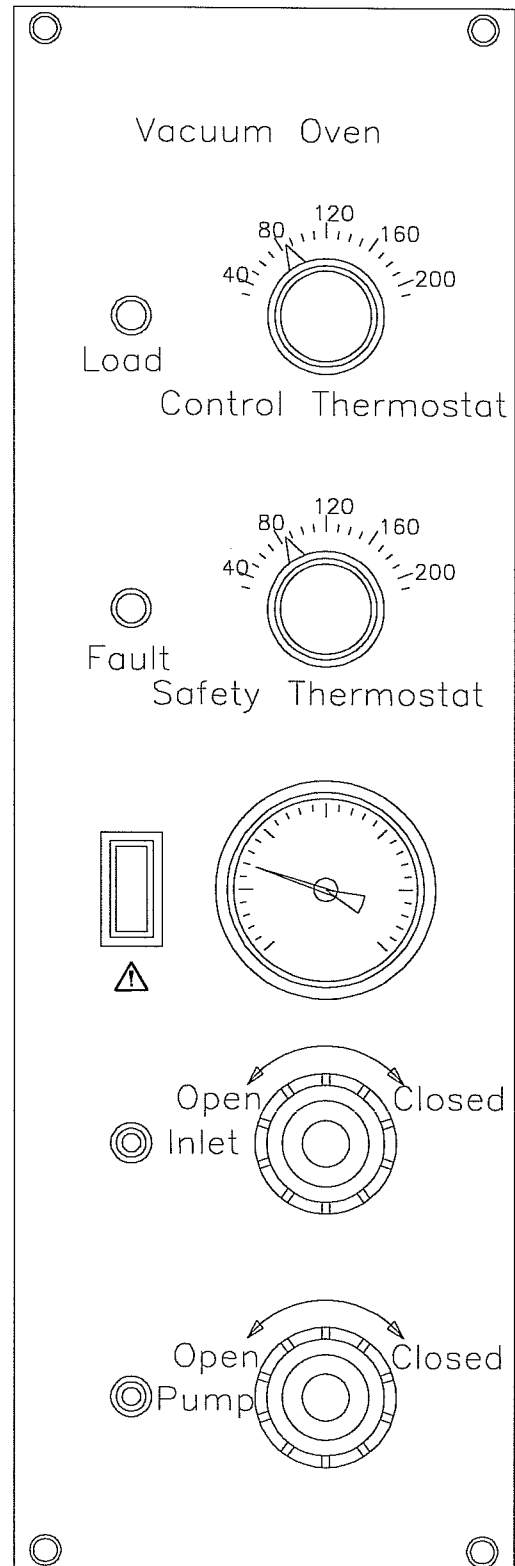


Figure 5 Control Panel

4.1 Solvent Removal

The oven unit can be used for solvent removal. The extracting pump and tubing must then be able to cope with solvent laden air and must itself be vented either to a condenser system or an external vent.

Certain solvents may attack the silicone door seals, therefore it is recommended that spare seals are held.

The unit can also operate as an inert atmosphere oven. Air is withdrawn from the chamber via the pump outlet and a source of the desired gas is connected to the inlet side and bled in via the inlet valve until the desired pressure conditions are reached.

WARNING: This equipment is not designed for use within a potentially explosive atmosphere!

5. WARNING SYSTEM

The temperature warning system is based around the safety thermostat. When this takes control of the oven, the fault lamp will light, warning that a fault condition has developed.

5.1 To Set the Temperature Warning System

Set the oven thermostat to the desired oven operating temperature.

Set the safety thermostat to about 10°C over the control temperature already set above.

The fault lamp lights if a malfunction causes the oven temperature to rise beyond the desired set temperature to that at which the safety thermostat has been set. The safety thermostat then cuts the heater power. When temperature drops below set control temperature the red lamp will go off and the load lamp will come on, indicating that power has been restored to the heating elements.

5.2 Pressure Warning System

Pressure warning is provided by the vacuum meter. This reads from 0 to 1010.

0 mbar is equivalent to ambient barometric pressure. The meter indicates the level of vacuum attained.

Under no circumstances should the needle fall below zero - this would signify positive pressure inside the oven. If this happens, switch off mains power, gently open the inlet valve and detach any inert gas supply. The door is designed to release excessive, positive internal pressure.

6. OPERATING SUMMARY

1. Make sure that the oven is clean and ready for use and that a vacuum pump is connected.
2. Clip the thermometer to front of shelf.
3. Check set temperature.
4. Set safety thermostat to about 10°C over oven set temperature.
5. Switch on at mains and switch on oven at panel.
6. Load the oven as required.
7. Ensure door is fully closed giving a good seal, prior to using vacuum pump. Open inlet and pump valves, then start pump.
8. Near set temperature close the inlet valve to establish a vacuum. Check the vacuum gauge to see how evacuation is proceeding.
9. It is possible to alter vacuum by bleeding air in or out using the two valves and the pump. Establish normal pressure before trying to re-open the door and unload.

If warning signals occur in use, refer to the trouble shooting guide on page 16.

7. LOADING/UNLOADING & SEALS

7.1 Loading and Unloading

Space items evenly.

Use shallow trays when removing moisture from samples.

Use as few shelves as safety permits, shelves impair heat transfer to samples.

If using a dessicant it should be inert, solid and placed on a shelf.

7.2 Care with Liquids

Be aware that the boiling point of liquids falls as pressure falls.

Avoid using sealed containers of any kind.

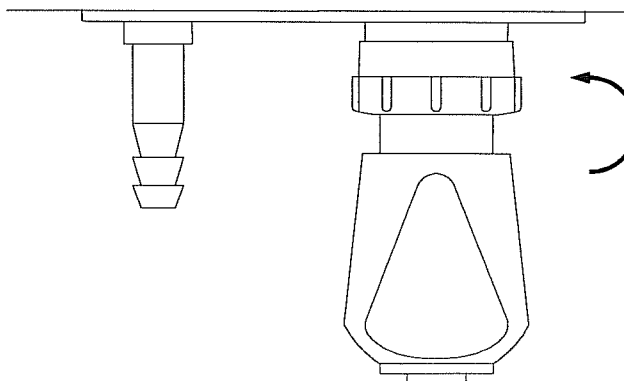
Do not allow any liquids heated under vacuum to boil unless this is specifically required.

7.3 Care with Thermometer

The glass thermometer is fragile. It contains mercury which is a hazardous substance.

Prior to using the oven it is recommended that mercury decontamination procedures are studied and followed in the event of a breakage.

7.4 Checking The Inlet/Outlet Seal (Older versions only)



Undo for inspection of diaphragm (valve seal). If badly damaged contact your dealer to have it renewed.

Figure 6
Checking Inlet & Outlet Valve Seal

8. SEAL/CALIBRATION/PUMP

8.1 Replacing The Seal On The Door Surround

Four bolts secure the door surround over the seal edge. Loosen these fixings and pull out the old seal, noting which way round it fits. Replace it with a new seal.

8.2 Thermostat Knob Setting Insufficiently Accurate

Position the control knob without regard to the scale so that the oven heats to the required temperature as indicated by a thermometer. When the temperature has stabilised, rotate the knob to indicate the temperature shown by the thermometer. Use a fine bladed instrument screw driver to adjust the range screw (accessed through the hole adjacent to the control knob) until the load lamp just switches off. The knob reading will now correspond with oven temperature.

Note that the range screw must be turned clockwise if the oven temperature is higher than the knob setting and vice versa.

8.3 The Pump

The oven's vacuum characteristics depend on the vacuum pump which is connected. The pump should be correctly and regularly maintained. Most pumps have an oil reservoir which must be changed regularly. If evaporating solvents it is good practice to include a cold trap to prevent contamination of the pump oil. Consult the pump manufacturer's literature.

9. TROUBLE SHOOTING

Warning: If in doubt about a malfunction of your Vacuum Oven contact your dealer or Fistreem International Ltd for service and advice.

Symptom	Likely Cause	Action
Oven will not heat Heater lamp out	No power connected	Make sure oven is plugged in and switched on and that no fuses/breakers are blown
Oven will not heat but power connected	Safety thermostat has cut in (Red neon will light) Circuit/thermostat failure	Increase set temperature. Check cause of safety stat cut-in before using oven further. Consult your dealer
Oven heats very slowly - an empty oven will normally take about an hour to reach temperature	Heater circuit failure	Consult your dealer
Oven heats but temperature is not controlled	Thermostat failure	Consult your dealer
Oven temperature is controlled but not at set temperature	Thermostat out of calibration	Reset calibration of thermostat, see page 15
Oven controls but temperature increases slowly with a fixed control knob setting	Leak/faulty thermostat hydraulic system	Consult your dealer
Oven temperature is controlled but fluctuates excessively	Faulty/badly positioned thermostat	Consult your dealer
Safety thermostat does not cut in at set safety temperature/inaccurate	Safety thermostat may require re-calibration	Reset calibration of thermostat, see page 15
Vacuum is lost when both valves are closed	Check all external pipe joints. Door not properly closed or seals dirty or ill fitting. Valve diaphragms faulty	Tighten as necessary Check door closed Clean seals or refit Unscrew and check valves, see page 14 Consult dealer if valve seals need replacing or if fault persists
Door will not open	Unit still under vacuum	Open pump and inlet valves

10. SPECIFICATION

10.1 Construction

Epoxy polyester stoved steel outer case
Inner chamber is a cast alloy unit
Insulation between outer and inner case is glass fibre
Door is 12mm toughened glass in a metal frame with an outer transparent polycarbonate safety shield 4mm thick
Seals are silicone rubber

10.2 Controls

Temperature control is by direct reading hydraulic thermostat
An independent safety over temperature thermostat is provided
A vacuum gauge and two diaphragm valves are provided for connection and monitoring of an external vacuum pump (not supplied)

10.3 Accessories Supplied

2 shelves
1 angled, mercury in glass thermometer

10.4 Dimensions

Internal H x W x D	260mm x 355mm x 310mm
External H x W x D	420mm x 630mm x 425mm
Capacity	31 litres
Shelf dimensions	366mm x 290mm

10.5 Performance Specification

Temperature range	30°C to 200°C
Temperature fluctuation	+ or - 1°C
Time to 200°C minutes	60
Vacuum range	0.01 - 1010 mbar

10.6 Operating Specification

Temperature	10 to 40°C
Humidity	MRH 80% up to 31°C decreasing linearly to 50% RH at 40°C
Altitude	Up to 2000M

10.7 Rating

Power rating	1000W maximum
Type OVA031.XX1.5	220-240V, 50-60 Hz
Type OVA031.XX1.1	110-120V, 50-60 Hz

11. SPARES

Components most subject to stress or wear should be available on site to assure continuity of operation.

Recommended

Part No.	Description	Qty.
71070.087	Glass door	1
OVL-578-090G	Door gasket	2
33100.098	Heaters	1
OVL-578-050S	Thermometer 0-200°C	1
77050.160	Pipe sealing 'O' rings	1
37080.012	Control thermostat	4
75030.007	Vacuum Guage	1

12. PRESSURE CONVERSION TABLE

1 atmosphere	= 760mm Hg = 101325 N/m ² = 1.0332 Kgf/cm ² = 29.9213 in Hg = 101325 Pa = 14.696 lbf/in ²
1 bar	= 750.062mm Hg = 1 x 10 ⁵ N/m ² = 1.0197 kgf/cm ² = 29.53 in Hg = 1 x 10 ⁵ Pa = 14.504 lbf/in ²
1 lbf/in ²	= 6894.76 N/m ² = 6.89476 x 10 ² bar = 7.0307 x 10 ² kgf/ cm ² = 6894.76 Pa
1 torr	= 1/760 atm = 1.3332 mbar = 1mm Hg

13. AMBIENT PRESSURE AND GAUGE READING

When the oven is under vacuum the reading on the gauge will reflect the reverse reading of the ambient barometric pressure.

Example: When room pressure 970m bar, then gauge will read -970m bar. If left overnight, should the room pressure change to 900m bar, then the gauge will read -900 m bar.

Note: The use of the minus sign is for explanation purposes, in fact the vacuum inside the oven will be zero when reverse reading is reached.

14. PRODUCT DISPOSAL - ISO 14001 COMPLIANCE

This product should be treated as industrial waste and disposed of accordingly. There are no toxic material used in the manufacture of this product. The majority of materials used in this product are recyclable, and all can be disposed of safely. Where the product has refrigeration, it is important that prior to disposal the refrigerant gas is recovered by a qualified person. The insulation material is non-toxic but could be an irritant. If removed from the product it should be bagged and disposed of at an authorised site.

15. HOW TO OBTAIN SERVICE ON YOUR VACUUM OVEN

Fistreem International Ltd is committed to giving our customers the best possible service. If your vacuum oven should require service at any time please follow these procedures: -

1. Contact the repairs centre - have the model, serial number, and date of purchase and fault description available.
2. You will be given a return goods authorisation number and directions for shipping.

All countries - Contact your local Fistreem International Ltd distributor, details can be found on our website: www.fistreeminternational.com.

UK only For all technical and service enquires contact: -
FISTREEM INTERNATIONAL LTD
Monarch Way
Belton Park
Loughborough
Leicester LE11 5XG
Telephone +44 (0) 1509 224613
Fax +44 (0) 1509 260210
E-mail: sales@fistreem.co.uk

**Monarch Way
Belton Park
Loughborough
LE11 5XG UK
Tel : +44 (0) 1509 224613 / 224615 Fax : +44 (0) 1509 260210
Email : sales@fistreem.co.uk
www.fistreeminternational.com**


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